

## SPECIFICATIONS OF MATERIALS INDEX

### Particulars

### Page No.

General Technical Specifications-General  
Standard Technical Specifications

3

M.	1.		Water	5
M.	2.		Lime	5
M.	3.		Cement	5
M.	4.		White Cement	5
M.	5.		Coloured Cement	5
M.	6.		Sand	6
M.	7.		Stone Dust	6
M.	8.		Stone Grit	6
M.	9.		Cinder	7
M.	10.		Lime Mortar	7
M.	11.		Cement Mortar	8
M.	12.		Stone coarse aggregates For Nominal Mix Concrete	8
M.	13.		Black trap or equivalent Hard Stone Coarse aggregate For design Mix concrete	9
M.	14.		Brick bats aggregates	9
M.	15.		Brick	9
M.	16.		Stone	9
M.	17.		Laterite stone	10
M.	18.		Mild Steel Bars	10
M.	19.		High yield strength steel deformed bars	10
M.	20.		High tensile steel wires	10
M.	21.		Mild Steel binding Wires	11
M.	22.		Structural Steels	11
M.	23.		Galvanised iron sheets	11
M.	23.	A	G.I. Valleys gutters ridges	11
M.	24.		Asbestos cement sheets	11
M.	25.		Mangalore pattern roof tiles	11
M.	26.		Shuttering	11
M.	27.		Expansion Joints, premodulded Filler	12
M.	28.		Expansion Joints, copper strips & hold Fast	12
M.	29.		Teak wood	13
M.	29.	A	Non Teak wood	13
M.	30.		Wooden Flush door shutters (Solid Core)	13
M.	31.		Aluminium Doors, Windows, Ventilators	14
M.	32.		Rolling steel gate	14
M.	33.		Collapsible steel gate	15
M.	34.		Welded steel Wire Fabric	15
M.	35.		Expanded metal sheets	15
M.	36.		Mild Steel Wires (Wire gauze Jali)	15

M.	37.		Plywood	16
M.	38.		Glass	16
M.	39.		Acrylic sheets	17
M.	40.		Particle board	17
M.	41.		Expanded polystyrene or Framed sty roper slabs	17
M.	42.		Resign boded Fiber glass	17
M.	43.		Fixtures and Fastening	18
M.	44.		Paints	19
M.	45.		French Polish	19
M.	46.		Marble pipes For marble mosaic terrazzo	19
M.	47.		Flooring tiles	20
M.	48.		Rough Kota stone	21
M.	49.		Polished Kota stone	22
M.	50.		Dholpur Stone slab	22
M.	51.		Marble slab	22
M.	52.		Granite stone slab	22
M.	53.		P.V.C. Flooring	23
M.	54.		Facing tiles	23
M.	55.		White glazed tiles	24
M.	56.		Galvanized iron pipes and fitting	24
M.	57.		Bib cooks and stop cock	24
M.	58.		Gun metal Wheel valve	24
M.	59.		while glazed porcelain wash basin	24
M.	60.		European type water closed	24
M.	61.		Orrissa type water closet	25
M.	62.		Indian type water closet	25
M.	62.	A	Foot Rests	25
M.	63.		Glazed earthenware sink	25
M.	64.		Glazed earthenware lipped type flat back urinal/Corner type urinal	25
M.	65.		Low level enamel Hushing tank	25
M.	66.		Cast Iron flushing cistern	25
M.	67.		Flush cock	26
M.	68.		Cash iron pipes and fitting	26
M.	69.		Nahni Trap	26
M.	70.		Gulley Trap	26
M.	71.		Glazed stoneware pipes and filling	27
M.	72.		Wall peg rail	27
M.	73.		G. 1. Water spout	27
M.	74.		Asbestos cement pipe ( A.C. pipe )	27
M.	75.		Crydon ball valve	27
M.	76.		Bitumen fell for water proofing and damp proofing	27
M.	77.		Selected Earth	27
M.	78.		barbed-Wire	28

## GENERAL TECHNICAL SPECIFICATIONS FOR BUILDING WORKS

### GENERAL:

1. In the specifications "as directed" / "approved" shall be taken to mean "as directed" / "approved by the Engineer-in-Charge".
2. Wherever a reference to any Indian Standard appears in the specifications, it shall be taken to mean as a reference to the latest edition of the same in force on the date of agreement.
3. In "Mode of Measurement" in the specifications wherever a dispute arises in the absence of specific mention of a particular point of aspect the provisions on these particular points, or aspects in the relevant Indian Standards shall be referred to
4. All measurements and computations, unless otherwise specified, shall be carried out nearest to the following limits:
  - (i) Length, width and depth (height) 0.01 meter
  - (ii) Areas 0.01 Sq.Mt.
  - (iii) Cubic Contents 0.01 Cu.Mt.

In recording dimensions of work the sequence of length, width and height (depth) or thickness shall be followed.
5. The distance which constitutes lead shall be determined along the shortest practical route and note necessarily the route actually taken The decision of the Engineer-in-charge in this regard shall be taken as final.
6. Where no lead is specific, it shall mean "all leads"
7. Lift shall be measured from plinth level.
8. Up to "floor two level" means actual height of floor (Maxi 4 M) up to 3 Mt. above plinth level.
9. Definite particulars covered in the items of work, though not mentioned or elucidated in it specifications shall be deemed to be included therein.
10. Reference to specifications of materials as made in the detailed specification of the items of works is in the form of a designation containing them number of the specification of the material and prefix 'M' e.g. 'M-5',
11. Approval to the samples of various materials given by the Engineer-in-charge shall not absolve the contractor from the responsibility of replacing defective material brought on site or materials used in the work found defective at a later date. The contractor shall have no claim to any payment or compensation whatsoever on account of any such materials being rejected by the Engineer-in-charge.
12. The contract rate of the item of work shall be for the work completed in all aspects.
13. No collection of materials shall be made before it is got approved from the Engineer-in-charge.
14. Collection of approved materials shall be done at site of work in a systematic manner. Materials shall be stored in such a manner as to prevent damage, deterioration or

- intrusion of foreign matter and to ensure the preservation of their quality and fitness for the work.
15. Materials, if and when rejected by the Engineer-in-charge, shall be immediately removed from the site of work.
  16. No materials shall be stored prior to, during and after execution of a structure in such a way as to cause or lead to damage or overloading of the various components of the structure.
  17. All works shall be carried out in a workmanlike manner as per the best techniques for the particular item.
  18. All tools, templates, machinery and equipment for correct execution of the work as well as for checking lines, levels, alignment of the works during execution shall be kept in sufficient numbers and in good working condition on the site of the work.
  19. The mode, procedure and manner of execution shall be such that it does not cause damage or over-loading of the various components of the structure during execution or after completion of the structure.
  20. Special modes of construction not adopted in general Engineering practice if proposed to be adopted by the Contractor, shall be considered only if the contractor provides satisfactory evidence that such special mode of construction is safe, sound and helps in speedy construction and Completion of work to the required strength and quality. Acceptance of the same by the Engineer-in-Charge shall not, however absolve the contractor of the responsibility of any adverse effects and consequences of adopting the same in the course of execution of completion of the work.
  21. All installations pertaining to water supply and fixtures there of as well as drainage lines and sanitary fittings shall be deemed to be completed only after giving satisfactory tests by the contractor.
  22. The contractor shall be responsible for observing the rules and regulations imposed under the "Minor Minerals Act", and such of the laws and rules prescribed by Government from time to time.
  23. All necessary safety measures and precautions {including those laid down in the various relevant Indian Standards) shall be taken to ensure the safety of men. Materials and machinery on the works as also of the work itself.
  24. The testing charges of all materials shall be borne by the Contractor.
  25. Approval to any of the executed items for the work does not in any relieve the contractor of his responsibility for the correctness, soundness and strength of the structure as per the drawings and specifications.

## SPECIFICATIONS OF MATERIALS

### **M-1 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 and injurious alkalis, salts, organic matter and other deleterious material which will either weaken the mortar of concrete or cause efflorescence or attack the steel in R.C.C. Container for transport, storage and handling of water shall be clean. Water shall conform to the standard specified in I.S. 456-1978.
- 1.2. If required by the Engineer-in-Charge it shall be tested by comparison with distilled water. Comparison shall be made by means of standard cement tests for soundness time of setting and mortar strength as specified in I.S. 269-1976. Any indication of unsoundness change in time of setting by 30 minutes or more or decrease of more than 10 per cent in strength, of mortar prepared with water sample when compared with the results obtained with mortar prepared with distilled water shall be sufficient cause for rejection of water under test.
- 1.3. Water for curing mortar, concrete or masonry should not be too acidic or too alkaline. It shall be free of elements which significantly affect the hydration reaction or otherwise interfere with the hardening of mortar or concrete during curing or those which produce objectionable stains or other unsightly deposits on concrete or mortar surfaces.
- 1.4. Hard and bitter water shall not be used for curing.
- 1.5. Potable water will generally found suitable for curing mortar or concrete.

### **M-2. Lime**

- 2.1. Lime shall be hydraulic lime as per I.S. 712-1973. Necessary tests shall be carried out as per I.S. 6932 (Parts I to X) 1973.
- 2.2. The following field tests for limes are to be carried out:
  - (1) A very rough idea can be formed about the type of lime by its visual examination i.e. fat lime bears pure white colour, lime in form of porous lumps of dirty white colour indicates quick lime, and solid lumps are the unburnt lime stone.
  - (2) Acid tests for determining the carbonate content in lime. Excessive amount of impurities and rough determination of class of lime.
- 2.3. Storage shall comply with I.S. 712-1973. The slaked lime, if stored, shall be kept in a weather proof and damp-proof shed with impervious floor and sides to protect it against rain, moisture, weather and extraneous materials mixing with it. All lime that has been damaged in any way shall be rejected and all rejected materials shall be removed from site of work.
- 2.4. Field testing shall be done according to I.S. 1624-1974 to show the acceptability of materials.

### **M-3. Cement**

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

### **M-4. White Cement**

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

### **M-5. Coloured Cement**

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

- 5.2.** The pigments used for coloured cement shall be of approved quality and shall not exceed 10% of cement used in the mix. The mixture of pigment add cement shall be properly ground to have a uniform colour and shade. The pigments shall have such properties to provide for durability under exposure to sunlight and weather.
- 5.3.** The pigment shall have the property such that it is neither affected by the cement nor detrimental to it

#### **M-6 Sand**

- 6.1.** Sand shall be natural sand, clean, well graded hard strong, durable and gritty particles free from injurious amounts of dust, clay kankar nodules, soft or flaky particles shale, alkali salts organic matter, loam, mica or other deleterious substances and shall be got approved from the Engineer-in-Charge. The sand shall not contain more than 8 percent of silt as determined by field test, if necessary the sand shall be washed to make it clean.
- 6.2. Coarse Sand :** The fineness modulus of coarse sand shall not be less than 2.5 and shall not exceed 3.0. The sieve analysis of coarse shall be as under :

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

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

I.S. Sieve Designation	Percentage by Weight Passing through	I.S. Sieve Designation	Percentage by Weight Passing through
4.75 mm	100	600 Micron	40 - 85
2.36 mm	100	300 Micron	5 - 50
1.18 mm	70 - 100	150 Micron	0 - 10

#### **M-7 Stone Dust :**

- 7.1.** This shall be obtained from crushing hard black trap or equivalent. It shall not contain more than 8% of silt as determined by field test will measuring cylinder. The method of determining silt contents by fields test is given as under :
- 7.2.** A sample of stone dust to be tested shall be placed without drying in 200 mm. measuring cylinder. The quantity of the sample shall be such that it fills the cylinder up to 100 mm. mark. The clean water shall be added up to 150 mm. mark. The mixture shall be stirred vigorously and the content allowed to settle for 3 hours.
- 7.3.** The height of silt, visible as settled layer above the stone dust shall be expressed as percentage of the height of the stone dust below. The stone dust containing more than 8% silt shall be washed so as to bring the content within the allowable limit.
- 7.4.** The fineness modules of stone dust shall not be less than 1.80.

#### **M-8. Stone Grit**

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

comply with the provisions of I.S. 383-1970. Unless special stone of particular quarries is mentioned grit shall be obtained from the best black trap or equivalent hard stone as approved by the Engineer-in-charge. The grit shall have no deleterious with cement.

**8.2.** The Grit shall conform to the following gradation as per sieve analysis :

I.S. Sieve Designation	Percentage Passing through sieve	I.S. Sieve Designation	Percentage by Weight Passing through Sieve
4.75 mm	100	600 Micron	40 - 85
2.36 mm	100	300 Micron	5 - 50
1.18 mm	70 - 100	150 Micron	0 - 10

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

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

#### **M-9. Cinder**

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

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

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

I.S. Sieve Designation	Percentage Passing	I.S. Sieve Designation	Percentage Passing
20 mm	100	4.75 mm	70
10 mm	86	2.36 mm	32

#### **M-10 Lime Mortar**

**10.1** Lime shall conform to specification M-2. Water shall conform to specification M-1.

Sand shall conform to specification M-6.

##### **10.2. Proportion of Mix:**

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

##### **10.3. Preparation of mortar:**

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

##### **10.4. Storage:**

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

##### **10.5. Use:**

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

# **M-11. Cement Mortar**

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

## **11.2. Proportion of Mix**

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

## **11.3. Preparation of Mortar :**

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

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

# **M-12. Stone Coarse Aggregate for Nominal Mix Concrete**

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

**12.2.** The aggregate shall generally be cubical in shape unless special stones of particular quarries are mentioned aggregates shall be machine crushed from the best black trap or equivalent hard stone as approved aggregate shall have no deleterious reaction with cement. The size of the coarse aggregate for plain cement and ordinary reinforced cement concrete shall generally be as per the table given below.

However in case of reinforced cement concrete the maximum limit may be restricted to 6 mm. less than the minimum lateral clear distance between bars or 6- mm. less than the cover whichever is smaller.

**TABLE**

I.S. Sieve Designation	Percentage passing for single sized aggregates of Nominal size			I.S. Sieve Designation	Percentage passing for single sized aggregates of Nominal size		
	40 mm	20 mm	16 mm		40 mm	20 mm	16 mm
80 mm	-	-	-	12.5 mm	-	-	-
63 mm	100	-	-	10 mm	0.5	0.02	0.30
40 mm	85-100	100	-	4.75 mm	-	0.5	0.5
20 mm	0-20	85-100	100	2.35 mm	-	-	-
16 mm	-	-	85-100				

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

**12.3.** The grading test shall be taken in the beginning and at the change of source of materials. The necessary tests, indicated in I.S. 383-1970 and 456-197f shall have to be carried out to ensure the acceptability. The aggregates shall be stored separately and handled in such a manner as to prevent the intermixing of different aggregates. If the aggregates are covered with dust, they shall be washed with water to make them clean. .



**M-13. Black Trap or Equivalent Hard Stone Coarse**

- 13.1. Aggregate For Design Mix Concrete :** Coarse aggregate shall be of machine crushed stone of black trap or equivalent hard stone and be hard, strong, dense, durable, clean and free from skin and coating likely to prevent proper adhesion of mortar.
- 13.2.** The aggregates shall generally be cubical in shape. Unless special stones of particular quarries are mentioned, aggregates shall be machine crushed, from the best, black trap or equivalent hard stones as approved, Aggregate shall have no deleterious with cement
- 13.3.** The necessary tests indicated in I S. 383-1970 and I.S.456-1978 shall have to be carried out to ensure the acceptability of the material.
- 13.4.** If aggregate is covered with dust it shall be washed with water to make it clean.

**M-14. Brick Bats Aggregate**

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

**M-15. Bricks**

- 15.1.** The bricks shall be hand or machine molded and made from suitable soils and kiln burnt. They shall be free from cracks and flaws and nodules of free lime they shall have smooth rectangular faces with sharp corners and shall be of uniform colour.
- The bricks shall be moulded with a frog of 100 mm. x 40 mm. and 10 mm. to 20 mm. deep on one of its flat sides. The bricks shall not break when thrown on the ground from a height of 600 mm.
- 15.2.** The size of modular bricks shall be 190 mm.x 90 mm.x 90 mm.
- 15.3.** The size of the conventional bricks shall be as under :  
( 9" x 4.3/8" x 2,3/4" ) 225 x 110 x 75 mm.
- 15.4.** Only bricks of one standard size shall be used on one work. The following tolerances shall be permitted in the conventional size adopted in a particular work.  
Length + 1/8" ( 3.0 mm.) Width  $\pm$  1/16" ( 1.50 mm. ) Height + 1/16" ( 1.50 mm. )
- 15.5.** The crushing strength of the bricks shall not be less than 35 Kg/Sq. Cm. The average water absorption shall not be more the 20 percent by weight Necessary tests for crushing strength and water absorption etc. shall be carried out as per I.S. 3495 ( Part-I to IV ) - 1976

**M-16. Stone**

- 16.1.** The stone shall be of the specified variety such as Granite/Trap Stone/ Quartzite or any other type of good hard stones. The stones shall be only from the approved quarry and shall be hard sound, durable and free from defects like cavities, cracks, sand holes, flaws injurious veins, patches of loose or soft materials etc. and weathered portions and other structural defects Or imperfections tending to affect their soundness and strength. The stone with round surface shall not be used. The percentage of water absorption shall not be more than 5% of dry weight. When tested in accordance with I.S. 1124-1974. The minimum crushing strength of stone shall be 200 Kg/.Sq. Cm. unless otherwise specified.
- 16.2.** The samples of the stone to be used shall be got approved before the work is started
- 16.3.** The Khanki facing stone shall be dressed by chisel as specified in the item for khanki facing in required shape and size. The face of the stone shall be-so dressed that the bushing on the

exposed face shall not project by more than 40 mm. from the general wall surface and on face to be plastered it shall not project by more than 19 mm. nor shall it have depressions more than 10 mm. from the average wall surface.

**M-17. Laterite Stone**

- 17.1. Laterite stone shall be obtained from the approved quarry it shall be compacted in texture sound, durable and free from soft patch. It shall have minimum crushing strength of 100 Kg/Sq. Cm. in its dry condition. It shall not absorb water more than 20% of its own weight, when immersed for 24 hours in water. After quarrying, the stone shall be allowed to weather for some time before using in work.
- 17.2. The stone shall be dressed into regular rectangular blocks so that all faces are free from waviness and unevenness, and the edges true and square
- 17.3. Those types of stone in which white clay occurs should not be used
- 17.4. Special corner stones shall be provided where so directed.

**M-18. Mild Steel Bars**

- 18.1. Mild steel bars reinforcement for R.C C. work shall conform to I.S. 432 (Part -II) 1966 and shall be of tested quality. It shall also comply with relevant part of I.S. 456-1978.
- 18.2. All the reinforcement shall be clean and free from dirt, paint, grease, mill scale or loose or thick rust at the time of placing
- 18.3. For the purpose of payment, the bar shall be measured correct up to 10 mm. length and weight payable worked out at the rate specified below :

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

**M-19. High Yield Strength Steel Deformed Bars**

- 19.1. High yield strength steel deformed bars shall be either cold twisted other rolled and shall conform to I.S. 1786-1966 and I.S. 1139-1966 respectively.
- 19.2. Other provisions and requirements shall conform to specification No. M-18 for Mild Steel Bars.

**M-20. High Tensile Steel Wires**

- 20.1. The high tensile wires for use in pre stressed concrete work shall conform to I.S,2090-1962.
- 20.2. The tensile strength of the high tensile steel bars shall be as specified in the item. In absence of the given strength the minimum strength shall be taken as per Para 6-1 of the I.S. 1785-1962. Testing shall be done as per I.S. requirements.
- 20.3. The high tensile steel shall be free from loose mill scale, rust, oil, grease, or any other harmful matter. Cleaning of steel bars may be carried out by immersion in solvent solution, wire brushing or passing through a pressure box containing Carborudum.
- 20.4. The high tensile wire shall be obtained from manufacturers. in coils having diameter not less then 350 times the diameter of wire itself so that wire springs back straight on being uncoiled .

**M-21. Mild Steel Binding Wire**

- 21.1.** The mild steel wire shall be of 1.63 mm. or 1.22 mm. ( 16 to 18 gauge ) diameter and shall conform to I.S. 280-1972.
- 21.2.** The use of black wire will be permitted for binding reinforcement bars. It shall be free from rust oil paint, grease loose mill scale or any other undesirable coating which may prevent adhesion of cement mortar.

**M-22. Structural Steel**

- 22.1.** All structural Steel shall conform to I S. 226-1985: The steel shall be free from the defects mentioned in I.S 226-1975 and shall have a smooth finish. The material shall be free from loose mill scale, rust pits or other defects affecting the strength and durability. River bars shall conform to I.S. 1148-1973.
- 22.2.** When the steel is supplied by the Contractor test certificate of the manufacturers shall be obtained according to I.S. 226-1975 and other relevant Indian Standards.

**M-23. Galvanised Iron Sheets**

- 23.1.** The galvanised iron sheets shall be plain or corrugated sheets of gauges as specified in item The G.I. Sheets shall conform to I.S.277-1977. The sheets shall be undamaged in carnage and handling either by rubbing off of zinc coating or otherwise. They shall have clean and bright surface and shall be free from dents, bends, holes, rust or white powdery deposit.
- 23.2.** The length and width of G.I. sheets shall be as directed as per site condition.

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

- 23.A.1.** The G.I. ridges and hips shall be of plain galvanised sheets Class - 3 of the thickness as specified in item. These shall be 600 mm. in width and properly bent up to shape without damage to the sheets in process of bending.
- 23.A.2.** Valleys gutters and flashings shall also be of galvanised sheet of thickness as specified in item Valleys Shall be 900 mm. wide overall and flashing shall be 380 mm. wide overall They shall be bent to the required shape without damage to the sheet in the process of bending.

**M-24. Asbestos Cement Sheets**

- 24.1.** Asbestos cement sheets plain, corrugated of semi-corrugated shall conform to I.S.459-1970 The thickness of the sheets shall be as specified in the item. The sheets shall be free from all defects such as cracks, holes, deformities chipped edges or otherwise damaged.
- 24.2. Ridges & Hips :**
- 24.2.1.** Ridges and hips shall be of same thickness as that of A.C. sheets. The types, of ridges shall be suitable for the type of sheets and location.
- 24.2.2.** Other accessories to be used in roof such as flashing pieces eaves filler pieces, valley gutters, north light, and ventilator curves, barge boards etc, shall be of standard manufacture and shall be suitable for the type of sheets and location.

**M-25. Manglore Pattern Roof Tiles**

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

**M-26. Shuttering**

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

centering rigid. In places of bullies props, brick pillar of adequate section built in mud mortar may be used.

- 26.2. The form work shall be sufficiently strong and shall have camber so that it assumes correct shape after deposition of the concrete and shall be able to resist forces caused by vibration of live load of men working over it and other incidental loads associated with it. The shuttering shall have smooth and even surface and its joints shall permit leakage of cement grout.
- 26.3. If at any stage of work during or after placing concrete in the structure, the form work sags or bulges out beyond the required shape of the structure, the concrete shall be removed and work redone with fresh concrete and adequately rigid form work. The complete form work shall be got inspected by and got approved from the Engineer-in charge, before the reinforcement bars are placed in position.
- 26.4. The props shall consist of bullies having 100 mm minimum diameter measured at mid length and 80 mm at thin end shall be placed as per design requirement. These shall rest squarely on wooden sole plates 40 mm thick and minimum bearing area of 0-10 sq.m laid on sufficiently hard base.
- 26.5. Double wedges shall further be provided between the sole plate and the wooden props so as to facilitate tightening and easing of shuttering without jerking the concrete.
- 26.6. The timber used in shuttering shall not be so dry as to absorb water from concrete and swell or bulge nor so green or wet as to shrink after erection. The timber shall be properly sawn and planed on the sides and the surface coming in contact with concrete wooden form work with metal sheet lining or steel plates stiffened by steel angles shall be permitted.
- 26.7. As far as practicable, clamps shall be used to hold the forms together and use of nails and spikes avoided.
- 26.8. The surface of timber shuttering that would come in contact with concrete shall be well wetted and coated with soap solution before the concreting is done. Alternatively coat of raw linseed oil or oil of approved manufacture may be applied in place of soap solution. In case of steel shuttering either soap solution or raw linseed oil shall be applied after thoroughly cleaning the surface. Under no circumstances black or burnt oil shall be permitted.
- 26.9. The shuttering for beams and slabs shall have camber of 4 mm per meter ( 1 in 250 ) or as directed by the Engineer-in-charge so as to offset the subsequent deflection. For cantilevers, the camber at free end shall be 1/50 of the projected length or as directed by the Engineer-in-charge.

#### **M- 27. Expansion Joints - Premoulded filler**

- 27.1. The item provides for expansion joints in R.C.C. frame structures for internal joints, as well as exposed joints, with the use of premoulded bituminous joint filler.
- 27.2. Premoulded bituminous joints filler i.e. performed strip of expansion joints filler shall not get deformed, or broken by twisting bending or other handling when exposed to atmospheric condition. Pieces of joints filler that have been damaged shall be rejected.
- 27.3. Thickness of the per-moulded joints filler shall be 25 mm. unless otherwise specified.
- 27.4. Premoulded bituminous joints filler shall conform to I S 1838-1961

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

- 28.1. The item provide for expansion joints in R.C.C. frame structure for internal joints, as well as exposed joints, with the use of premoulded bituminous joints filler.
- 28.2. Copper sheet shall be of 1.25 mm. width and or 125 mm. width and the " U " shape in the middle. Copper strip shall have holdfast of 3 mm diameter copper rod fixed to the plate soldered on strip at

intervals of about 30 cm or as shown in the drawing or as directed. The width of each flange ( horizontal side ) of the copper plate Jo be embedded in the concrete work shall be 25 mm depth of "U" to be provided in the expansion joint, in the copper plate shall be of 25 mm.

**M-29. Teak wood**

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

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

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

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

**29.5. First class teak wood**

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

**29.6. Second Class Teak Wood:**

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

**M-29. A Non-teak wood:**

The non-teak wood shall be chemically treated, seasoned as per I.S. Specifications and of good quality. The type of wood shall be got approved before collecting the same on site Fabrication of wooden members shall be started only after approval. For this purpose wood of Bio, Kalai, Sires. Saded, Behda, Jamun, Sisoo will be used for door where as only Kalai. Sires, Halda. Kalam etc. will be permitted for shutters after proper seasoning and chemical treatment.

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

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

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

holes shall be permissible except in the exposed edges of the core members. The commercial plywood, cross-bands shall conform to I.S. 303-1275.

- 30.2.** The face panel of the shutters shall be formed by gluing by the hot press process on both faces of the core with either plywood or cross-bands and face veneers. The1 hopping, rebating opening of glazing, venation etc. shall be provided if specified in the drawing.
- 30.3.** All edges of the door shutters shall be square. The shutters shall be free from twist or warp in its plane. Both faces of the shutters shall be sand papered to smooth even texture.
- 30.4.** The shutters shall be tested for-
- (1) End immersion test:** The test shall be carried out as per I.S.2202 ( part-1 ) 1980 There shall be no delamination at the end of the test.
- (2) Knife Test :** The face panel when tested in accordance with I.S 1659-1979 shall pass the test.
- (3) Glue adhesion test :** The flush door shall be tested for glue adhesive test in accordance with I S 2202 ( part -I ) 1980. The shutters shall be considered to have passed the test, if no delamination occurs in the glue lines in the plywood and if no single determination more than 80 mm in length and more than 3 mm in depth has occurred in the assembly glue lines between the plywood face and the style and rail. Delamination at the corner shall be measured continuously around the corner Delamination at the knots, knot hole and other permissible wood defects shall not be considered in assessing the sample.
- 30.5.** The tolerance in size of scud core type flush door shall be as under :
- In Nominal thickness  $\pm 1.2$  mm. In Nominal height  $\pm 3$ m
- 30.6.** The thickness of the shutter shall be uniform throughout with a permissible variation of not more than 0.8 mm. when measured at any points.

**M-31. Aluminum doors, windows, ventilators**

- 31.1.** Aluminum alloy used in the manufacture of extruded window sections shall conform to I.S. designation HEAWP of I.S. 733-1975 and also to I S. Designation WVG-WP of I.S 1285-1975 The section shall be as specified in the drawing and design. The fabrication shall be done as directed
- 31.2.** The hinges shall be cast or extruded aluminum hinges of same type as in window but of larger size.
- 31.3.** The hinges shall normally be of 50 mm. projecting type. Non-projecting type of hinges may also be used if directed. The handles of door shall be of specified design. A suitable lock for the door Operable either from outside or inside shall be provided. In double shutter door, the first closing shutter shall have concealed aluminum alloy bolt at top and bottom.

**M-32. Rolling Shutters**

- 32.1.** The rolling shutters shall conform to I.S.6248-1979 Rolling shutters shall be supplied of specified type with accessories. The size of the rolling shutters shall be specified in the drawings. The shutters shall be specified in the drawings. The shutters shall be constructed with interlocking lath sections formed from cold rolled steel strips not less than 0.9 mm. thick and 80 mm. wide for shutters up to 3.5 m .width not less than 1.25 mm. thick and 80 mm wide for shutters 3.5 m. in width and above unless otherwise specified.
- 32.2.** Guide channels shall be of mild steel deep channel section and of rolled pressed or built up (fabricated) joint less construction The thickness of sheet used shall not be less than 3.15 mm.
- 32.3.** Hood covers shall be made of M S. Sheets not less than 0.90 mm. thick. For shutters having width 3.5 Meter and above, the thickness of M.S. sheet for the hood cover shall be not less than 1 25 mm.

- 32.4.** The spring shall be of best quality and shall be manufactured from tested high tensile spring steel wire of strip of adequate strength to balance the shutters in all position. The spring pipe shaft etc. shall be supported on strong M S of malleable C I. brackets. The brackets shall be fixed on or under the lintel as specified with raw plugs and screws bolts etc.
- 32.5.** The rolling shutters shall be of self rolling up to 8 Sq. m. clear area without ball bearing and up to 12 Sq.m. clear area with ball bearing. If the rolling shutters are of larger, then gear operated type shutters shall be used.
- 32.6.** The locking arrangement shall be provided at the bottom of shutter at both ends The shutters shall be opened from outside.
- 32.7.** The Shutters shall be completed with door suspension shafts, looking arrangements, pulling hooks, handles and other accessories.

**M-33. Collapsible Steel Gate**

- 33.1.** The collapsible steel gate shall be in one or two leaves and size as per approved drawings or as specified. The gate shall be fabricated from best quality mild steel channels, flats etc. Either steel pulleys or ball-bearings shall be provided in every double channel Unless otherwise specified the particulars of collapsible gate shall be as under.
- (a) Pickets : These shall be of 20 mm. M.S. channels of heavy sections unless otherwise shown on drawings. The distance centre to centre of pickets shall be 12 cms .with an opening or 10 Cms
- (b) Pivoted M.S. flats shall be 20 mm x6 mm
- (c) Top and bottom guides shall be from tee of flat iron of approved size.
- (d) The fittings like stoppers fixing, locking cleats, brass handles and cast iron rollers shall be of approved design and size

**M-34. Welded Steel Wire Fabric**

- 34.1** Welded steel wire fabric for general purpose shall be manufactured form cold drawn steel wire "as drawn" or galvenised steel conforming to I.S. 226-1975 with longitudinal and transverse wire securely connected at every intersection by a process of electrical resistance welding and conforming to I.S.4948-1974. it shall be fabricated and finished in workmanlike manner and shall be free from injurious defects and shall be rust proof The type of mesh shall be oblong or square as directed The mesh sizes and sizes if wire for square 3b well as oblong welded steel wire fabric shall be as directed The steel wire fabric in panels shall be in one whole piece in each panel as far as stock sizes permit.

**M-35 Expanded Metal Sheets**

- 35.1.** The expanded metal sheets shall he free from flaws joints broken strands laminations and other harmful surface defects. Expanded metal steel sheet shall confirm to IS-412-1975. except that blank sheets need not be with guaranteed mechanical properties The size of the diamond mesh of expanded metal and dimensions of strands (width and thickness) shall be as specified. The tolerance on nominal weight of expanded metal sheets shall be of + 10 percent.
- 35.2.** Expanded metal in panels shall be in one whole piece in each panel as far as stock sizes permit. The expanded metal sheets shall be coated with suitable protective coating to prevent corrosion.

**M-36. Mild Steel Wire ( Wire Gauze Jali )**

- 36.1.** Mild steel wire may be galvanized as indicated. All finished steel wire shall be well cleanly drawn to the dimensions and size of wire as specified in item. The wire shall be sound free from splits surface flaws, rough jagged and imperfect edges and other harmful surface defects and shall conform to I.S. 280-1978.

### **M-37. Plywood**

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

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

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

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

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

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

**37.6.** Thickness of plywood Boards

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

### **M-38. Glass**

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

#### **38.2. Sheet Glass**

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

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

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



**38.3. Plate Glass:**

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

**38.4. Obscured Glass:**

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

**38.5. Wired Glass:**

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

**M-39. Acrylic Sheets**

**39.1.** Acrylic sheets shall be of thickness as specified in the item and of an specified shape and size as the case may be panels may be flat or curved It should be light in weight it shall be colourless or coloured or opaque as specified in the item. Colourless sheet shall be as transparent as the finest optical glass. Its light transmission rate shall be about 95% Transparency shall not be affected for the sheets of larger thickens, it shall be extremely resistant to sunlight weather and low temperatures. It shall not sow any significant yellowing or change in physical properties or loss of light transmission over a longer period of use. The sheet shall be impact resistant also Sheets should be of such quality that they can be cut, bent jointed as desired Solution for the joints shall be used as per the requirement of manufacturer.

**M-40. Particle board**

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

**M-41. Expanded polystyrene or framed styroper slabs**

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

**M-42. Resign bonded fiber glass.**

**42.1.** The resign bonded fiber glass tiles or roils shall be of approved make and shall be of sizes. thickness and finish as indicated.

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

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

- (1) Bituminous Hessian Kraft paper suitable for use in position where moisture has to be excluded.
- (2) Hessian cloth or Kraft paper for keeping out dust
- (3) G.I wire netting, suitable for surfaces to be plaster over

**M-43. Fixtures and fastenings**

**43.1. General:**

- 43.1.1. The fixtures and fastenings, that is butt hinges tee and strap hinges sliding door bolts, tower bolts, door latch, bath-room latch, handles door stoppers, casement window fasteners, casement stays and ventilators catch shall be made of the metal as specified in the item or its specification.
- 43.1.2. They shall be of iron, brass, aluminum chromium plated iron, chromium plated brass, copper oxidised iron, copper oxidised brass or anodised aluminum as specified
- 43.1.3. The fixtures shall be heavy medium or light type. The fixtures and fastenings shall be smooth finished and shall be such as will ensue ease of operations.
- 43.1.4. The samples of fixtures and fastenings shall be got approved as regards, quality and shape before providing them in position.
- 43.1.5. Brass and anodised aluminium fixtures and fastenings shall be bright finished

**43.2. Holdfasts:**

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

**43.3. Butt hinges:**

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

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

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

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

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

**43.6. Door Latch:**

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

**43.7. Bathroom Latch:**

- 43.7.1. Bathroom latch shall be similar to tower bolt.

**43.8. Handle:**

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

**43.9. Door Catch:**

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

**43.10. Door Stoppers:**

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

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

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

**43.12. Casement Window Fastener:**

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

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

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

**43.14. Ventilator Catch:**

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

**43.15. Pivot:**

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

**M-44. Paints:**

**44.1. (A) Oil paints :**

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

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

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

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

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

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

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

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

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

**M-45. French Polish**

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

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

**45.2.** The French polish so prepared shall conform to I S : 348-1 9C8.

**M-46. Marble chips for marble mosaic terrazzo**

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

**46.2.** The size of various colours of marble chips ranging from the smallest up to 20 mm shall be used where the thickness of top wearing layer is 6 mm size The marble chips of approved quality and

colours only as per grading as decided by the Engineer-in-charge shall be used for marble mosaic tiles or works.

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

**M-47. Flooring Tiles**

**47.1. (A) Plain Cement tiles;**

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

- 47.1.2.** The tiles shall be manufactured from a mixture of cement and natural aggregates by pressure process. During manufacture the tiles shall be subjected to pressure of not less than 140 Kg/Sq. Cm. The proportion of cement to aggregate in the backing of the tiles shall be not less than 1 .3 by weight The wearing face, through the tiles are of plain cement, shall be provided with stone chips of 1 to 2 mm. size. The proportions of cement to aggregate in the wearing layer of the tiles shall be three parts of cement to one parts chips by weight. The minimum thickness of wearing layer shall be 3 mm. The colour and texture of wearing layer shall be uniform throughout its face and thickness. On removal from mould, the tiles shall be kept in moist condition continuously at least for seven days and subsequently, if necessary, for such long period as would ensure their conformity to requirements of I.S.1237-1980 regarding strength resistance to wear and water absorption.

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

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

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

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

**47.2. (B) Plain Coloured Tiles:**

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

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

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

**47.3. (C) Marble mosaic tiles:**

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

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

- 47.3.3.** Chips used in the tiles be from smallest up to 20 mm. size. The minimum thickness of wearing layer of tiles shall be 6 mm. For pattern of chips to be had on the wearing face; a few samples with or without their full size photographs as directed shall be approved by the Engineer-in-charge, for approval.
- 47.3.4.** Any particular samples if found suitable shall be approved by the Engineer-in-charge, or he may ask for a few more samples to be presented. The samples shall have to be made by the contractor till a suitable sample is finally approved for use in the work. The Contractor shall ensure that the tiles supplied for the work shall be in conformity with the approved sample only, in terms of its dimensions, thickness of backing layer and wearing surface, materials, ingredients, colour, shade, chips, distribution etc. required.
- 47.3.5.** The tiles shall be prepared from cement conforming to Indian Standards or coloured port land cement generally depending upon the colour of tiles to be used or as directed.
- 47.4. (D) Chequered Tiles :**
- 47.4.1.** Chequered tiles shall be plain cement tiles or marble mosaic tiles. The former shall have the same specification as per (A) above and the latter as per marble mosaic tiles as per (C) except as mentioned below
- 47.4.2.** The tiles shall be of nominal size of 250 mm. x 250 mm. or as specified. The centre to centre distance of chequer shall not be less than 25 mm. and not more than 50 mm. The overall thickness of the tile shall be 22 mm
- 47.4.3.** The grooves in the chequers shall be uniform and straight. The depth of the grooves shall not be less than 3 mm. The chequered tiles shall be plain coloured or mosaic as specified. The thickness of the upper layer measured from the top of the chequers shall not be less than 6 mm. The tiles shall be given the first grinding with machine before delivery to site.
- 47.4.4.** Tiles shall conform to relevant I.S 1237-1980.

**47.5. (E) Chequered Tiles For Stair Cases :**

- 47.5.1.** The requirements of these tiles shall be the same as chequered tiles as per (D) above except in following respects :
- (1) The length of a tile including nosing shall be 300 mm (2) The minimum thickness shall be 28 mm (3) The nosing shall have also the same wearing layer as at the top. (4) The nosing edge shall be rounded (5) The front portion of the tile for a minimum length of 75 mm. from and including the nosing shall have grooves running parallel to nosing and at centers not exceeding 25 mm. Beyond that the tiles shall have normal chequer pattern.

**M-48. Rough Kotah Stone**

- 48.1.** The Kotah stones shall be hard even, sound, and regular in shape and generally uniform in colour. The colour of the stone shall generally be green Brown coloured shall not be allowed for use. They shall be without any soft veins, cracks or flaws.
- 48.2.** The size of the stones to be used for flooring shall be of size 600 mm x 600 mm and/or size 600 mm. x 450 mm as directed. However smaller sizes will be allowed to be used to the extent of maintaining required pattern. Thickness shall be as specified
- 48.3.** The edges of stones shall be dressed to a minimum of 30 mm on accounts of chisel dressing of edges shall be permitted for length as well as breadth. Tolerance in thickness shall be  $\pm 3$  mm
- 48.4.** The edges of stones shall be truly chiseled and table rubbed with coarse sand before paving. All angles and edges of the stones shall be true, square and free from chipping and surface shall be true and plain.

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

**M-49. Polished Kotah Stoics**

- 49.1.** Polished kotah stone shall have the same specification as per rough kotah stone except as mentioned below :
- 49.2.** The stones shall have machine polished surface. When brought on site, the stones-shall be single polished or double polished depending upon its use. The stones for paving shall generally be single polished The stones to be used for dedo, skirting, sink, veneering, sills steps etc. where machine polishing after the stones are fixed in situ is not possible shall be double polished

**M-50. Dholpur Stone Slab**

- 50.1.** Dholpur stone slab shall be of best quality as approve by the Engineer-m-charge. The stone slab shall be without my veins, cracks, and flaws The stone slab shall be even sound and durable regular in snaps and of uniform colour
- 50.2.** The size of the stone shall be as specified in the item or detailed drawing or as approved by the Engineer-in-charge. The thickness of the stone shall be as specified in the item of work with the permissible tolerance of plus or minus 2 mm. The provision in respect of polishing as for polished kotah stone shall apply to polished Dholpur stone also. All angles and edges of the face of the stone slab shall be fine chiseled or polished as specified in the item of work and all the four edges shall be machine cut All angles and edges of the stone slab shall be true and plane.
- 50.3.** The sample of stone shall be got approved by the Engineer-in-charge for a particular work It shall be ensured that the stones to be used in a particular work shall not differ much in shade or tint from the approved sample.

**M-51. Marble Slab**

- 51.1.** Marble slab shall be white or of other and of best quality as approved by the Engineer-in-charge
- 51.2.** Slabs shall be hard, close, uniform and homogeneous in texture. They shall have even crystalline gram and free from defects and cracks. The surface shall be machine polished to an even and perfect plane surface and edges machine cut true and square. The rear f ice shall be rough to provide key for the mortar.
- 51.3.** Marble slabs with natural veins, if selected shall have to be laid as per the pattern given by the Engineer-in-charge.  
Size of the slab shall be minimum 460 mm x 450 mm and preferably 600 mm x 600 mm. However, smaller sizes will be allowed to be used of the extent of maintaining required pattern.
- 51.4.** The slab shall not be thinner than the specified thickness at its thinnest part. A few specimen of finished slab to be used shall be deposited by the Contractor in the office for reference
- 51.5.** Except as above the marble slabs shall conform to I.S. 1130-1969

**M-52. Granite Stone slab**

- 52.1.** Granite shad be of approved colour and quality. The stone shall be hard, even sound and regular in shape and generally uniform in colour. It shall be without any soft veins, cracks of flaws.
- 52.2.** The thickness of the stone shall be specified in items
- 52.3.** All exposed faces shall be double polished to tender truly smooth and even reflecting surface. The exposed edges and corners shall be rounded off as directed. The exposed edges shall be machine cut and shall have uniform thickness.

**M-53. P.V.C. Flooring**

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

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

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

(a) Thickness + 015 mm.

(b) Length or Width

(1) 300 mm. Square tiles       $\pm 0.20$  mm.      (3) 900 mm Square tiles       $\pm 0.60$  mm.

(2) 600 mm. Square tiles       $\pm 0.40$  mm.      (4) Sheets and roll       $\pm 0.10$  percent.

**53.4. Adhesive:**

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

**M-54. Facing Tiles**

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

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

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

Size	Tolerance for	
	1st Class Brick	2nd Class Brick
19 cm.	$\pm 6$ mm	$\pm 10$ mm
9 cm.	$\pm 3$ mm	$\pm 7$ mm
4 cm.	$\pm 1.5$ mm	$\pm 3$ mm

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

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

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

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

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

**M-55. White glazed tiles**

- 55.1.** The tiles shall be of best quality as approved by the Engineer-in-charge. They shall be flat and true to shape. They shall be free from cracks, crazing spots chipper) edges and corners. The glazing shall be of uniform shade.
- 55.2.** The tiles shall be nominal size of 150 mm x 150 mm unless otherwise, specified. The maximum variation the stated sizes other than the thickness of tile shall be plus or minus 1.5 mm. The thickness of tile shall be 6 mm. Except as above the tiles shall conform to I.S. 1977-19/0.

**M-56. Galvanised iron pipes and fittings**

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

**M-57. Bib cock and stop cock**

- 57.1.** A bib cock is a draw off tap with a horizontal inlet and free outlet A stop cock is a valve with suitable means of connection for insertion in a pipe line for controlling or stopping the flow.
- 57.2.** They shall be of screw down type and of brass chromium plated and of diameter as specified in the description of the item. They shall conform to I.S. 781-1977 and they shall be of best Indian make. They shall be polished bright.
- 57.3.** The minimum finished weight of bib cock and stop cock shall be as given below :

Diameter	Bib Cock	Stop Cock	Diameter	Bib Cock	Stop Cock
8 mm	0.25 Kg.	0.25 Kg.	15 mm	0.40 Kg.	0.40 Kg.
10 mm	0.30 Kg.	0.35 Kg.	20 mm	0.75 Kg.	0.75 Kg.

**M-58. Gun metal wheel valve**

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

**M-59. White glazed porcelain wash basin**

- 59.1.** Wash basin shall be of white porcelain first quality best Indian make and it shall conform to I.S. 2556 (Part -IV) -1972 and I.S. 771-1979. The size of the wash basin shall be as specified in item. Wash basin shall be of one piece construction with continued over flow arrangements All internal angles shall be designed so as to facilitate cleaning. Wash basin shall have single tap hole as specified. Each basin shall have a circular waste hole which is either riveted or beveled internally with 65 mm. diameter at top and 10 mm. depth to suit the waste fitting. The necessary stud slot to receive the bracket on the under side of the basin shall be provided Basin shall have an internal soap holder which shall fully drain into the bowl.
- 59.2.** White glazed pedestal of the quality and colour as that the basin shall be provided where specified in the item. It shall be completely recessed at the back for reception of supply and wash pipe. It shall be capable of supporting the basin rigidly and adequately and shall be so designed as to make the height from the floor the floor to top of the rim of basin 750 mm. to 800 mm. as directed.

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

- 60.1.** The European type water closet shall be white glazed porcelain first quality and shall be of wash down type conforming to I.S. 2556-1973 and I.S. 771-1979.
- 60.2.** 'S' trap shall be provided as required with water seal not than 50 mm. The solid plastic seat and cover shall be of best Indian make conforming to I.S 2548-1980. They shall be made of moulded synthetic materials which shall be tough and hard with high resistance to solvents and shall be free



from blisters and surface defects and shall have chromium plated brass hinges and rubber buffer of suitable size.

**M-61. Orissa type water closet**

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

**M-62. Indian type water closet**

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

**M-62. A. Foot Rests**

- 62.A.1.** A pair of white glazed earthen ware rectangular foot to minimum size 250 mm. x 130 mm. x 20 mm shall be provided with the water closet.

**M-63. Glazed Earthen Ware Sink**

- 63.1.** The glazed earthen-ware sink shall be of specified size, colour and quality. The sink shall conform, to I.S. 771 Part – II – 1979. The brackets for sinks shall conform to I.S 775-1970.
- 63.2.** The pipes shall conform to I.S. 1239-part-I 1973 and I.S. 404-1962 for steel and lead pipes respectively. 32 mm. brass waste coupling of standard pattern with brass chain and rubber plug shall be provided with sink.

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

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

**M-65. Low level Enamel flushing tank**

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

**M-66. Cast iron flushing cistern.**

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

**M-67. Flush cock**

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

**M-68. Cast iron pipes and fittings.**

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

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

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

**68.4. Tolerances :**

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

Sr. No.	Nominal dia. of Bore	Thickness	Overall		
			1.5 m long	1.8 m long	2 m. long
1.	75 mm	5.0 mm	12.83 Kg.	16.52 Kg.	18.37 Kg.
2.	100 mm	5.0 mm	18.14 Kg.	21.67 Kg.	24.15 Kg.

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

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

**M-69. Nahni Trap**

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

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

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

**M-70. Gully Trap**

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

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

**70.3.** Each gully trap shall have one C.I. grating of square size corresponding to the dimensions, of inlet of gully trap. It will also have a water tight C.I. cover with frame inside dimensions 300 mm. x 300

mm. the cover with frame inside dimensions 300 mm. x 300 mm. the cover and weighing not less than 4.53 Kg. and the frame not less than 2.72 Kg. The grating cover and frame shall be of sound and good casting and shall have truly square machined seating faces.

**M 71. Glazed Stone Ware pipe And Fittings**

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

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

**M-72. Wall Peg Rail**

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

**M-73. G.I. Water Spot**

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

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

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

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

**M-75. Crydon Ball valve**

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

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

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

**M-77. Selected Earth**

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

**77.2.** The selected earth shall be good yellow soil and shall be got approved from the Engineer-in-charge. In no case black cotton soil or similar expansive and shrinkable soil shall be used. It shall be clean and free from all rubbish and perishable materials, stones or brick bats. The clods shall be broken to a size of 50 mm or less. Contractor shall make his own arrangement at his own cost for land for borrowing selected earth. The stacking of material shall be done as directed by the

Engineer-in-charge in such a way not to interfere with any construction all activities and in proper stacks.

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

**M-78. Barbed Wire**

- 78.1.** The barbed wire shall be of galvanized steel and it shall generally conform to I.S. 278-1978. The barbed wire shall be of types-I whose nominal diameter for line wire shall be 2.5 mm. and point wire 2.24 mm. The nominal distance between two barbs shall be 75 mm unless otherwise specified in the item. The barbed wire shall be formed by twisting together two line wires. One containing the barbs. The size of the line and point wires and barb spacing shall be as specified above. The permissible deviation from the nominal diameter of the line wire and point wire shall not exceed  $\pm 0.08$  mm
- 78.2.** The barbs shall carry four points and shall be formed by twisting two point wires, each two turns tightly round one line wire making altogether four complete turns. The barbs shall have a length of not less than 13 mm and not more than 18 mm. The point shall be sharp and cut at an angle not greater than 35 degree of the axis of the wire forming the barbs.
- 78.3.** The line and point wires shall be circular in section, free from scale and other defects and shall be uniformly galvanized. The line wire shall be in continuous length and shall not contain any welds other than those in the rod before it is drawn. The distance between two successive splices shall not be less than 15 meters.
- 78.4.** The lengths per 100 Kg. of barbed wire I.S. type I shall be as under:
- |                    |                   |                     |
|--------------------|-------------------|---------------------|
| Nominal 1000 meter | Minimum 934 meter | Maximum 1066 Meter. |
|--------------------|-------------------|---------------------|

# **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:-**

- 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.
- 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 recompact. 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 the 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 Earthwork 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 metres 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

**item No. 1 :-** Empty boring through all sorts of strata for providing 0.600 mt. Diameter R.C.C. bored piles to required Depth including providing necessary casing pipe with all plants and equipments also including transportation of excavated mud as required complete

**WORKMANSHIP** as per instruction and direction given by Engineer-in-charge.

**MODE OF MEASUREMENT & PAYMENT**

The rate shall be made on rmt. base of one work done.

**item No. 4 :-** Performing Integrity test (low strain) on vertical pile. The item shall include chipping of weak concrete at the top of pile, leveling, bending of reinforcing bars, preparation of pile head including testing with pile driving analyzer or approved equivalent. To be carried out at least 15 days after concreting of piles. A specialist approved agency shall be employed by the Contractor for the test. The test shall be carried out as per relevant ASTM code, The item is including complete testing with approved apparatus, analysis of results and conclusions including submission of test reports in three hard copies with soft copy in CD.

**WORKMANSHIP** as per instruction and direction given by Engineer-in-charge.

**MODE OF MEASUREMENT & PAYMENT**

The rate shall be made on point. base of one work done.

**item No. 5 :-** Load testing of foundation piles including loading with necessary kentledge or any other suitable method as directed.

**WORKMANSHIP** as per instruction and direction given by Engineer-in-charge.

**MODE OF MEASUREMENT & PAYMENT**

The rate shall be made on MT. base of one work done.



**Item No. 6 :- Excavation for foundation upto 1.50mt.Depth including sorting out and stacking of useful materials and disposing of the excavated stuff as directed with in all lead & Lift (B) Dense or Hard soil.**

**1.0 Dense or Hard Soil**

**1.1** Any soil which generally required close application of picks or jumpers or scarifiers to loosen if stiff clay gravel and stone etc. fall under this category

**1.2.** Excavation for structures shall consist of the removal of material for the construction of Buildings, in accordance with the requirements, of these specifications and the lines and dimensions shown on the drawings or as indicated by the Engineer-in-charge. The work shall be include all necessary sheeting, shoring, bracing, draining and pumping and the removal of all logs, stumps, shrubs and other deleterious matter and obstruction necessary for the foundations, trimming bottoms of excavations; back filling and clearing up the site and the disposal of all surplus material.

**1.3.** The depth to which the excavation is to be carried out shall be is shown on the drawings, unless the type of materia1s. encountered is such as to required changes, in which case the depth shall be as ordered by the Engineer-in-charge.

**1.4.** Excavation shall be taken to the with of the lowest step of the footing. The contractor at his own expense shall put up necessary shoring, strutting and planking or cut slopes to a safer angle or both with due regard to the safety of personal and works and to the satisfaction of the Engineer-in-charge.

**1.5.** Where water is met with in excavation due to stream flow, seepage, springs, rain or other reasons, the contractor shall take adequate measures such as bailing pumping, to keep the foundation trenches dry when so required and to protect the green concrete/ masonry against damage by erosion or sudden rising of water level. The methods to be adopted in this regard and other details thereof shall be left to the choice of the contractor but subject to approval of the Engineer-in-charge. Approval of the Engineer-in-charge shall, however not relieve the contractor of the responsibility for *the* adequacy of dewatering, and production arrangements and for the quality and safety of the works.

**1.6.** Pumping from the interior of any foundation enclosure shall be done in such a manner as to preclude the possibility of movement of water through any fresh concrete. No pumping shall be permitted during the placing of concrete or for any period of at least 24 hours thereafter, unless it is done from a suitable sump separated from the concrete work by a water tight wall or other similar means.

**1.7.** The bottom of the foundation shall be leveled both longitudinally and transversely or stepped as directed by the Engineer-in-charge. Before foundation concrete is laid, the surface shall be slightly watered and rammed. In the event of excavation having been made deeper than that shown on the drawings or as otherwise ordered by the Engineer-in-charge, the extra depth shall be made up with concrete or masonry of the foundation grade, at the cost of the contractor. Ordinary filling shall not be used for the purpose to bring the foundation to level if there are any slips or blows is the excavation, these shall be removed by the contractor at his own cost.

**1.8.** Near towns, villages and all frequented places, trenches and foundation pits shall be securely fenced, provided with proper caution sings and marked with red lights at night to avoid accidents. The contractor shall take adequate protective measures to see that the excavation operations do not affect or damage adjoining structures

**1.9.** Back filling shall be done with approved materials after concrete or masonry is fully set and carried out in such a way as not to cause undue thrust on any part of the structure. All space between foundation masonry or concrete and the sides of excavation shall be refilled to the original surface, making due allowance for settlement in 250mm loose layers, which shall be watered and compacted.

**1.10.** All the excavated materials shall be the property of the Government. Where the excavated material is to be used in the filling of plinth, it shall be directly deposited at the required location, within 100 meters lead.

**1.11.** All useful materials not intended for use in the filling, shall be stacked neatly on Government land as directed by the Engineer-in-charge within 100 meters lead. Unsuitable and surplus materials not intended for use shall be disposed off as directed by the Engineer-in-charge

## **2.0 CLEANING SITE**

**2.1** The site on which the structure is to be built be cleaned and all obstructive loose stone materials and rubbish of all kind bush wood and trees shall be removed as directed. The material so obtained shall be property of the Government and shall be conveyed and stacked as directed within 50m lead. The roots of the trees coming in the sides shall be cut and coated with a hot asphalt.

## **3.0 WORKMAN SHIP**

**3.1.** After the site has been cleared the limits of excavation shall be set out true to lines, curves, slopes, grades and sections as shown on the drawings or as directed by the Engineer-in-charge. The contractor shall provide all labour, survey instruments and materials such as strings, pegs, nails, bamboos, stones, lime, mortar, concrete etc. required in connection with the setting out of works and the establishment of bench mark, centre line stones and other marks and stakes as long as in the opinion of the Engineer-in-charge, they are required for the work.

**3.2.** 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 if 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 brining 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 1.5m depth shall be measured under this item.

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

## **4.0. SETTING OUT**

**4.1.** 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.

## **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 50 M and all lift.

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

**6.1.** Excavation for structures shall be measured in cubic meters for each class of materials encountered, limited to the dimensions shown on the drawing or as directed by the Engineer-in-charge. Excavation over increased width cutting of slopes, shoring, shuttering and planking shall be deemed as convenience for the contractor in executing the work and shall not be measured and paid for separately.

The contract under rate for the items of excavation for structures shall be paid in full for carrying out the required operations including:

1. Setting out and fixing bench marks and centre lines stones.
2. Construction of necessary shoring and bracing and their subsequent removal.
3. Removal of all logs, stumps, grubs and other deleterious matter and obstructions for placing the foundations including trimming of bottoms of excavations;
4. Foundation sealing, dewatering including pumping;
5. Back filling ,clearing up the site and disposal of all surplus material within all lifts and lead up to 100 meters;
6. All labour, materials, tools equipment, safeguards and incidentals necessary to complete the work to the specification.

**6.2.** Excavation shall be for soil such as vegetation or organic soil, turf, sand, silt, loam, clay, mud, black cotton soil, soft shale or soft murrum, a mixture of these and similar material which yields to the ordinary application of pick and shovel, or other ordinary digging equipment Removal of gravel or any other nodular material having diameter in anyone direction not exceeding 75mm. occurring in such strata shall be deemed to be covered under this category. The classification of excavation shall be decided by the Engineer-in-charge and his decision shall be final and binding on the contractor.

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

**6.3.** The payment will be made on Cubic Meter basis of the finished work.

**Item No. 7 :- Excavation for foundation up to 1.50M. to 3.0 mt. Depth including sorting out and stacking of useful materials and disposing of the excavated stuff up to 50M. Lead(D) soft rock not required to blasting**

## **2.0. Workmanship**

The relevant specification of **Item No. 6** shall be followed except that the excavation work shall be carried in Loose and soft soil.

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

**3.1.** The relevant specifications of **Item No. 6** shall be followed.

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

**Item No. 8 :- Filling in plinth with sand under floors including watering, ramming, consolidating and dressing etc. complete.**

**1.0. Materials**

**1.1.** Sand shall conform to M-6.

**2.0. Workmanship**

The relevant specifications of **Item No. 4** shall be followed except that sand shall be filled in under floors, including watering, ramming, consolidating and dressing etc. complete.

**3.0. Mode of Measurements & Payment**

**3.1.** The relevant specifications of **Item No. 4** shall be followed.

**3.2.** The rate includes cost of collecting, carting sand with all lead and labour for filling the same in plinth under floors.

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

**Item No. 9 :-** Filling available excavated earth (excluding rock) in trenches plinth side of foundation etc. in layer not exceeding 20 cm in depth consolidation each deposited layer by ramming and watering etc. complete.

## **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 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 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. 10 :- Filling in foundation and plinth with murrum or selected soil in layers of 20 cm thickness including watering, ramming and consolidation etc. complete.**

**1.0 MATERIALS**

- 1.1. Murrum or selected soil shall be clean, of good binding quality and of approved quality obtained from approved pots / quarries of disintegrated rocks which contain silicon's material and natural mixture of clay of clariions origin. The P.I. value of selected soil used shall not be more than 6.0.

**2.0 WORKMANSHIP**

- 2.1 The murrum or selected soil to be used for filling shall be free from salts, organic or other foreign matter all colds of murrum or selected soil shall be broken.
- 2.2 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 murrum or selected soil in layers not exceeding 20 cms. Each layer shall be adequately watered, rammed and consolidated before the succeeding layer is laid. The murrum shall be rammed with iron rammers where feasible and with the but ends of crow bars. Where rammer cannot be used.
- 2.3 The plinth shall be similarly tilled with murrum or selected soil in layers not exceeding 20 cms adequately watered and consolidated by ramming with iron or wooden rammers. When filling reaches finished level the surface shall be flooded with water for at least 24 hours and allowed to dry and then rammed and consolidated.
- 2.4 The finished level of filling shall be kept to shape intended to be given to floor.
- 2.5 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.

**3.0. MODE OF MEASUREMENTS & PAYMENT**

- 3.1 The payment shall be made for filling in plinth and foundation no deduction shall be made for shrinkage or voids, if consolidated as instructed above.
- 3.2 The rate includes cost of collecting and carting murrum / or selected earth of approved quality with all lead and labour required for filling in trenches and plinth.
- 3.3 The rate shall be for a unit of one Cum. meter.

### **Item no 11**

Applying general insecticide pest control treatment to floors, cupboards etc including labour materials etc. complete. Using Imidacloprid 30.5 SCas Per IS 6313 part - II( 0.075% concentration by mass) is recommended 10.5ml chemical diluted with 5 liters of water application 0.5 litre chemical /Sqm of surface is recommended as per I.S

As per item description and applying as per site in charge instruction.

Measured in sqm.

**Item No. 12 :- Providing and laying controlled cement concrete M-150 and curing complete including the cost of form work but excluding cost of reinforcement for reinforced concrete work in Foundations, footings base of columns & 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 150 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:

<b>Grade of Concrete</b>	<b>Compressive strength of 15 cms. cubes in kg/cmt. at 28 days, conducted in accordance with I.S. 516-1959.</b>	
	<b>Preliminary test Min.</b>	<b>Work Test Min.</b>
<b>M 150</b>	200	150
<b>M 200</b>	260	200
<b>M 250</b>	320	250
<b>M 300</b>	380	300
<b>M 350</b>	440	350
<b>M 400</b>	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 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, 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 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. 13:- Providing & laying cement concrete 1: 3 : 6 ( 1 Cement : 3 Coarse sand : 6 graded B.T stone aggregate 20mm nominal size) Curing comp. including cost of form work 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. **Hand broken stones** 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, coarse sand and **stone aggregate** shall be one part of cement. 3 parts of coarse sand and 6 parts of **hand broken 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 pounding for a period of not less then 7 days from the date of placement.

**2.7. Mode of Measurement & Payment:**

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

**Item No. 14 :-** Providing and laying controlled cement concrete M-250 and curing complete including the cost of form work but excluding the cost of reinforcement concrete work in Column upto floor two level. Upto ground level.

The work shall be executed as per specification of **Item No. 13** except that the grade of **controlled** cement concrete **M-250** for **R.C.C. work in Columns upto plinth level** including the cost of form work instead of **controlled** cement concrete **M-150** grade in reinforcement concrete work in **Foundations, footing base of columns** shall be considered.

**Item No. 2:-** Providing and laying controlled cement concret M 250 for R.C.C. bored piles of 0.600 mt diameter including. vibrating curing and finishing complete

The work shall be executed as per specification of **Item No. 13** except that the grade of **controlled** cement concrete **M-250** for **R.C.C. work in Columns upto plinth level** including the cost of form work instead of **controlled** cement concrete **M-150** grade in reinforcement concrete work in **R.C.C. bored piles of 0.600 mt diameter**

**Item No. 3 :-** Providing and laying in position Ready Mixed M-250 grade concrete for reinforced cement conctere work , using cement content as per approved Design Mix manufactured in fully automatic batching plant and transported to site of work in transit mixer for a lead up to 10 kms having continuous agitated mixer, manufactured as per mix design of specified grade for reinforced cement concrete work including pumping of R.M.C. from transit mixer to site of laying, Including the cost of centering, shuttering, finishing, excluding the cost of reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. Without Fly Ash (Min cement level as per latest IS 456 shall be maintained) -For Pile Cap (Cement level 450 kg )

The work shall be executed as per specification of **Item No. 13** except that the grade of **controlled** cement concrete **M-250** for **R.C.C. work in Columns upto plinth level** including the cost of form work instead of **controlled** cement concrete **M-150** grade in reinforcement concrete work in **R.C.C. bored piles of 0.600 mt diameter**



**Item No. 15 :-** Providing and laying Controlled cement concrete M200 using B.T. stone aggregate and curing etc. complete including the cost of form work but excluding the cost of reinforcement. (a) Column for Ground floor.

The work shall be executed as per specification of **Item No. 13** except for the item is work of **Providing and laying Controlled cement concrete M200 using B.T. stone aggregate and curing etc. complete including the cost of form work but excluding the cost of reinforcement. (a) Column for Ground floor.**

**Item No. 16 :-** Providing and laying Controlled cement concrete M200 using B.T. stone aggregate and curing etc. complete including the cost of form work but excluding the cost of reinforcement. (a) Column for First floor.

The work shall be executed as per specification of **Item No. 15** except for the item is work of **Providing and laying Controlled cement concrete M200 using B.T. stone aggregate and curing etc. complete including the cost of form work but excluding the cost of reinforcement. (a) Column for First floor.**

**Item No. 17 :-** Providing and laying Controlled cement concrete M200 using B.T. stone aggregate and curing etc. complete including the cost of form work but excluding the cost of reinforcement. (a) Column for Second floor .

The work shall be executed as per specification of **Item No. 15** except for the item is work of **Providing and laying Controlled cement concrete M200 using B.T. stone aggregate and curing etc. complete including the cost of form work but excluding the cost of reinforcement. (a) Column for Second floor .**

**Item No. 18 :-** Providing and laying Controlled cement concrete M 250 using B.T. stone aggregate and curing etc. complete including the cost of form

work but excluding the cost of reinforcement for (c) PLINTH BEAM having cross sectional area more than 0.12 sqm

The work shall be executed as per specification of **Item No. 15** except for the item is work of **Providing and laying Controlled cement concrete M 250 using B.T. stone aggregate and curing etc. complete including the cost of form work but excluding the cost of reinforcement for (c) PLINTH BEAM having cross sectional area more than 0.12 sqm**

**Item No. 19 :-** Providing and laying controlled cement concrete M-150 and curing complete including the cost of form work but excluding the cost of reinforcement for reinforced concrete work in Plinth PLINTH Slab .

The work shall be executed as per specification of **Item No. 15** except for the item is work of **Providing and laying controlled cement concrete M-150 and curing complete including the cost of form work but excluding the cost of reinforcement for reinforced concrete work in Plinth PLINTH Slab .**

**Item No. 20 :-** Providing and laying controlled cement concrete M-200 and curing complete including the cost of form work but excluding the cost of reinforcement for reinforced concrete work in Wall caps / Coping / Lintel bends Ground Floor.

The work shall be executed as per specification of **Item No. 12** except that the grade of controlled cement concrete **M-250 for RCC work in Wall caps / Coping / Lintel bends Ground Floor.** including the cost of form work instead of controlled cement concrete **M-150 grade in reinforcement concrete work in Foundations, footing base of columns** shall be considered.

**Item No. 21 :-** Providing and laying controlled cement concrete M-200 and curing complete including the cost of form work but excluding the cost of reinforcement for reinforced concrete work in BEAMS Ground Floor.

The work shall be executed as per specification of **Item No. 15** except for the item is work of **Providing and laying controlled cement concrete M-200 and curing complete including the cost of form work but excluding the cost of reinforcement for reinforced concrete work in BEAMS Ground Floor.**

**Item No. 22 :-** Providing and laying controlled cement concrete M-200 and curing complete including the cost of form work but excluding the cost of reinforcement for reinforced concrete work in BEAMS First Floor.

The work shall be executed as per specification of **Item No. 15** except for the item is work of **Providing and laying controlled cement concrete M-200 and curing complete including the cost of form work but excluding the cost of reinforcement for reinforced concrete work in BEAMS First Floor.**

**Item No. 23 :-** Providing and laying controlled cement concrete M-200 and curing complete including the cost of form work but excluding the cost of reinforcement for reinforced concrete work in BEAMS Second Floor.

The work shall be executed as per specification of **Item No. 15** except for the item is work of **Providing and laying controlled cement concrete M-200 and curing complete including the cost of form work but excluding the cost of reinforcement for reinforced concrete work in BEAMS Second Floor.**

**Item No. 24 :-** Providing and laying controlled cement concrete M-200 and curing complete including the cost of form work but excluding the cost of reinforcement for reinforced concrete work in LINTELS Ground Floor.

The work shall be executed as per specification of **Item No. 15** except for the item is work of **Providing and laying controlled cement concrete M-200 and curing complete**



including the cost of form work but excluding the cost of reinforcement for reinforced concrete work in LINTELS Ground Floor.

**Item No. 25 :-** Providing and laying controlled cement concrete M-200 and curing complete including the cost of form work but excluding the cost of reinforcement for reinforced concrete work in LINTELS First Floor.

The work shall be executed as per specification of **Item No. 15** except for the item is work of **Providing and laying controlled cement concrete M-200 and curing complete including the cost of form work but excluding the cost of reinforcement for reinforced concrete work in LINTELS First Floor.**

**Item No. 26 :-** Providing and laying controlled cement concrete M-200 and curing complete including the cost of form work but excluding the cost of reinforcement for reinforced concrete work in CHHAJJAS Ground Floor.

The work shall be executed as per specification of **Item No. 15** except for the item is work of **Providing and laying controlled cement concrete M-200 and curing complete including the cost of form work but excluding the cost of reinforcement for reinforced concrete work in CHHAJJAS Ground Floor.**

**Item No. 27 :-** Providing and laying controlled cement concrete M-200 and curing complete including the cost of form work but excluding the cost of reinforcement for reinforced concrete work in CHHAJJAS First Floor.

The work shall be executed as per specification of **Item No. 15** except for the item is work of **Providing and laying controlled cement concrete M-200 and curing complete including the cost of form work but excluding the cost of reinforcement for reinforced concrete work in CHHAJJAS First Floor.**

**Item No. 28 :-** Providing and laying controlled cement concrete M-200 and curing complete including the cost of form work but excluding the cost of reinforcement for reinforced concrete work in slabs for Ground Floor.

The work shall be executed as per specification of **Item No. 15** except for the item is work of **Providing and laying controlled cement concrete M-200 and curing complete including the cost of form work but excluding the cost of reinforcement for reinforced concrete work in slabs for Ground Floor.**

**Item No. 29 :-** Providing and laying Controlled cement concrete M200 using B.T. stone aggregate and curing etc. complete including the cost of form work but excluding the cost of reinforcement. In slab for First floor.

The work shall be executed as per specification of **Item No. 15** except for the item is work of **Providing and laying Controlled cement concrete M200 using B.T. stone aggregate and curing etc. complete including the cost of form work but excluding the cost of reinforcement. In slab for First floor.**

**Item No. 30 :-** Providing and laying Controlled cement concrete M200 using B.T. stone aggregate and curing etc. complete including the cost of form work but excluding the cost of reinforcement. In slab for Second floor.

The work shall be executed as per specification of **Item No. 15** except for the item is work of **Providing and laying Controlled cement concrete M200 using B.T. stone aggregate and curing etc. complete including the cost of form work but excluding the cost of reinforcement. In slab for Second floor.**

**Item No. 31 :-** Providing and laying controlled cement concrete M-200 using B.T. stone aggregate and curing complete including the cost of formwork but excluding the cost of reinforcement for reinforced cement concrete work in staircases G.F. to F.F.

The work shall be executed as per specification of **Item No. 15** except for the item is work of **Providing and laying controlled cement concrete M-200 using B.T. stone aggregate and curing complete including the cost of formwork but excluding the cost of reinforcement for reinforced cement concrete work in staircases G.F. to F.F.**

**Item No. 32 :-** Providing and laying controlled cement concrete M-200 using B.T. stone aggregate and curing complete including the cost of formwork but excluding the cost of reinforcement for reinforced cement concrete work in staircases F.F. to S.F.

The work shall be executed as per specification of **Item No. 15** except for the item is work of **Providing and laying controlled cement concrete M-200 using B.T. stone aggregate and curing complete including the cost of formwork but excluding the cost of reinforcement for reinforced cement concrete work in staircases F.F. to S.F.**

**Item No. 33 :- Providing TMT Bar FE 500D reinforcement for R.C.C. work including bending, binding and placing in position complete upto all floor level.**

**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, [confirms 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.

## **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 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. 34 :- Brick work using common burnt clay building bricks having crushing strength not less than 35 Kg./Sq.m. in foundation and plinth in cement mortar 1:6 (1 cement:6 fine sand) (b) Conventional.**

**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 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, 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 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, 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 to 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 plunks 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 sand bed plates bearing of slab, chhajjas, and like whose thickness does not exceed 10 cms. and the bearing does not extend the full thickness of wall.

(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. 35 :-** Brick work using common burnt clay building bricks having crushing strength not less than 35 Kg./ Sqm. in cement mortar 1:6 ( 1 cement : 6 Fine sand ) in super structure above plinth level upto floor two level ( for G.F ) Conventional

The work shall be executed as per specification of **Item No. 34** except for the work of **Brick work using common burnt clay building bricks having crushing strength not less than 35 Kg./ Sqm. in cement mortar 1:6 ( 1 cement : 6 Fine sand ) in super structure above plinth level upto floor two level ( for G.F ) Conventional**

**Item No. 36 :-** Brick work using common burnt clay building bricks having crushing strength not less than 35 Kg./ Sqm. in cement mortar 1:6 ( 1 cement : 6 Fine sand ) in super structure above plinth level upto floor two level ( for F.F ) Conventional.

The work shall be executed as per specification of **Item No. 34** except for the work of **Brick work using common burnt clay building bricks having crushing strength not less than 35 Kg./ Sqm. in cement mortar 1:6 ( 1 cement : 6 Fine sand ) in super structure above plinth level upto floor two level ( for F.F ) Conventional.**

**Item No. 37 :-** Brick work using common burnt clay building bricks having crushing strength not less than 35 Kg./ Sqm. in cement mortar 1:6 ( 1 cement : 6 Fine sand ) in super structure above plinth level upto floor two level ( for S.F ) Conventional.

The work shall be executed as per specification of **Item No. 34** except for the work of **Brick work using common burnt clay building bricks having crushing strength not less than 35 Kg./ Sqm. in cement mortar 1:6 ( 1 cement : 6 Fine sand ) in super structure above plinth level upto floor two level ( for S.F ) Conventional.**

**Item No. 38 :-** Half brick masonry in common burnt clay building bricks having crushing strength not less than 35kg./sq.cm. in cement mortar 1:3 (1 cement : 3 coarse sand ) with 2nos. of 6mm dia mild steel round bars every three coarse embedded in cement mortar in superstructure for Ground floor (Conventional).

**1.0. Materials**

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

**2.0. Workmanship**

- 2.1.** Relevant specifications of bricks, wetting and laying of bricks, joints, curing etc shall conform to **Item No. 34** except that the brick work of half brick shall be carried out.
- 2.2.** Cement mortar used in masonry work shall be in proportion of 1 part of cement and 4 parts of coarse sand by volume.
- 2.3.** All bricks shall be laid stretcher wise, breaking joints with those in the upper and lower courses. The wall shall be taken truly plumb. All courses shall be said truly horizontal and all vertical joints shall be truly vertical. The bricks shall be laid with frogs upwards. A set of masons tools shall be maintained on work as required for frequent checking. After every three course 2 nos. of 6mm mild steel bars shall be embedded in cement mortar.

**3.0. Mode of measurement and payment**

- 3.1.** The half brick masonry work in foundation and plinth shall be measured under this item the limiting dimensions shall not exceed those shown in the plan or as directed. Any work done extra over the specified dimensions shall be ignored.
- 3.2.** The relevant specifications of **Item No. 34** shall be followed. The length shall be measured nearest to one cm.
- 3.3.** The rate includes the cost of providing 2 nos. of 6mm steel bars after every three course.
- 3.4.** The rate shall be for a unit of one sq. meter.

**Item No. 39 :-** Half brick masonry in common burnt clay building bricks having crushing strength not less than 35kg./sq.cm. in cement mortar 1:3 (1 cement : 3 coarse sand ) with 2nos. of 6mm dia mild steel round bars every three coarse embedded in cement mortar in superstructure First floor (Conventional)

The work shall be executed as per specification of **Item No. 38** except for the work of **Half brick masonry in common burnt clay building bricks having crushing strength not less than 35kg./sq.cm. in cement mortar 1:3 (1 cement : 3 coarse sand ) with 2nos. of 6mm dia mild steel round bars every three coarse embedded in cement mortar in superstructure First floor (Conventional)**

#### **ITEM NO 40.**

Providing and fixing door Double shutter having factory fabricated std. Extruded aluminium colour anodized hollow section {Section 63.50 x 38 mm x 2.50 mm thick } for door frame, hollow portion of door frame shall be filled with wood to be insert for durable grip of door hinges, with factory made 38 mm.thick flush door with both side 1mm thick laminated with 6 Lever Mortice lock , SS Aldrop 30cm long, SS Handle size 15 Cm Long, Tower Bolt size 20 cm etc. as per detail colour & pattern approved by this office including necessary anodized alluminum fixtures and fastenings.

**WORKMANSHIP** as per instruction and direction given by Engineer-in-charge.

#### **MODE OF MEASUREMENT & PAYMENT**

The rate shall be made on sqm base of one work done.

#### **ITEM NO 41**

Providing and fixing door Single shutter having factory fabricated std. Extruded aluminium colour anodized hollow section {Section 63.50 x 38 mm x 2.50 mm thick } for door frame, hollow portion of door frame shall be filled with wood to be insert for durable grip of door hinges, with factory made 38 mm.thick flush door with both side 1mm thick laminated with 6 Lever Mortice lock , SS Aldrop 30cm long, SS Handle size 15 Cm Long, Tower Bolt size 20 cm etc. as per detail colour & pattern approved by this office including necessary anodized alluminum fixtures and fastenings.

**WORKMANSHIP** as per instruction and direction given by Engineer-in-charge.

#### **MODE OF MEASUREMENT & PAYMENT**

The rate shall be made on sqm base of one work done.

#### **ITEM NO 42**

Providing & fixing FRP Frame size 100 x 50mm and 35mm thick FRP depress panel shutter having extra reinforcement on sides and edges and in gel coat finish. The cores of the shutter is to be filled up with intected fire extinguishing grade polyurethane wooden pieces for stiffening and also for taking hinges and fixtures. The FRP shutter is to be water proof, weather proof, termite proof and resistance to mild acid / Alkali including S.S hinges with necessary screws and alluminium fixtures and fastenings & Fastener Sleeve.

**WORKMANSHIP** as per instruction and direction given by Engineer-in-charge.

#### **MODE OF MEASUREMENT & PAYMENT**

The rate shall be made on sqm base of one work done.

#### **ITEM NO 43**

Providing and fixing Anodized Alluminum Section Jindal Deluxe Partly Fixed & Partly Sliding Window THREE track window as shown in elevation, shutter with 5mm thick transparent plain float glass, with transparent silicon sealant with allu. anosized coated fittings and fixture etc complete.

**WORKMANSHIP** as per instruction and direction given by Engineer-in-charge.

#### **MODE OF MEASUREMENT & PAYMENT**

The rate shall be made on sqm base of one work done.

#### **ITEM NO 44**

Providing and fixing Anodized Alluminum Section Jindal Deluxe Partly Fixed & Partly Sliding Window Two track window as shown in elevation, shutter with 5mm thick transparent plain float glass, with transparent silicon sealant with allu. power coated fittings and fixture etc complete.

**WORKMANSHIP** as per instruction and direction given by Engineer-in-charge.

#### **MODE OF MEASUREMENT & PAYMENT**

The rate shall be made on sqm base of one work done.

**Item No. 45 :-** Providing and fixing standard extruded of aluminium section of size 63.50 x 38.10 x 1.95 mm @ Wt 1.094Kg / Rmt with colour powder coated aluminium frame with 5 mm thick transparent bronze colour tinted float glass as details etc. complete for fix window.

## **1.0 MATERIALS**

- 1.1 Standard extruded anodized aluminium section for fix window allows used in the manufacture of extruded section shall confirm to I.S. designation HEA-WP of IS 733 - 1975 and also designation WVG - WP of IS 1285 - 1975 section shall be as specified in the drawing a design or as directed by Engineer-in-charge. All section shall be free from scratches holes or any damages on surface. All section shall have finished plaster surface on all sides.
- 1.1.1. The work includes standard extruded of Aluminium section of size 63.50mm x 38.10 mm x 1.95mm (of Jindal Section no. 4605 @ Wt 1.094Kg / Rmt with colour powder coated aluminium frame as directed by Engineer in charge.
- 1.2 Glass :** The transparent bronze colour tinted float glass of louvers fixed to aluminium strip blade shall be of approved make having thickness of 5mm. The glass shall be clear and free from scratches and cracks. The glass shall be provided on wall panel and fixed with tinted silicon gasket.
- 1.2.1 The glass shall be of the brief quality, free from specks, bubbles, smoken veins, air holes distress and other defects. The kind of glass to be used shall be as mentioned in the item or as shown in detailed drawing or as directed by Engineer-in-charge.
- 1.3. **Glazing clips:** Glazing clips shall be colour marble jambs all around the ventilator shall be free from any scratches or holes or any damage of on surface all section shall have finished luster surface on all sides.
- 1.4 **Rubber Gasket :** Rubber gasket shall be approved make shall be free from any scratches or holes or any damage on surface and shall have finished luster surface on all sides.
- 1.5. Fixtures**
- 1.5.1. Hinges shall be of approved make shall be free from any scratches or holes or any damage on surface and shall have finished luster surface on all sides.

## **WORKMANSHIP**

The work of standard extruded of Aluminium section for fix window shall be done with extreme finishing. The inclined blades shall be fixed as directed by Engineer-in-charge. 5 mm thick transparent bronze colour tinted float glass shall be fixed as details etc. complete.

## **MODE OF MEASUREMENT & PAYMENT**

The unit rate of standard extruded of Aluminium section for fix window shall include the cost of all labours, materials, anodizing charges, tools, plants, cost of necessary fixtures & fastenings.

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

#### **ITEM NO 46**

Providing and fixing standard extruded of aluminium section of size 63mm x 38.10mm x 1.2mm @ Wt. 0.643 Kg/mt) with colour anodized aluminium frame for ventilation with 5 mm thick frosted glass as details etc complete for Ventilation {Colour as directed by Engineer in charge except black & Aluminium section and glass

**WORKMANSHIP** as per instruction and direction given by Engineer-in-charge.

#### **MODE OF MEASUREMENT & PAYMENT**

The rate shall be made on sqm base of one work done.

#### **ITEM NO 47**

Providing and fixing standard GI Channel frame for ventilation with fixed louvers 114mm wide G.I.sheet with thickness of 0.55mm & wt. not less than 400gm per meter roll formed to create 84mm wide louver snap fixed on special shaped GI channel. Fix louvers & Channels shall finished with powder coating of 55microns etc. complete.

**WORKMANSHIP** as per instruction and direction given by Engineer-in-charge.

#### **MODE OF MEASUREMENT & PAYMENT**

The rate shall be made on sqm base of one work done.

#### **ITEM NO 48**

Providing and fixing Safety grills of required pattern for windows Rectangular CRC pipes of size 50 x 30 x 2mm & 16mm dia M.S. bar at 10cm spacing as per design including fixing rat mesh and hold fastening with coach bolts including one coat of primer and two coats of mattfinished oil painting etc complete.

**WORKMANSHIP** as per instruction and direction given by Engineer-in-charge.

#### **MODE OF MEASUREMENT & PAYMENT**

The rate shall be made on kg base of one work done.



**Item No. 49 :-** Providing and laying Machine cut, Free edges, Machine polished Granite stone slab 18 mm (Average) thick {Single piece not more than 150 cm } for stair steps and riser as per design incl. full moulded round front edge & 1 cm nosing & necessary groove on trade of steps laid on 20 mm thick cement mortar 1:6 (1 -cement : 6 coarse sand ) jointed with grey cement slurry including rubbing and polishing etc. complete

## **General**

This work shall consist of providing and fixing machine cut granite stone slab 18 mm thick (single piece not more than 150 cm) for Doors / Windows sill and jambs cladding as per design of the shape and dimensions shown on the drawings and conforming to these specifications or as approved by the Engineer in charge.

### **1.0 MATERIAL**

Water shall confirm to M-1. Cement Mortar shall confirm to M-11. Granite slab shall confirm to M-49. Sand shall conform to M-6.

### **1.0 GRANITE SLAB**

**1.1.** Granite slab shall be hard even sound, and regular in shape and generally uniform in colour. The colour of the stone shall generally be green. Only approved coloured shall not be allowed for use. They shall be without any soft veins cracks of flaws Granite slab shall be hard, even, and regular in shape and it should without fault.

**1.2.** The size of the Granite slab to be used as approved by Engineer in charge or Architect. However smaller sizes will be allowed to be used to the extent of maintaining required pattern. Thickness shall be as specified. For Doors / Windows sill & jambs cladding, risers the Granite slab shall be in single piece.

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

**1.4.** The edges of Granite slab shall be truly chiseled and table rubbed with coarse sand before paving. All angles and edges of the stones of shall be true, square and free chipping and surface shall be true and plain.

**1.5.** The Granite slab shall have machine cut free edges with half round pipe moulding mirror polished surface. When brought on site. The stones to be used for flooring dedo, skirting, sink, veneering, sills, steps, etc.

### **2.0 WORKMANSHIP**

**2.1** Granite slab shall be of approved quality shall be laid evenly to level and slope as directed by Engineer in charge over a bed of a base layer consisting of cement mortar 1:6 (1 cement: 6 coarse sand by volume) or Lime Mortar 1:1.5 (1 lime : 1.5 lime putty by volume).

**2.2** Granite slab shall be laid evenly as per detailed drawing or as directed by Engineer in charge. Width, length and shape of stone shall be as per pattern shown in detailed drawing.

**2.3.** Cement and sand for base layer shall be mixed in proportions of 1:6 (1 cement : 6 coarse sand by volume). Cement and sand shall be proportioned by volume after making due allowance for bulking. The require quantity of water shall then be added and the mortar mixed to produce workable consistency before mixing platform shall be thoroughly cleaned before changing from one type of cement to another.

**2.4.** The mixing for base layer shall be done intimately. The operation shall be carried out on clean water tight platform, and cement sand shall be first mixed dry in the required proportion to obtain uniform colour and then the mortar shall be mixed for at least two

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

- 2.5. Cement and sand for base layer shall be mixed in proportion as specified in the item, Cement and sand shall be proportioned by volume after making due allowance for bulking. The required quantity of water shall then be added and the mortar mixed to produce workable consistency.
- 2.6. Curing shall be started as soon as the mortar used for finished has hardened sufficiently no to be damaged when watered. It shall be kept wet for a period of at least 7 days. During this period, it shall be suitably protected from all damages;
- 2.7. During hot weather, all finished or partly finished work shall be covered or wetted in such manner as will prevent rapid drying of the flooring work.
- 2.8. Joints of Granite slab flooring shall be through and continuous throughout the building as directed by Engineer in charge.
- 2.9. Joints shall be filled with a stiff mixture of gray cement slurry.
- 2.10. The Granite slab flooring work shall be finished by rubbing and mirror polishing after the work of flooring is set properly.

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

- 3.1. The unit rate **Granite stone slab** 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 & placing stones in position, finishing, curing etc. flooring all over the length of walls and corners and sill of doors etc. and all other incidental expenses for producing flooring work 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 includes cost of mirror polishing of flooring and dado work.
- 3.2. The rate shall include the cost of all materials and labours involved in all the operations described above. The **granite stone slab** flooring shall be measured in Square meter correct to 2 places of decimal. Length and breadth shall be measured to correct to a centimeter and between the finished the finished face of the skirting, dado or wall plaster and no deduction shall be made nor extra paid for any opening in floors or areas up to 0.1 square meter.
- 3.3. The rate shall be for a unit of **one Square meter**.

**Item No. 50 :- Providing and laying 60 x 60cm Matt Finished Vitrified tiles 8 to 10 mm thick with pattern colour & Shade as detailed approve by architect in flooring treads of steps and landing laid on a bed of 12mm thick cement mortar 1:3 (1-cement : 3-coarse sand) finishing with flush pointing in white cement.**

**1.0. Materials**

Water shall conform to M-1. Cement mortar shall conform to M-11. **60 x 60cm Matt Finished Vitrified tiles 8 to 10 mm thick with pattern colour & Shade** shall conform to relevant Indian standard. The size & colour of **shade type** 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 20mm (average) thick base of cement mortar 1:3 (1 cement : 3 coarse sand) on new surface or fixing on existing 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 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 upto 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 51:** Providing and laying 60 x 60cm Matt Finished Vitrified tiles 8 to 10 mm thick with pattern colour & Shade as detailed approve by architect in skirting risers of steps and dedo on 10mm thick cement plaster 1:3 (1-cement : 3-coarse sand) and jointed with white cement slurry

The work shall be executed as per specification of **Item No. 50** except for the item is work of **Providing and laying 60 x 60cm Matt Finished Vitrified tiles 8 to 10 mm thick with pattern colour & Shade as detailed approve by architect in skirting risers of steps and dedo on 10mm thick cement plaster 1:3 (1-cement : 3-coarse sand) and jointed with white cement slurry**

**ITEM NO 52**

**Providing and laying 60 x 60cm Soluble Salt Vitrified tiles 8 to 10 mm thick with pattern colour & Shade as detailed approve by architect ( 10% Dark colour tiles Pattern ) in flooring treads of steps and landing laid on a bed of 12mm thick cement mortar 1:3 (1-cement : 3-coarse sand) finishing with flush pointing in white cement.**

The work shall be executed as per specification of **Item No. 50** except for the item is work of **Providing and laying 60 x 60cm Soluble Salt Vitrified tiles 8 to 10 mm thick with pattern colour & Shade as detailed approve by architect ( 10% Dark colour tiles Pattern ) in flooring treads of steps and landing laid on a bed of 12mm thick cement mortar 1:3 (1-cement : 3-coarse sand) finishing with flush pointing in white cement.**

**ITEM NO 53**

**Providing and laying 60 x 60cm GTV Vitrified tiles 8 to 10 mm thick with pattern colour & Shade as detailed approve by architect ( 10% Dark colour tiles Pattern ) in skirting risers of steps and dedo on 10mm thick cement plaster 1:3 (1-cement : 3-coarse sand) and jointed with white cement slurry**

The work shall be executed as per specification of **Item No. 50** except for the item is work of **Providing and laying 60 x 60cm GTV Vitrified tiles 8 to 10 mm thick with pattern colour & Shade as detailed approve by architect ( 10% Dark colour tiles Pattern ) in skirting risers of steps and dedo on 10mm thick cement plaster 1:3 (1-cement : 3-coarse sand) and jointed with white cement slurry**

**Item No. 54 :- Providing and laying 60 x 60cm Antiskid Vitrified tiles 8 to 10 mm thick in flooring treads of steps and landing laid on a bed of 12mm thick cement mortar 1:3 (1-cement : 3-coarse sand) finishing with flush pointing in white cement.**

**1.0. Materials**

Water shall conform to M-1. Cement mortar shall conform to M-11. **laying 60 x 60cm Antiskid Vitrified tiles 8 to 10 mm thick in flooring** shall conform to relevant Indian standard. The size & colour of Anti skid type 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 20mm (average) thick 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. 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 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 upto 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. 55 :- Providing and laying 30 x 30 cm size Ceramic 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 ) finishing with flush pointing in white cement.**

**1.0. Materials**

Water shall conform to M-1. Cement mortar shall conform to M-11 **30 x 30 cm size Ceramic tiles 6mm thick in flooring treads of steps and landing laid on a bed** shall conform to relevant Indian standard. The size & colour of **Dark shade type** 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 20mm (average) thick base of cement mortar 1:3 (1 cement : 3 coarse sand) on new surface or fixing on existing 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 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 upto 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. 56 :- Providing and laying 30 x 60Cm size Ceramic tiles 6mm thick in skirting risers of steps and dedo on 10mm thick cement plaster 1:3 (1-cement : 3-coarse sand) and jointed with white cement slurry**

**1.0. Materials**

Water shall conform to M-1. Cement mortar shall conform to M-11. **30 x 60Cm size Ceramic tiles 6mm thick in skirting risers of steps and dedo** shall conform to relevant Indian standard. The size & colour of **Dark shade type** 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 20mm (average) thick base of cement mortar 1:3 (1 cement : 3 coarse sand) on new surface or fixing on existing 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 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 upto 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. 57**

Providing and fixing Pre-cast Rubber Dye inter locking concrete block 80 mm thick with grade of concrete M 300 pneumatic compressed by mechanically pressed and as per approved design CONFIRMING IS 15658 : 2006 including 75 mm Sand layer for levelling and filling the joint with sand in proper line and level as per guidelines of IRC: SP 63 - 2018 etc complete.

### **1504. INTERLOCKING CONCRETE BLOCK PAVEMENT**

#### **1504.1. Scope**

Interlocking Concrete Block Pavement (ICBP) shall consist of a surface layer of appropriate sized concrete paving blocks paved and compacted over a thin bedding sand layer of specified grading, which is spread over a properly constructed and profiled base course and is bounded by properly installed edge restraints. The joints shall be filled by fine sand of specified grading. The work shall include supplying laying and paving of blocks including all materials, labour and equipment and performing all operations in connection with the laying of ICBP as per these Specifications.

#### **1504.2. Materials**

**1504.2.1.** The Concrete Paving Block shall conform to the relevant IS standard.

**1504.2.2. Bedding sand :** Bedding sand shall conform to the grading given in Table 1500.6.

**1504.2.3. Joint filling sand :** Joint filling sand shall conform to grading given in Table 1500.6.

**TABLE 1500.6 : GRADINGS FOR BEDDING AND JOINT FILLING SAND**

IS Sieve Size (mm)	Per cent Passing	
	For Bedding Sand	For Joint Filling Sand
10.00	100	100
4.75	90-100	90-100
2.36	60-95	75-100
1.18	15-34	55-90
0.60	25-60	35-59
0.30	5-20	8-30
0.15	0-10	0-10
0.075	0-5	0-5

#### **1504.3. Buffer**



Buffer of specified quantity of paving blocks (of the same shape, size and thickness) required for normal maintenance of paved area as specified by the Engineer, shall be supplied and stored for replacement as and when needed. Normally this will be 5 per cent of the blocks used in the paved area.

#### **1504.4. Block Thickness**

For rural roads catering to heavy vehicles, the minimum thickness of paving blocks shall be 60 mm for traffic up to 100 vehicles per day, and 80 mm for projected traffic from 100 to 250 vehicles per day.

#### **1504.5. Dimensions and Tolerances**

The dimensions and tolerances of paving blocks shall conform to the Specifications given in Table 1500.7. Aspect ratio is the ratio of length to thickness of blocks. Chamfer is the bevelled edge, provided on the top surface of a block. Plan area is the horizontal area bounded by the vertical faces. Wearing surface area is the horizontal area bounded by the vertical faces, minus the area reduced due to the presence of chamfer.

**TABLE 1500.7 : DIMENSIONS AND TOLERANCES FOR PAVING BLOCKS**

<b>S. No.</b>	<b>Dimension</b>	<b>Recommended Values</b>	<b>Tolerance Limit</b>
(1)	Width W	To be specified by Manufacturer	±2 mm
(2)	Length L	To be specified by Manufacturer	±2 mm
(3)	Thickness T	60 to 80 mm	±3 mm
(4)	Aspect Ratio L/T	Maximum : 4.0	±0.2
(5)	Chamfer (Arris)	Maximum : 5 mm Maximum : 7 mm	±1 mm
(6)	Plan Area	Maximum : 0.03 m <sup>2</sup>	+0.001 m <sup>2</sup>
(7)	Wearing Face Area	Minimum 75% of Plan Area	-1%
(8)	Squareness	Nil	±2 mm

#### **1504.6. Compressive Strength**

**1504.6.1.** The average 28 days compressive strength of 8 blocks shall be 30 MPa and strength of individual block shall not be less than 26 MPa.

**1504.6.2.** The 28 days compressive strength of paving blocks tested as per relevant IS specification shall be determined as explained hereinafter.

**1504.6.2.1.** Compression testing machine of adequate capacity shall be used for testing of blocks. The steel bearing plates shall have a minimum thickness of 25 mm. The surface area of the bearing side of the plate should be such

that no edge of the bearing plate is less than 10 mm from the outer edge of the paving block being tested.

**1504.6.2.2.** In case the testing surface of the paving block departs from a plain surface by more than 0.05 mm, capping using suitable materials shall be adopted for testing as per IS:516.

**1504.6.2.3.** The blocks shall be stored for  $24 \pm 4$  hours in water maintained at a temperature of  $(20 \pm 5)^\circ\text{C}$  before testing. The dimensions and plan areas of the block shall be determined. The bearing plates of the testing machine shall be wiped clean. The specimen shall be clamped between the plates in such a way that the axes of the specimen are vertically aligned with those of the bearing plates.

**1504.6.2.4.** The load shall be applied without shock and increased continuously at a rate of  $15 \pm 3 \text{ N/mm}^2/\text{minute}$  until no greater load can be sustained by the specimen or delamination occurs. The maximum load applied to the specimen shall be noted.

**1504.6.2.5.** The apparent compressive strength of individual block shall be calculated by dividing the maximum load (N) by the plan area ( $\text{mm}^2$ ). The corrected compressive strength shall be calculated by multiplying the apparent compressive strength by the appropriate correction factor from Table 1500.8. The strength shall be expressed to the nearest  $0.1 \text{ N/mm}^2$ .

**TABLE 1500.8 : CORRECTION FACTORS FOR THICKNESS AND CHAMFER OF PAVING BLOCK FOR CALCULATION OF COMPRESSIVE STRENGTH**

Paving Block Thickness (mm)	Correction Factor for	
	Plain Block	Chamfered Block
60	1.00	1.06
80	1.12	1.18

**1504.6.2.6. Water Absorption:** The water absorption being the average of five blocks shall be not more than 6 per cent by mass.

#### **1504.7. Edge Blocks**

The edge blocks shall have equivalent cube compressive strength not less than 30 MPa. The road kerbs provided on the edges of the road also serve the purpose of edge blocks. In case the end kerbs are not provided, 300 mm x 300 mm x 150 mm of M30 grade concrete edge blocks or other suitable size as per drawings or direction of the Engineer shall be provided.

#### **1504.7.2. Subgrade**

The Subgrade shall conform to Clause 1501.5.1 of these Specifications. The soaked CBR of subgrade soil shall not be less than 4 per cent.

#### **1504.8. Sub-base**

The sub-base shall be 100 mm thick granular layer conforming to Clause 401 or 100 mm thick WBM Gr.I conforming to Clause 405 of these Specifications. In case the sub grade soil is clayey, the sub-base shall be extended over the full formation width for proper drainage.

#### **1504.9. Base Course**

A minimum 100 mm thick layer of granular/stabilized base course shall be provided. The base course layer shall be extended at least 300 mm beyond the edge restraints. The material shall conform to Clause 402 of these Specifications.

#### **1504.10. Bedding Sand**

Bedding sand conforming to Table 1500.6 shall be uniformly laid to a compacted thickness of 25 mm for 60 mm thick blocks and 30 mm for 80 mm thick blocks. Bedding sand shall be unloaded in small piles regularly placed over the base course and shall preferably have a moisture content of about 6 per cent which will facilitate its spreading and compaction. Bedding sand shall be screened in a uniform layer over the base course. The screed can be guided to level by tensioned string lines set above the base course. At the time of spreading, the thickness of sand must allow for the amount by which it will be subsequently compacted which is normally about 25 per cent more than the compacted thickness. Screening shall not proceed beyond about 1 m ahead of the planned end of block paving for the day. Sand shall preferably be compacted with a manual, fabricated plate compactor and the level shall **be readjusted** using the screed. The surface profile of the screened bedding sand shall **match that** required for the completed pavement.

#### **1504.11. Paving Pattern**

The pattern in which blocks are to be paved shall be decided in advance and got approved from the Engineer in charge.

**1504.11.1.** By and large, these patterns are the same as adopted for brick paving. All shapes of blocks are not amenable to the above paving patterns. For paving in trafficked areas, herringbone pattern shall be adopted for

ensuring better performance. Paving shall commence and progress from one starting line only. Wherever possible, paving shall commence adjacent to or against edge restraint.

#### **1504.12. Paving and Compaction of Blocks**

Blocks shall be placed at the correct angle to the start line to achieve the final orientation of the laying pattern. For curved or unfavorably oriented edge restraints, a string line shall be established to permit fast, easy laying such that it is not required to force a block between the blocks already paved. Control over alignment, laying pattern and joint width can be assisted by the use of chalked string lines set at about 5 m intervals. Nominal joint width of 2 to 4 mm shall be maintained by holding the paving unit lightly against the face of the adjacent block and allowing it to slide into position. Cutting paving units for filling the paving gaps occurring against edge restraints etc. shall be deferred until sufficient work has progressed to allow reasonably continuous operation. When space does not permit the use of cut pieces of blocks, premixed or dry packed concrete shall be used. After a section has been paved, compaction shall be effected by using vibrating plate compactors in the following sequence of operations:

- (i) Vibrate the blocks with 3 passes of the plate vibrator of adequate capacity.
- (ii) Spread a thin layer of fine joint filing sand on top of the paved blocks and sweep it into the joints, using suitable brooms.
- (iii) Vibrate the sand into the joints by making 3 passes of the compactor.
- (iv) Sweep off the excess sand from top of blocks.

As a guide to the characteristics of typical vibrating plate compactors, standard compactors have a weight of 90 kg, a plate area of 0.3 m<sup>2</sup> and apply a centrifugal force of 1500 kg. Heavy duty compactors weigh between 300 to 600 kg, have a plate area of about 0.5 to 0.6 m<sup>2</sup> and apply a centrifugal force in the range of 2000-3000 kg. Use of heavy duty compactors is desirable for trafficked pavements.

**1504.12.1. Trial length :** The contractor shall lay a trial length of 30 m and get it inspected and approved by the Engineer before proceeding with the regular paving work. The trial length shall be rectified/re-laid if found deficient in any respect. The procedure demonstrated in the laying of trial length shall be followed while executing the main construction work.

### **1504.13. Opening to Traffic**

The pavement can be opened to traffic as soon as the construction work is completed.

**1504.14.1. Transverse profile :** When measured by a camber template, the transverse profile shall not deviate by more than 10 mm from the design profile.

**1504.14.2. Longitudinal profile :** When measured by a 3 m straight edge, the longitudinal profile shall not deviate by more than 12 mm from the design profile.

### **1504.15. Acceptance Criteria**

From each lot of 500 blocks, 5 blocks shall be selected at random for water absorption and compressive strength tests. In case the number of blocks in the lot is less than 500, a minimum 1 per cent of the blocks delivered to site shall be tested for water absorption and strength. The blocks shall be first tested for water absorption and these shall meet the requirement of Clause 1504.5.2.6 of these Specifications. The same five blocks (or minimum 1 per cent) shall be tested for strength and shall conform to the strength as per Clause 1504.5.1 of these Specifications.

The paved surface shall meet the tolerances for lines, levels, and grades etc. as given in Section 1800 of these Specifications.

### **1504.16. Measurements for Payment**

The measurement of the paved area shall be in square meters measured from the inner edge of edge restraints on one side of the pavement to the inner edge of the edge restraints on the transverse side of the pavement. The measurement of the edge restraints shall be in number of units or in cubic meters.

### **1504.17. Rate**

The contract unit rate shall include the cost of blocks, cost of stacking, transportation to site and paving including supply and application of bedding sand and joint filling sand. The rate shall include full compensation for labour, tools, plant, equipment, testing and all incidentals to the work, including all royalties, taxes, storage rents wherever necessary, and all leads and lifts.

The payment shall be made on **Sqmt.** Basis

## **ITEM NO. 58**

**Providing and fixing Pre-cast concrete kerb stone of gray cement based concrete block 30cm length, 30cm height and 15cm thick of M250 grade concrete as per approved design and including excavation for fixing in proper line and level, filling the joint with C:M 1:3 (1 cement: 3 fine sand) etc complete.**

Concrete Shall be done as per the Relevant Item Specification Detail Specification  
Page 24 Form work Shall be done as per the relevant item specifications

### **Laying**

Trenches shall first be made along the edge of the wearing course of the road to receive the kerb stones of cement concrete of specified grade. The bed of the trenches shall be compacted manually with steel rammers to a firm and even surface and then the stones shall be set in cement mortar of specified proportion.

The kerb stones with top 20 cm. wide shall be laid with their length running parallel to the road edge, true in line and gradient at a distance of 30 cm. from the road edge to allow for the channel and shall project about 12.5 cm. above the latter. The channel stones with top 30 cm. wide shall be laid in position in chamber with finished road surface and with sufficient slope towards the road gully chamber. The joints of kerb and channel stones shall be staggered and shall be not more than 10 mm. Wherever specified all joints shall be filled with mortar 1:3 (1 cement : 3 coarse sand) and pointed with mortar 1:2 (1 cement: 2 fine sand) which shall be cured for 7 days.

The necessary drainage openings of specified sizes shall be made through the kerb as per drawings or as directed by the Engineer-in-Charge for connecting to storm water drains.

### **Finishing**

Berms and road edges shall be restored and all surplus earth including rubbish etc. disposed off as directed by the Engineer-in-charge. Nothing extra shall be paid for this.

### **Measurements**

It shall be measured in cubic meters with Length of the finished work (for specified width and height of stone) shall be measured in running metre along the edge of the road correct to a cm.

### **Rate**

The rate shall include the cost of all the materials and labour involved in all the operations described as above.

The payment shall be made on **Rmt.** Basis

**Item No. 59 :-** Providing and laying water proofing treatment with china mosaic tiles flooring over avg 40 mm C.C. 1:2:4 ( 1 Cement, 2 sand, 1 Kapchi 20mm + 3 grit 6mm to 10mm ) bedding for maintaining slope for plain and curve surface & 12 mm to 20 mm of broken piece of ceramic / glazed tiles ( one or more color as directed ) to be laid over cement mortar bedding of C M 1:3 (1 cement : 3 sand ) containing one Kg. of water proofing materials per bag of O P C at plain or / and slopes and to be tempered to bring mortar ceramic up to surface with using white cement and colour pigment including rounding of junctions and extending them up to 15 cm along the wall and curing with bends any patterns or design as per drawing and cleaning by using oxalic acid etc complete.

## **1.0 MATERIAL**

(a) Water shall conform to M-1 (b) Cement shall conform to M-3 (c) Sand shall conform to M-6.

### **1.1 WATER PROOFING COMPOUND**

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

### **1.2 BRICK BATS**

Brick bat aggregates shall be broken from well burnt or slightly over burnt and dense bricks it shall be homogeneous in texture roughly cubical in shape clean and free from dirt or any other foreign material brick bats shall be of 25mm to 100mm size unless otherwise specified in the item the under burnt or over burnt bricks bats shall not be used.

### **1.3 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.

### **1.4 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 raked off and cut in trench which shall be filled by neat cement slurry admixed with water proofing compound. The joints with parapet shall be raked 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.

**B** Cleaning the surface opening the cracks in "V" grooves patterned filling the same with water proof cement mortar 1:1 (1 cement : 1 Bodeli sand) including B.B. as directed or specified



thickness shall be laid (Specification of C.C. 1:5:10 shall be followed for the execution of this layer) all over the surface of the terrace in true level and 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. 1:4 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.

## **2.0 MODE OF MEASUREMENT AND PAYMENT**

- 2.1** 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. They 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.

- 2.2** 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.

- 2.4** [A guarantee bond on appropriately stamped paper shall be given by the contractor to the Department in the manner and form prescribed below.](#)

- 2.3** The payment will be made on **Square Meter** basis of the finished work.

## **FORM OF GUARANTEE BOND**

Contractor I / We \_\_\_\_\_) here by guarantee that work will remain unaffected and will not be in anyway damaged by water rain and will not leak from surface for a period for 5 years after completion of the work of water proofing treatment as per the terms and conditions of the contract and damage that might be caused on account of water rain and or other similar type of dampness of leakage from walls or above floor.

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

The deposit at the rate of 20% of the cost of this item from the running and final bills shall be recovered and remained for the first one year after completion of the work or at least on monsoon season passed which ever is later and 10% shall be retained for the balance of the guarantee period and shall be returned only after completion of the guarantee period.

## **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. upto 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. 60 :- Providing and laying Mirror polished Machine polished Green Marble stone slab 18mm (Average ) thick for doors & windows sill & Jams clading as per design including full moulded round front steps & 1cm nosing & necessary groove on trades of steps ;laid on 20mm thick cement mortar 1:6 ( 1 cement : 6 coarse sand ) jointed with gray cement sluury including rubbing and polsihing etc. complete.for Doors / windows sill & jams clading.**

## **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. **18 mm thick polished Green Marble stone** shall conform to M-49.
- 1.1. Marble stone slab shall be hard even sound, and regular in shape and generally uniform in colour. The colour of the stone shall generally be green. Brown coloured shall not be allowed for use. They shall be without any soft veins cranks of flaws Marble stone slab shall be hard, even, and regular in shape and it should without fault.
- 1.2. The size of the Marble stone slab to be used for flooring shall be of size 600 mm x 600 mm and or as approved by Engineer in charge or Architect. However smaller sizes will be allowed to be used to the extent of maintaining required pattern. Thickness shall be as specified.
- 1.3. Tolerance of minus 30 mm. on accounts of chisel dressing of edges shall be permitted for length as well as breadth. Tolerance in thickness shall be +3 mm.
- 1.4. The edges of Marble stone slab shall be truly chiseled and table rubbed with coarse sand before paving. All angles and edges of the stones of shall be true, square and free chipping and surface shall be true and plain.
- 1.5. When machine cut edges are specified the exposed and the edges at joints shall be machine cut the thickness of the exposed machine cut edges shall be uniform.
- 1.6. The stones shall have machine polished surface. When brought on site, the stones shall be single polished or double polished depending upon its use. The stones for paving shall generally be single polished. The stones to be used for dedo, skirting, sink, veneering, sills, steps etc. where machine polishing after the stones are fixed in situ is not possible shall be double polished.

## **2.0. Workmanship**

- 2.1. Each slab shall be cut to the required size and shape and fine chisel dressed at all the edges. The sides trust 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 20 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 Marble stone slabs shall be of cement mortar 1:6 (1 cement : 6 coarse sand) or L.M. 1:1.5 of average thickness 20 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 Marble 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 dedo. 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 rate shall include the cost of all materials and labour involved in all the operations described above. The Marble stone flooring shall be measured in square meters correct to two places decimal, length and breadth shall be measured correct to a centimeter and between the finished face of skirting dedo plaster and no deduction shall be made nor extra paid for any opening in floor of areas upto 0.1 sq.
- 3.2. The rate shall be for a unit of one **sq. meter**.

**Item no 121 : Providing and laying hand dressed polished blue 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 laid over and jointed with grey cement slurry including rubbing and semi mirror polishing with emery No. 600 etc. complete. (A) 25mm thick**

As per above specification.

**Item No. 61 :- Providing 20 mm thick double coat mala cement plaster on interior brick / concrete work for plastering comprising of base coat of 12 mm thick cement plaster in cement mortar (1 Cement : 4 coarse sand) in rough finishing and 8 mm thick top coat of cement mortar 1:2 (1 Cement : 2 Coarse sand) finished with trowel including scaffolding curing etc. complete. for Second Floor.**

**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 interior brick / concrete work plaster which shall be independent of the walls.

**2.2. Preparation of back ground :**

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

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

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

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

- 2.3.2.** Cement plaster shall be used within half an hour after addition of water and mortar or plaster which is partially set shall be rejected and removed forthwith from the site.
- 2.3.3.** In suspending the work at the end of the day, the plaster shall be left out clean to the line both horizontally and vertically, when recommencing the plaster, the edges of the old work shall be scraped clean and wetted with cement putty before plaster is applied to the adjacent areas to enable the two to properly join together. Plastering work shall be closed at the end of the day on the body of the wall and nearer than 15 cm. to any corners or arises. It shall not be closed on the body of features such as plaster bands and cornices not at the corners or arises. Horizontal joints in plaster work shall not also occur on parapet tops and copings as these invariably lead to leakage. No portion of the surface shall be left out initially to be packed up later on.
- 2.3.4.** Each coat shall be kept damp continuously till the next coat is applied or for a minimum period of 7 days. Moistening shall commence as soon as plaster is hardened sufficiently. Soaking of walls shall be avoided and only as much water as can be readily absorbed shall be used, excessive evaporation on the sunny or windward side of building in hot air or dry weather shall be prevented by hanging matting or gunny bags 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 ceiling surface/ sloping roof etc. for interior plastering up to floor two level, finished even and smooth in **C.M. 1:4**.
- 2.3.6** The coat of cement and fine sand 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 to day breaks 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, labour and scaffolding etc. involved in the operations described under workmanship.
- 3.2.** All plastering shall be measured in square meters unless otherwise specified. Length breadth or height shall be measured correct to a centimeter.
- 3.3.** Thickness of the plaster shall be exclusive of the thickness of the key i.e. grooves or open joints in brick work, stone work etc. or space between laths. Thickness of plaster shall be average thickness with minimum **10 mm** at any point on this surface.
- 3.4.** This item includes plastering 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 50 Kg. cement used extra over the rate of plastering work.
- 3.12. The rate shall be for a unit of **One sq. meter.**

**Item No. 62 :- Providing 20 mm thick double coat mala cement plaster on interior brick / concrete work for plastering comprising of base coat of 12 mm thick cement plaster in cement mortar (1 Cement : 4 coarse sand) in rough finishing and 8 mm thick top coat of cement mortar 1:2 (1 Cement : 2 Coarse sand) finished with trowel including scaffolding curing etc. complete. for First Floor**

The relevant specifications of **Item No. 61** shall be followed for the work of **Providing 20 mm thick double coat mala cement plaster on interior brick / concrete work for plastering comprising of base coat of 12 mm thick cement plaster in cement mortar (1 Cement : 4 coarse sand) in rough finishing and 8 mm thick top coat of cement mortar 1:2 (1 Cement : 2 Coarse sand) finished with trowel including scaffolding curing etc. complete. for First Floor.**

**Item No. 63 :- Providing 20 mm thick double coat mala cement plaster on interior brick / concrete work for plastering comprising of base coat of 12 mm thick cement plaster in cement mortar (1 Cement : 4 coarse sand) in rough finishing and 8 mm thick top coat of cement mortar 1:2 (1 Cement : 2 Coarse sand) finished with trowel including scaffolding curing etc. complete. for Second Floor**

The relevant specifications of **Item No. 61** shall be followed for the work of **Providing 20 mm thick double coat mala cement plaster on interior brick / concrete work for plastering comprising of base coat of 12 mm thick cement plaster in cement mortar (1 Cement : 4 coarse sand) in rough finishing and 8 mm thick top coat of cement mortar 1:2 (1 Cement : 2 Coarse sand) finished with trowel including scaffolding curing etc. complete. for Second Floor**

**Item No. 64 :- Providing 10mm thick cement plaster in single coat on brick/concrete walls for interior plastering upto floor two level and finished even and smooth in (i) Cement mortar 1:3 (1-cement:3-sand) including finishing with a flating coat of neat cement slurry etc. complete. for Ground Floor**

The relevant specifications of **Item No. 61** shall be followed for the work of **Providing 10mm thick cement plaster in single coat on brick/concrete walls for interior plastering upto floor two level and finished even and smooth in (i) Cement mortar 1:3 (1-cement:3-sand) including finishing with a flating coat of neat cement slurry etc. complete. for Ground Floor**

**Item No. 65 :- Providing 10mm thick cement plaster in single coat on brick / concrete walls for interior plastering upto floor two level and finished even and smooth in (i) Cement mortar 1:3 (1-cement:3-sand) including finishing with a flating coat of neat cement slurry etc. complete. for First Floor**

The relevant specifications of **Item No. 61** shall be followed for the work of **Providing 10mm thick cement plaster in single coat on brick / concrete walls for interior plastering upto floor two level and finished even and smooth in (i) Cement mortar 1:3 (1-cement:3-sand) including finishing with a flating coat of neat cement slurry etc. complete. for First Floor**

**Item No. 66 :- Providing 10mm thick cement plaster in single coat on brick/concrete walls for interior plastering upto floor two level and finished even and smooth in (i) Cement mortar 1:3 (1-cement:3-sand) including finishing with a flating coat of neat cement slurry etc. complete. for Second Floor**

The relevant specifications of **Item No. 61** shall be followed for the work of **Providing 10mm thick cement plaster in single coat on brick/concrete walls for interior plastering upto floor two level and finished even and smooth in (i) Cement mortar 1:3 (1-cement:3-sand) including finishing with a flating coat of neat cement slurry etc. complete. for Second Floor**



**Item No. 67 :- Providing 20 mm thick Water proof cement plaster for sunk in single coat on bricks/ concrete wall for interior plastering upto floor two level finished even and smooth (ii) Cement mortar 1:3 (1- cement : 3-sand) and mixing waterproofing materials of approved brand and manufacture in cement mortar in proportion recommended by the manufacturer for All Floors.**

**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 and 8mm thick finishing coat of C.M. 1:1 (1 cement : 1 sand) for all heights as directed etc. complete.

**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 back ground :**

**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 15x15 cms. shall be first applied horizontally and vertically at not more than 2 meters intervals over the entire surface to serve as gauge. The surfaces of these gauges shall be truly in plane of the finished plastered surface. The mortar shall then be applied in uniform surface slightly more than the specified thickness, then brought to a true surface by working a wooden straight edge reaching across the gauges with small upward and sideways movements at a time. Finally, the surface shall be finished off true with a trowel or wooden float according as a smooth or a smooth or a sandy granular texture is required Excessive

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

**2.4.2.** 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 oh 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 8 mm. 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 level, 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 gutkha 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, labour and scaffolding etc. involved in the operations described under workmanship.

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

- 3.3. Thickness of the plaster shall be exclusive of the thickness of the key i.e. grooves or open joints in brick work, stone work etc. or space between laths. Thickness of plaster shall be average thickness with minimum 20 mm at any point on this surface.
- 3.4. This item includes plastering up to floor two level 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 72 : 20mm thick sand faced cement Gutka finished plaster on walls upto height 10 metres above ground level consisting of 12mm thick backing coat of C.M. 1:3 (1-cement : 3-sand) and 8mm thick finishing coat of C.M. 1:1 (1-cement : 1-sand) etc. complete.**

**SAME AS ABOVE**

**Item No. 68 :- Providing and fixing chicken mesh jali with square of 12.50 x 12.50 mm of 25 gauge at junction the Brick.masonry and reinforcement cement concrete member including fixing materials scaffolding labour etc. complete**

## **MATERIALS**

150 mm wide Chicken wire mesh jali of 25 gauge of approved make or as directed.

## **WORKMANSHIP**

Chicken wire mesh jali shall approved by Engineer in charge. It shall be fixed at junction the brick masonry and reinforcement cement concrete member including necessary fixtures & fastenings at junction of brick work and RCC work or two dissimilar surfaces, at all heights fixed by nails, rowal plugs or tag by cement mortar 1:3 before applying the plaster. Chicken wire mesh jali shall be cut to size and same shall be fixed at the junction of concrete and brick wall with nails in such a manner that it stick to wall surface.

## **MODE OF MEASUREMENTS & PAYMENT**

The unit rate of fixing Chicken wire mesh jali shall include the cost of all materials, tools and plant required for lifting to required height with all lead and lift, placing & fixing in position, all required specials and finishing as per direction of the Engineer-in-charge.

The Chicken wire mesh jali work shall be measured for its width and height limiting to specified capacity to those specified on plan or as directed.

The rate shall be for a unit of Square meter.

**Item No. 69 :-** Applying two coats of putty & two coats of primer of approved brand and manufacture on new wall surface to give an even shade including thoroughly brushing the surface free from mortar dropping and other foreign matter and sand papered smooth. For all floor

**1.0. Materials**

Water shall be conform M-1. The plastic emulsion paint shall conform to I.S.: 5411-1969 (Part-I). Birla or Asian acrylic lappy (putty) and primer shall be of approved brand and manufacture.

**2.0. Workmanship**

The painting work shall be for subsequent coat of plastic emulsion paint of approved brand & manufactures on wall surfaces for all floors to give an even shade as directed.

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

**2.1. Scaffolding :** Wherever scaffolding is necessary it shall be erected in such a way that as far as possible on part of scaffolding shall rest against the surface to be white or colour washed. A properly secured strong and well tied suspended platform (Zoola) may be used for white washing. Where ladders are used pieces of old gunny bags shall be tied at top and bottom to prevent scratches to the floors and walls. For white washing of ceilings, proper stage scaffolding shall be erected where necessary.

**2.2. Preparation of surface :** 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.

**2.2.1.** 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.

**2.3. Priming coat :**

**2.3.1.** A priming coat of 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. Preparation of Mix :**

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

#### **2.4. Application :**

- 2.4.1.** Before pouring into small containers for use, the paint shall be stirred thoroughly in item container. When applying also, the paint shall be continuously stirred in the smaller container, so that its consistency is kept uniform.
- 2.4.2.** The paint shall be laid on evenly and smoothly by means of crossing and laying off the crossing and consist of covering the area over with paint, brushing the surface hard for the first time over and then, brushing alternately in opposite direction two or three times and then finally brushing lightly in direction at right angles to the same. In this process, no brush Marks shall be left after the laying off is finished. No hair marks from the brush or clogging of paint puddles in the corners of panels, angles of moldings, etc. shall be left on the work. The full process of crossing and laying off will constitute one coat.
- 2.4.3.** The paint shall be applied with brush or rollers. For undecorated surfaces, the surface shall be treated with minimum **two coats** of cement water proofing paint. The second or subsequent coat shall not be started until the proceeding coat as become sufficiently hard to resist marking by brushing being used.
- 2.4.4.** The surface on finishing shall present a flat velvety smooth finish. It shall be even and uniform in shade without patches, brush marks, paint drops etc.

#### **2.5. Precautions :**

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

- 2.6. Protective measures :** The surface of doors, windows, floors, articles, of furniture etc. and such other parts of the building not to be white washed shall be protected from being splashed upon. Such surfaces shall be cleaned of white wash splashed if any.

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

- 3.1.** All the work shall be measured in the decimal system as under:

- (a) Dimensions shall be measured to the nearest 0.01 m.
- (b) Area in individual item shall be worked out to the nearest 0.01 sq.m.

All the work shall be measured in sq.mt. Deductions for jambs, soffits, sills etc. for openings not exceeding 0.5 sq.mt. each in area, for ends of joists, posts, beams, girders, steps etc.

not exceeding 0.5 sq.mt. each in area and for openings exceeding 0.5 sq.mt. and not exceeding 3.0. sq.mt. each in area, deductions and additions shall be made as under.

- 3.2.** No deductions shall be made for ends of joists, beams, posts, etc. and openings not exceeding 0.5 sq mt. each. No addition shall be made for reveals, jambs, soffits, sills etc. of these openings not for finish around ends of joints, beams, posts etc.
- 3.3.** No deductions for openings exceeding 0.5 sq.mt. but not exceeding 3 sq.mt. each shall be made as follows and no addition will be made for reveals, jambs, soffits etc. of these openings :
- (a) When both the faces of **wall surfaces** are provided with finish, deduction shall be made for one face only.
  - (b) When each face of **wall surface** is provided with different finish, deduction shall be made for that side of frame for door, windows, etc. on which width of reveals is less than that of the other side. Where width of reveals on both faces of wall are equal, deduction of 50% of area of opening on each face shall be made from total area of finish.
  - (c) When only one face of wall is treated and the other face is not treated, full deduction shall be made if the width of reveal on the treated side is less than that on the untreated side, but if the width of the reveal is equal or more than on the untreated side neither deductions nor additions to be made for reveals, jambs, soffits, sills etc.
- 3..4** In case of area of openings exceeding 3 sq. mt. each, deductions shall be made for openings but jambs, soffits, sills shall be measured.
- 3.5.** No deductions shall be made for attachment such as casing, conducts, pipe, electric wiring and the like.
- 3.6.** Corrugated surfaces shall be measured flat as fixed and not girth. The quantities so measured shall be increased by the following percentage and the resultant shall be included with the general areas:
- (a) Corrugated steel sheets..... 14%
  - (b) Corrugated A.C. sheets..... 20%
  - (c) Semi corrugated A.C. Sheets..... 10%
  - (d) Nainital pattern roof (Plain sheeting sheets)..... 10%
  - (e) Naintial pattern roof (with corrugated sheets)..... 25%
- 3.7.** Cornices and other wall features, when they are not picked out in a different finish/colour shall be girthed and included in the general area.
- 3.8** Extra payment shall be done on ceiling and sloping roofs.
- 3.9.** The rate includes cost of ail materials, labours, scaffolding, protective measures etc. involved in all the operations described above. This shall also include conveyance, delivery, handing, unloading, storing work etc.
- 4.0** The rate shall be for a unit of **One sq.** meter.

**Item no 119:-**

**Painting two coats including priming coat on new steel and other metal surfaces with enamel paint brushing interior to give an even shade including cleaning the surface of all dirt, dust and other foreign matter.**

**AS per Above**



**Item No. 70 :- Wall painting (three coats) with plastic emulsion paint of approved brand and manufacture on undecorated wall surface to give an even shade including thoroughly brushing the surface free from mortar droppings and other foreign matter and sand papered smooth including**

**1.0. Materials**

Water shall be conform M-1. The plastic emulsion paint shall conform to I.S.: 5411-1969 (Part-I). Birla or Asian acrylic lappy (putty) and primer shall be of approved brand and manufacture.

**2.0. Workmanship**

The painting work shall be for subsequent coat of plastic emulsion paint of approved brand & manufactures on undecorated ceiling and soffits of slab for all floors to give an even shade as directed.

**The lappy (putty) shall be carried out on ceiling and soffits to give an even shade.**

**2.1. Scaffolding :** Wherever scaffolding is necessary it shall be erected in such a way that as far as possible on part of scaffolding shall rest against the surface to be white or colour washed. A properly secured strong and well tied suspended platform (Zoola) may be used for white washing. Where ladders are used pieces of old gunny bags shall be tied at top and bottom to prevent scratches to the floors and walls. For white washing of ceilings, proper stage scaffolding shall be erected where necessary.

**2.2. Preparation of surface :** 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.

**2.2.1.** 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.

**2.3. Priming coat :**

**2.3.1.** A priming coat of 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. Preparation of Mix :**

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

### **2.4. Application :**

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

**2.4.2.** The paint shall be laid on evenly and smoothly by means of crossing and laying off the crossing and consist of covering the area over with paint, brushing the surface hard for the first time over and then, brushing alternately in opposite direction two or three times and then finally brushing lightly in direction at right angles to the same. In this process, no brush Marks shall be left after the laying off is finished. No hair marks from the brush or clogging of paint puddles in the corners of panels, angles of moldings, etc. shall be left on the work. The full process of crossing and laying off will constitute one coat.

**2.4.3.** The paint shall be applied with brush or rollers. For undecorated surfaces, the surface shall be treated with minimum **two coats** of cement water proofing paint. The second or subsequent coat shall not be started until the proceeding coat as become sufficiently hard to resist marking by brushing being used.

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

### **2.5. Precautions :**

(a) Old brushes if they are to be used with emulsion paints shall be completely dried of turpentine or oil paint by washing in warm soap water. Brushes shall be quickly washed in water immediately after use and kept immersed in water fusing break periods to prevent the paint from hardening on the brush.

(b) In the preparation of **wall surfaces** for plastic emulsion painting, no oil base petals shall be sued in filling cracks, holes etc.

(c) Splashes on floors etc. shall be cleaned out without delay as they will be difficult to remove after hardening.

(d) Washing or surfaces treated with emulsion paint shall not be done within 3 to 4 weeks of application.

**2.6. Protective measures :** The surface of doors, windows, floors, articles, of furniture etc. and such other parts of the building not to be white washed shall be protected from being splashed upon. Such surfaces shall be cleaned of white wash splashed if any.

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

**3.1.** All the work shall be measured in the decimal system as under:

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

(b) Area in individual item shall be worked out to the nearest 0.01 sq.m.

All the work shall be measured in sq.mt. Deductions for jambs, soffits, sills etc. for openings not exceeding 0.5 sq.mt. each in area, for ends of joists, posts, beams, girders, steps etc. not exceeding 0.5 sq.mt. each in area and for openings exceeding 0.5 sq.mt. and not exceeding 3.0. sq.mt. each in area, deductions and additions shall be made as under.

- 3.2.** No deductions shall be made for ends of joists, beams, posts, etc. and openings not exceeding 0.5 sq mt. each. No addition shall be made for reveals, jambs, soffits, sills etc. of these openings not for finish around ends of joints, beams, posts etc.
- 3.3.** No deductions for openings exceeding 0.5 sq.mt. but not exceeding 3 sq.mt. each shall be made as follows and no addition will be made for reveals, jambs, soffits etc. of these openings :
- (a) When both the faces of **wall surfaces** are provided with finish, deduction shall be made for one face only.
- (b) When each face of **wall surface** is provided with different finish, deduction shall be made for that side of frame for door, windows, etc. on which width of reveals is less than that of the other side. Where width of reveals on both faces of wall are equal, deduction of 50% of area of opening on each face shall be made from total area of finish.
- (c) When only one face of wall is treated and the other face is not treated, full deduction shall be made if the width of reveal on the treated side is less than that on the untreated side, but if the width of the reveal is equal or more than on the untreated side neither deductions nor additions to be made for reveals, jambs, soffits, sills etc.
- 3.4** In case of area of openings exceeding 3 sq. mt. each, deductions shall be made for openings but jambs, soffits, sills shall be measured.
- 3.5.** No deductions shall be made for attachment such as casing, conducts, pipe, electric wiring and the like.
- 3.6.** Corrugated surfaces shall be measured flat as fixed and not girth. The quantities so measured shall be increased by the following percentage and the resultant shall be included with the general areas:
- (a) Corrugated steel sheets..... 14%
- (b) Corrugated A.C. sheets..... 20%
- (c) Semi corrugated A.C. Sheets..... 10%
- (d) Nainital pattern roof (Plain sheeting sheets)..... 10%
- (e) Naintial pattern roof (with corrugated sheets)..... 25%
- 3.7.** Cornices and other wall features, when they are not picked out in a different finish/colour shall be girthed and included in the general area.
- 3.8** Extra payment shall be done on ceiling and sloping roofs.
- 3.9.** The rate includes cost of ail materials, labours, scaffolding, protective measures etc. involved in all the operations described above. This shall also include conveyance, delivery, handing, unloading, storing work etc.
- 4.0** The rate shall be for a unit of **One sq.** meter.

**ITEM NO 71**

**Wall painting (three coats) with plastic emulsion paint of approved brand and manufacture on undecorated ceiling surface to give an even shade including thoroughly brushing the surface free from mortar droppings and other foreign matter and sand papered smooth.**

**SAME AS ABOVE.**

**Item No. 73**

**Providing and fixing 90 cm high Stainless steel railing made from anticorrosive S S pipe of 50 mm dia (16Gauge) as hand rail with S S 38 mm dia (16Gauge) as a vertical support fixed in RCC slab at 1.2m c/c including three horizontal S S pipes of 25 mm dia (16Gauge) at equal distance fixed by 18.75 mm dia (16Gauge) S S pipe including accessories as per detailed drawing as directed etc. complete.**

In general the work shall be carried out as per the standard specifications of P.W.D. / C.P.W.D. relevant drawings and as per the instructions of Engineer in Charge. Work shall be carried out as per item description.

The Stainless steel pipe railing 900 mm high shall be made using round S.S. pipe of various diameter of approved quality with S.S. No. 304 consisting 8 % nickel having pipe of 18 gauge including Horizontal and vertical pipe as per detailed drawing. The Vertical pipe (posts) shall be firmly embedded in flooring with concrete to give a proper and tough support. The pipes should be interred connected by stainless steel gas welding. All joints having a smooth finish including required fixtures and fastening of approved quality. The fabrication should be done as per detailed drawing and as per instructions given by E.I.C. including all material and labour required etc. complete.

**Mode of measurement and payment:**

The rate includes cost of all materials, tools, plants and labour involved in satisfactory completion of work

The rate shall be for unit of One **Rmt** as per actual work done.

**Item No. 74 :-** Providing laying and jointing in true line and level 15mm 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) 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 in 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 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 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. 75 :-** 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 cancelled as directed including necessary fittings etc. including testing of pipe and joints and fixing the same with adhesive solvent, including cost of all materials. [B] 25mm dia.

The relevant specifications of **Item No. 74** shall be followed accept for the work of **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 cancelled as directed including necessary fittings etc. including testing of pipe and joints and fixing the same with adhesive solvent, including cost of all materials. [B] 25mm dia..**

**Item No. 76 :-** Providing laying and jointing in true line and level 40mm 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 cancelled as directed including necessary fittings etc. including testing of pipe and joints and fixing the same with adhesive solvent, including cost of all materials.[D] 40 mm.

The relevant specifications of **Item No. 74** shall be followed accept for the work of **Providing laying and jointing in true line and level 40mm 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 cancelled as directed including necessary fittings etc. including testing of pipe and joints and fixing the same with adhesive solvent, including cost of all materials.[D] 40 mm.**

**Item No. 77 :-** Providing laying and jointing in true line and level 50mm 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 cancelled as directed including necessary fittings etc. including testing of pipe and joints and fixing the same with adhesive solvent, including cost of all materials.[E] 50 mm.

The relevant specifications of **Item No. 74** shall be followed accept for the work of **Providing laying and jointing in true line and level 50mm 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 cancelled as directed including necessary fittings etc. including testing of pipe and joints and fixing the same with adhesive solvent, including cost of all materials.[E] 50 mm.**



**Item No. 82 :-** Providing, laying and jointing in true line and level 75 diameter U.P.V.C (Type B) conforming to IS 13592-1992 with one end plain and other end socketed with rubber ring, & fittings conforming to ISI 14735-1999 of approved make for drainage system pipe line, pipe shall be jointed with each other with rubber lubricant, pipe shall be fixed on wall using of PVC clamp of the size 110 mm diameter x 149 mm length x 145 mm height at every 2000 mm center to center or shall be concealed in walls as directed including necessary fittings such as bends, shoes etc. including testing of pipes and joints and jointed with adhesive solvent cement including cost of all materials.

The relevant specifications of **Item No. 74** shall be followed accept for the work of **Providing, laying and jointing in true line and level 75 diameter U.P.V.C (Type B) conforming to IS 13592-1992 with one end plain and other end socketed with rubber ring, & fittings conforming to ISI 14735-1999 of approved make for drainage system pipe line, pipe shall be jointed with each other with rubber lubricant, pipe shall be fixed on wall using of PVC clamp of the size 110 mm diameter x 149 mm length x 145 mm height at every 2000 mm center to center or shall be concealed in walls as directed including necessary fittings such as bends, shoes etc. including testing of pipes and joints and jointed with adhesive solvent cement including cost of all materials.**

**Item No. 84 :-** Providing, laying and jointing in true line and level 110 diameter U.P.V.C (Type B) conforming to IS 13592-1992 with one end plain and other end socketed with rubber ring, & fittings conforming to ISI 14735-1999 of approved make for drainage system pipe line, pipe shall be jointed with each other with rubber lubricant, pipe shall be fixed on wall using of PVC clamp of the size 110 mm diameter x 149 mm length x 145 mm height at every 2000 mm center to center or shall be concealed in walls as directed including necessary fittings such as bends, shoes etc. including testing of pipes and joints and jointed with adhesive solvent cement including cost of all materials.

The relevant specifications of **Item No. 74** shall be followed accept for the work of **Providing, laying and jointing in true line and level 110 diameter U.P.V.C (Type B) conforming to IS 13592-1992 with one end plain and other end socketed with rubber ring, & fittings conforming to ISI 14735-1999 of approved make for drainage system pipe line, pipe shall be jointed with each other with rubber lubricant, pipe shall be fixed on wall using of PVC clamp of the size 110 mm diameter x 149 mm length x 145 mm height at every 2000 mm center to center or shall be concealed in walls as directed including necessary fittings such as bends, shoes etc. including testing of pipes and joints and jointed with adhesive solvent cement including cost of all materials.**

**Item No. 85 :-** Providing, laying and jointing in true line and level 160 diameter U.P.V.C (Type B) conforming to IS 13592-1992 with one end plain and other end socketed with rubber ring, & fittings conforming to ISI 14735-1999 of approved make for drainage system pipe line, pipe shall be jointed with each other with rubber lubricant, pipe shall be fixed on wall using of PVC clamp of the size 160 mm diameter x 210 mm length x 196 mm height at every 2000 mm center to center or shall be concealed in walls as directed including necessary fittings such as bends, shoes etc. including testing of pipes and joints and jointed with adhesive solvent cement including cost of all materials.

The relevant specifications of **Item No. 74** shall be followed accept for the work of **Providing, laying and jointing in true line and level 160 diameter U.P.V.C (Type B) conforming to IS 13592-**

1992 with one end plain and other end socketed with rubber ring, & fittings conforming to ISI 14735-1999 of approved make for drainage system pipe line, pipe shall be jointed with each other with rubber lubricant, pipe shall be fixed on wall using of PVC clamp of the size 160 mm diameter x 210 mm length x 196 mm height at every 2000 mm center to center or shall be concealed in walls as directed including necessary fittings such as bends, shoes etc. including testing of pipes and joints and jointed with adhesive solvent cement including cost of all materials.

**ITEM NO 78**

**Providing and fixing Handle valve of approved brand (B) 25mm dia.,**

**As per description.**

**ITEM NO 79**

**Providing and fixing Handle valve of approved brand (C) 40mm dia.,**

**As per description.**

**ITEM NO 80**

**Providing and fixing Butterfly valve of IS approved brand (C) 50mm dia.,**

**As per description.**

**Item no 81**

Providing and fixing to wall, ceiling and floor galvanised Mild steel tubes (Medium grade) of the following nominal bore, tube fitting and clamps including making good the wall ceiling and floor.(E) 40mm

As per above description.

**ITEM NO 83**

Providing and fixing to wall ceiling and floor 10.0 Kg. F/Cm<sup>2</sup> working pressure poluthene pipes of the following outside Dia. Low density, complete with special flange compression type fittings, wall clipsetc. including making good the wall ceiling and floor.(A) 110mm dia.

AS PER ITEM DESCRIPTION. AND ENGINEER INCHARGE

**Item No. 86 :- Providing and fixing PVC SWR Nahni trap IS 14735 for drain - 100 mm diameter with jali of the following nominal diameter of self cleansing design with C.I. screed down or hinged grating including the cost of cutting and making good the walls.**

**1.0. Materials**

- 1.1.** The PVC SWR Nahni Trap IS 14735 for drain with jali shall conform to M-69. The C.I. hinged or screwed down cover shall be of best quality and approved by Engineer in charge.

**2.0. Workmanship**

- 2.1.** The PVC SWR Nahni Trap with 100 mm. dia. inlet and 50 mm. dia. outlet shall be fixed as per drawing or as directed. 100 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. 87 :- Providing and fixing screw down quarter turn bib taps of following size**  
**(A) Brass chromium plated screw down bib tap (i) 15mm dia.**

**General**

This work shall consist of providing and fixing screw down bib taps of the shape and dimensions shown on the drawings and conforming to these Specifications or as approved by the Engineer in charge.

**1.0 MATERIAL**

**1.0 Bib Cock**

- 1.1.** Bib cock of specified 15 mm diameter nominal bore shall conform to I.S. 781-1977. The Bib Cock shall be best Indian make and quality .
- 1.2** Bib cock shall be polished bright of best quality.
- 1.3** A Bib cock is a draw off tap with a horizontal inlet and free outlet. A stop cock is a valve with a suitable means of connection of insertion in a pipe line for controlling or stopping the flow.
- 1.4** They shall be screw down type and or polished bright and of diameter as specified in the description of the item. They shall conform to I.S 781-1977 and they shall be of best Indian make. They shall be polished bright.
- 1.5** The minimum finished weight of bib cock and stop cock shall be as given below

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

- 1.6.** The Necessary galvanized fittings like Nipple, Casing etc, of best quality and makes as approved by the Engineer-in-charge required for specified dia. bore Bib cock shall be used for fitting Bib cock as necessary .

**2.0. WORKMANSHIP**

**Curing, Laying & Jointing**

- 2.1.** When the Bib cock is to be fitted, the ends shall be carefully filed out so that no obstruction to bore in offered. The Bib cock shall be fitted with pipes carefully in such a manner as will not result in slackness of joints when the two pieces are screwed together
- 2.2** In jointing the Bib cock the inside of the socket and the screwed end of the Bib cock shall be oiled and smeared with the white or red lead and wrapping around with a few turns of fine spun yarn round the screwed end of the Bib cock. The end shall then be tightly screwed in the

socket, Tees etc with a pipe wrench Care shall be taken that all items are free from dust, dirt and rust during fixing Burr from the joints shall be removed after screwing After laying the open ends of the Bib cock shall be temporarily plugged to prevent excess of water soil or any other foreign matter.

**2.3.** 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

### **TESTING OF JOINTS**

After fitting, the Bib cocks shall be inspected under working conditions of pressure and flow. Any joints found liken shall be redone, and all leaking Bib cocks shall be removed and replaced without extra cost.

The Bib cocks after they are fitted shall be tested to hydraulic pressure of 6 kg / sq. cm. The Bib cock shall be slowly and carefully charged with water allowing all air to escape and avoiding all shock and water hammer. The draw off takes and stop cock shall then be closed and specified hydraulic pressure shall be applied gradually. The Bib cocks shall be tested in sections as the work laying proceeds, veeping the joints exposed for inspection during the testing.

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

**3.1.** The unit rate of Bib cock shall include the cost of all materials, tools and plant required for fitting, the same to specified position as per drawings, and as directed by Engineer in charge finishing structure, etc. and all other incidental expenses for producing Bib cock work to complete the structure or its components as shown on the drawings, and as directed by Engineer in charge 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 bib cocks shall include the cost of all labour, materials, G. I. fittings as required, tools and plant scaffolding and all incidental expenses as described herein above including testing.

**3.2.** The Bib cock shall be measured for its Number, limiting dimensions to those specified on plan or as directed. The rate shall be for a unit of one Number.

**3.3.** The payment will be made on number basis of the finished work.



**Item No. 88 :- Providing and fixing CP brass Quarter turn pillar tap, capstan head screw down high pressure with screw, shanks and back ndts (A) 15 mm dia Long pipe}**

**1.0. Materials :** The C.P. brass capstan head, pillar tap 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 capstan head pillar tap of specified dia. shall be fixed as directed with required washers of selected leather or rubber asbestos composition or of plastic as directed. The cock shall fixed with pipe line white zink end spun yarn, to make joint water tight. The work shall be carried out in best workman like manner.

**3.0. Mode of measurements and payment**

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

**Item No. 89 :-** Providing and fixing wash basin with pedestal of std. Height with single hole for pillar tap with C.I or M.S brackets painted white including cutting cutting holes and making good the same including C.P. brass waste and waste pipes and bottal trap (A) Vitreous China: (ii) Flat Back washbasin 550 mm x 400mm size.In colour.

**1.0. Materials**

- 1.1. The Vitreous China flat back 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.P. brass trap and union shall be connected to 40mm. 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, C.P. brass 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 40mm dia. C.P. brass waste, 32mm dia. M.I. fisher union, 15 mm brass screw down stop cock, 15mm pillar cock with all labour, materials, tools and plant etc. required for satisfactory completion of this item as specified in workmanship.
- 3.2. The rate shall be for a unit of one number.

**Item No. 90 :-** Provision and fixing water closet squatting orissa type W.C. pan size 580mm integral footrest and 100mm p or s trap and including 25mm dia. C.P. brass flush valve and G.I. inlet connection etc. complet (A) Viterous china long pattern white or colour

**1.0. Materials**

Wash down water closet (**squatting orissa type European type water closet**) 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 with soil pipe in cement mortar 1:1 (1 cement : 1-fine sand) including seal and plastic seat and cover with C.P. brass hinges and rubber buffers. (A) vitreous china pattern (i) in white colour **as directed**.

**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 including testing.
- 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.

**Item No. 91 :-** Pro. & Fix.wash down water closet (European 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 value siphon, 15 mm. 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 cm 1:1 (a) Viterous china in white or colour

**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 with soil pipe in cement mortar 1:1 (1 cement : 1-fine sand) including seal and plastic seat and cover with C.P. brass hinges and rubber buffers. (A) vitreous china pattern (i) in white colour as directed.

**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 including testing.
- 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.

## **ITEM NO 92**

Providing and fixing Special Needs Range CRUSE SET, EWC, 710 x 370 x 810 mm, New Cat No: S1021113 S Trap, S1021114 P Trap, S1060106 Cistern, B1520118 Soft Close Seat Cover, B1810112 Twin Flush Fittings, S2040101 Wash Basin 510 x 400 mm, F9030451 Spatula Lever basin mixer, B2210106 Wall mounted Grab bar 600 mm long, B2210106 Wall mounted Grab bar 600mm long, B2210108 Wall mounted Hinged rail 750 x 750 {Cera or equivalent} as directed by Architect Office {SUGAMYA BHARAT Instruction}

AS PER ABOVE DESCRIPTION.

**Item No. 119 :- Providing and fixing Urinal of approved quality including connection with trap and with integral longitudinal flush pipe. (A) Squatting plate pattern white earthenware 550mm x 300mm.**

**1.0. Materials :**

The squatting plate pattern, white glazed earthenware urinal of 550 mm x 300 mm shall conform to I.S. 771-1063. It shall be test India make.

**2.0. Workmanship**

**2.1.** The squatting plate urinal shall be fixed as directed.

**2.2.** The top edge of the squatting plate shall be flush with the finished floor level adjacent to it. It shall be embedded on a layer of 25 mm. thick cement mortar 1:8 (1 cement: 8 fine sand) laid over a bed of burnt brickbat cement 1:5:10 (1 cement: 5 fine sand, 10 graded brick aggregate 20 mm. nominal size). There shall be 100 mm. dia. glazed earthenware or vitreous china channel as specified with stop and outlet pieces suitably fixed in floor in cement mortar 1:3 (1 cement: 3 coarse sand) and joint finished with white cement. The earthenware vitreous china shall discharge into 65 mm. C.P. brass outlet grating. The trap and fitting shall be fixed as directed.

**3.0. Mode of measurements and payment**

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

**3.2.** The rate shall be for a unit of each.

**Item No. 94 :-** Providing and laying Both side mirror polished Granite marble stone slab 18 mm (Average) thick of approved quality moulded round front edge fixed in wall for partition and jointed with grey cement slurry including rubbing and polishing complete

**MATERIALS :**

Water shall confirm to M-1. Cement shall confirm to M-3. Sand shall confirm to M-6, burnt brick shall confirm to M-15. Polished marble stone shall confirm to M-49. Rough marble stone shall confirm to M-48. Granite shall to M-52.

**Workmanship :**

**Item** comprises of 25 mm thick polished marble stone and mirror polished stone of approved quality.

The sand witch type counter shall be erected with 2 Nos. on three places of polished 25 mm thick marble stone with a height of 75 cm. and 0.75 width and with horizontal shelves of 60 cm x 75 cm. making groove of at least 50 mm in existing wall and vertical polished marble stone shall be inserted on to the groove and 60 cm. shall be clear from the wall surface shall be visible. The height of polished marble shall be 80 cm. from the floor surface. Each stone shall be erected at a distance of at least 25 mm. and shall be filled it with cement mortar of 1:3 (1: cement, 3 : coarse sand). The rough Marble stone shall be laid horizontally over the vertical post. The bedding of cement mortar of 1:3 (1: cement, 3 : coarse sand) shall be laid on top of at least 25 mm in thickness. After laying of bedding the 18 mm thick polished stone shall be laid in line and level so as to drain of the water easily on to the kitchen sink. The space for the sink shall be cut to the size of sink with the help of cutting machine. The edges of the Kitchen platform shall be covered with 10 cm. thick strip and shall be fixed with glue i.e. by epoxy type materials i.e. resin and hardener (Araldite type materials) and kept the same for curing up to 12 hours. The edges of the vertical strip shall be made half round by grinding machine and the grinded surface shall be polished as good as top surface. The rough / polished marbleh stone and granite stone shall be of approved quality as per the instruction of Engineer-in-charge.

The measurements and payment shall be made on **Square meter** basis.

**Item No. 95 :-     Providing erecting and fixing double coated PVC. (ISI) water tank of required capacity each with all necessary fittings and connection etc. complete on terrace.**

## **General**

This work shall consist of furnishing and placing providing and fixing double coated I.S.I. mark PVC water tank with necessary G.I. fittings of the shape and dimensions shown on the drawings and conforming to these specifications or as approved by the Engineer in charge.

### **1.0 MATERIAL**

#### **1.1 PVC WATER TANK**

PVC Water tank of specified capacity and of I.S.I. mark of approved in liters of approved make and quality equivalent to syntax product.

Net capacity shall be net volume of water stored between the lowest level of overflow and lowest specified level.

#### **1.2 NIPPLE**

Galvanize pipe nipple shall be of approved make and of best quality. Relevant specification given in Booklet of Building specification shall be applied for the execution of this item.

#### **1.3 BALL VALVE**

Ball valve shall be of approved make and of best quality. Relevant specification given in Booklet of Building specification shall be applied for the execution of this item.

#### **1.4 CONNECTIONS**

Connection shall be of approved make and of best quality. Relevant specification given in Booklet of Building specification shall be applied for the execution of this item.



## 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. 96 :- Providing and fixing 600mm x 450mm bevelled edge mirror of superior glass mounted on 6mm thick A.C. sheet or plywood sheet and fixing to wooden pluge with C.P. brass screws and washers.**

**1.0. Materials**

**1.1.** The 600 mm. x 450 mm. size mirror shall be of superior glass with edge rounded offer beveled as specified. It shall be free from flaws specks, or bubbles and its thickness shall not be less than 6 mm. The glass for the mirror shall be uniformly silver plated at the back and shall be free from silvering defects Silvering shall have a protective uniform covering of red lead paint. The 6 mm thick ply wood shall conform to M-37. The 6 mm. thick A.C. sheets shall conform to M-24. **The 6 mm. thickness of glass shall conform to M-38.**

**2.0. Workmanship**

**2.1.** The mirror of 600 mm. x 450 mm. size mounted on A.C. Sheet or plywood sheet 6 mm thick with C.P. brass clips shall be fixed as directed, by fixing wooden plugs in wall and C.P. brass screws and washers including fixing C.P. brass bracket support and guard rail fixed to wooden plugs with C.P. brass screws. The work shall be carried out in best workman like manner.

**3.0. Mode of measurements & payment**

**3.1.** The rate includes cost of all labour and materials, tools and plant etc. required for satisfactory completion of this item.

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

**Item No. 97 :- Providing and fixing C.P. brass towel rail complete with C.P. brass brackets fixed to wooden plugs with C.P. brass screws.(B) 600mm x 20mm size.**

**1.0. Materials**

- 1.1.** The C.P. brass towel rail shall be 600 mm x 20 mm. of best quality as approved by the Engineer-in-charge. The brackets shall be of C.P. brass. The rail shall conform to I.S. 1068-1958.

**2.0. Workmanship**

- 2.1.** The brackets of the towel rail shall be fixed by means of C.P. brass screws to wooden firmly embedded in the wall with C.M. 1:3 (1 cement : 3 coarse sand). The towel rail shall be fixed as and where directed. All necessary testing should be carried out.

**3.0. Mode of measurements and payment**

- 3.1.** The rate includes cost of all labour and materials, tools and plant etc. required for satisfactory completion of this item.
- 3.2.** The rate shall be for a unit of One number

**Item No. 98 :- Providing and fixing S.W. gully 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 of 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. Gully trap of 100 mm. x 100 mm. size shall conform to M-70.
- 2.0. Workmanship**
- 2.1.** Excavation for gully 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 No. 1** of earth work.
- 2.2. Fixing:**
- 2.2.1.** The gully 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 as under.
- 2.2. Laying:**
- 2.2.1.** The pipes shall be laid accurately and perfectly true to line, levels and gradients, Great care shall be taken to prevent sand etc. from entering the pipes. The pipes between two manholes shall be laid truly in a straight line without vertical or horizontal undulation. All junctions and changes in direction and diameter shall be made inside manholes by means of curved tapered channels formed in Cement concrete finished smooth and benched on both sides. The body of the pipe shall rest for its entire length, on a even level bed grips being made or left on the bed to receive the sockets of the pipes.
- 2.3. Jointing:**
- 2.3.1.** Tarred gask in or yarn soaked in neat cement slurry shall first be placed around the spigot to each pipe and the spigot shall then be placed well home into the socket of the pipe previously laid. The pipe shall then be adjusted and fixed in the correct position and gaskin caulked home so as to fill not more than 1/4th of the total depth or (13 mm. in depth) of the socket.
- 2.3.2.** The remainder of the sockets shall be filled with stiff mixture of cement mortar in proportion of one part of cement and one part of sharp sand. When the socket is fillet, a filled shall be formed round the joints with a trowel, forming an angle of 45° with the barrel of the pipe.
- 2.3.3.** The mortar shall be mixed as necessary for immediate use.
- 2.3.4.** After the joint is made, any extraneous materials shall be removed from the inside of the joints with a suitable scraper or "badger". The newly made joints shall be protected, until set, from the sun, dry winds, rain or frost, sacking or other suitable materials which shall be used for the purpose.

**2.3.5.** The mortar shall be cured for 10 days.

**2.4. Testing of Joints:**

**2.4.1.** If any leakage is visible the defective part of the work shall be made good at no extra cost. The pipe line shall be tested as directed.

**2.4.2.** A slight amount of sweating which is uniform may be overlooked, but excessive sweating from a particular pipe or joints shall be watched for and taken as indicating a defect to be made good.

**3.0. Brick masonry chamber :** After fixing and testing gulley and branch drain, a brick masonry 300 x 300 mm. inside with bricks in CM 1:5 (1 cement : 5 sand) shall be built with a 100 mm. brick work round off 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.

**3.1.** 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 cement : 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.

**4.0. Mode of measurements & payment**

**4.1.** The rate includes cost of all labour, materials, tools and plant etc. required for satisfactory completion of this item as described above.

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

**Item No. 99 :- Providing and fixing CP brass screw down stop cock of approved quality 15mm size with adjustable wall flange..**

**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. 100 :-** 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> in C.M. 1:5 C.I. cover with frame (Light duty) 455mm x 610mm internal dimensions, total weight of cover with frame to be not less than 38Kg. (Wt. of cover 23 Kg.) and Wt. of frame 15Kg. ) (R.C.C. top slab with 1:2:4 mix (1-cement :2- coarse sand :4-graded stone aggregate 20mm size) foundation concrete 1:5:10 inside plaster 15mm thick with cement mortar 1:3 finished smooth with a floating coat of neat cement on walls and bed concrete etc. complete.(i) 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. Wetting of bricks:**

**2.4.1.** 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.

**2.5. Laying:**

**2.5.1.** 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.

**2.5.2.** 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.

**2.5.3.** 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.

**2.5.4.** 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.

**2.5.5.** 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.

- 2.5.6.** 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

**2.6. Joints:**

- 2.6.1.** 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.

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

**2.7. Curing:**

- 2.7.1.** 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.

**2.8. Preparation of foundation bed:**

- 2.8.1.** 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.

- 2.9.** 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.

- 2.10.** The gully grating cover shall be hinged to frame to facilitate its opening for cleaning and repairs. The frames of the gully grating g shall be fixed on the top of masonry wall of the chamber in 15 cms. thick C.C. 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm. nominal size) laid over the full thickness of walls..

- 2.11.** 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.

- 2.12.** The cover slab of R.C.C. 1:2:4 (1 cement: 2 coarse sand: 4 graded stone aggregate 20 mm. nominal size) 15 cms. thick reinforced with 10 mm. bars at 15 cms. C/C both ways, surface and edges finished fair. Full bearing equal to the width to the width of wall shall be given to the slab on all sides. The frame of manhole cover shall be embedded firmly in R.C.C. slab so that the top of the frame remains flush with the top of R.C.C. slab.

**2.13. Testing:**

- 2.13.1** Manhole shall be tested by filling with water to a depth not exceeding 1.2 M. as directed.

- 2.13.2** After completion of work, manhole cover shall be sealed by means of thick grease.



**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. 101 :-** 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> in C.M. 1:5 C.I. cover with frame (Light duty) 455mm x 610mm internal dimensions total weight of cover with frame to be not less than 38Kg. (Wt. of cover 23 Kg.) and Wt. of frame 15Kg. ) (R.C.C. top slab with 1:2:4 mix (1-cement :2- coarse sand :4-graded stone aggregate 20mm size) foundation concrete 1:5:10 inside plaster 15mm thick with cement mortar 1:3 finished smooth with a floating coat of neat cement on walls and bed concrete etc. complete.(ii) Inside dimensions 500mm x 700 mm and 450mm deep for pipe line with one or two inlets.

As per above Item No. 100 for 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> in C.M. 1:5 C.I. cover with frame (Light duty) 455mm x 610mm internal dimensions total weight of cover with frame to be not less than 38Kg. (Wt. of cover 23 Kg.) and Wt. of frame 15Kg. ) (R.C.C. top slab with 1:2:4 mix (1-cement :2- coarse sand :4-graded stone aggregate 20mm size) foundation concrete 1:5:10 inside plaster 15mm thick with cement mortar 1:3 finished smooth with a floating coat of neat cement on walls and bed concrete etc. complete.(ii) Inside dimensions 500mm x 700 mm and 450mm deep for pipe line with one or two inlets.

The payment shall be made on **No.** basis.

**Item No. 102 :-** 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> in C.M. 1:5 C.I. cover with frame (Light duty) 455mm x 610mm internal dimensions total weight of cover with frame to be not less than 38Kg. (Wt. of cover 23 Kg.) and Wt. of frame 15Kg. ) (R.C.C. top slab with 1:2:4 mix (1-cement :2- coarse sand :4-graded stone aggregate 20mm size) foundation concrete 1:5:10 inside plaster 15mm thick with cement mortar 1:3 finished smooth with a floating coat of neat cement on walls and bed concrete etc. complete.(iii) Inside dimensions 600mm x 850mm and 450mm deep for pipe lines with three or more inlets

As per above **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> in C.M. 1:5 C.I. cover with frame (Light duty) 455mm x 610mm internal dimensions total weight of cover with frame to be not less than 38Kg. (Wt. of cover 23 Kg.) and Wt. of frame 15Kg. ) (R.C.C. top slab with 1:2:4 mix (1-cement :2- coarse sand :4-graded stone aggregate 20mm size) foundation concrete 1:5:10 inside plaster 15mm thick with cement mortar 1:3 finished smooth with a floating coat of neat cement on walls and bed concrete etc. complete.(iii) Inside dimensions 600mm x 850mm and 450mm deep for pipe lines with three or more inlets**

The payment shall be made on **No.** basis.

**ITEM NO 103:**

**Providing and filling screened of burnt coal cinder including and consoliation etc. complete.**

As per item description. And Engineer in charge.

**Item No. 104 :- Finishing wall with weather proof exterior emulsion paint on wall surface (two coats) to give an required shape even shade after thoroughly brushing the surface to remove all dirt, and remains of loose powdered materials.etc complete**

**General**

This work shall consist of painting the walls with weather proof exterior emulsion paint on 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 Emulsion Paint**

Exterior emulsion paint shall be of specified colour as approved by Engineer in charge the ready mixed exterior 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 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 emulsion paint shall show no curdling, livering cracking or colour separation and shall be free from lumps and skins.
2. The exterior emulsion paint as received shall brush easily possess good leveling properties and show no running or sagging tendencies.
3. The exterior emulsion paint shall not skin within 48 hours in a three quarters filled closed container
4. The exterior emulsion paint shall dry to a smooth uniform finish free from roughness grit unevenness and other imperfections
5. Ready mix exterior 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 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 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 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 exterior emulsion paint 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 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 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. 122 :-** Distempeing (Three coats) 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 priming coat with alkali resistance primer of approved brand after thoroughly brushing the surface and other foreign matter and also including preparing the surface even and sand parpered smooth.

**As per above description and applying as per site incharge.**

**Item No. 142 :-** Painting two coats (including priming coat) on new steel and other metal surface with enamel paint, brushing interior to give an even shade including cleaning surface of all dirt, dust and other foreing matter.

**As per above description and applying as per site incharge.**

**Item No. 105 :- Providing throating or plaster drip and moulding to R.C.C. chhajja.**

**1.0. Materials**

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

**2.0. Workmanship**

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

**3.0 Mode of Measurement & Payment :**

- 3.1.** The payment will be made on running meter basis of the finished work.
- 3.2.** All necessary labour, materials equipment etc. shall be provided by the Contractor.
- 3.3** The unit rate plaster drip molding shall include the cost of all materials, tools and plant required for molding and finishing as per direction of the Engineer-in-charge, curing and all other incidental expenses for producing plaster drip molding of specified size to complete the item 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.
- 3.4** The throating or plaster drip shall be measured for its length, limiting dimensions to those specified on plan or as directed.
- 3.5** The rate shall be for a unit of one running meter.

**Item No. 106 :- Providing 12mm wide groove throating / notch in plaster including finishing the same etc. complete for all height.**

AS PER ABOVE ITEM

**Item No. 107 :- Constructing Sandwich Platform of 18 mm thick Polished Black Granite at top and 25 mm thick Kota stone slab using cement mortar 1:3 for sandwich and fitting at bottom & edges with waterproof rigid adhesives including macking necessary grooves in walls with Vertical Kotastone 30 mm x 2 No sandwich thick every 60 cm centre to centre including all labour material of approved quality incl. full moulded round front edge fixed in wall for partition and jointed with grey cement slurry including rubbing and polishing etc. complete**

### **MATERIALS**

Water shall conform To M-1

Cement shall conform To M-3

Rough kotah stone shall conform to M-48

Polished kotah stone shall conform to M-49

Granite stone slab shall conform to M-52

### **WORKMANSHIP**

The sandwich type cooking plate form of size as directed shall be constructed in 45/60/75 cm width and 75 cm high using 25mm thick polished kotah stone as vertical on side and bottom using 25 mm thick

The top and exposed sides of R.C.C. slab shall be finished with Granite stone 25 mm thick of minimum 90cm length ( Except one stone) flooring and skirting. The work of flooring and dado shall be carried out as per relevant specification of Item no. 14.4(A) P. 78 And Item no. 14.4(B)

The whole work shall be finished with cement mortar in C.M. 1:4

### **Mode of payment**

The rate includes cost of all labour , materials etc. required for satisfactory completion of this item as described above.

The rate shall be for a unit of one running meter basis.

**Item No. 108 :- Providing and fixing in position 300mm high , 150mm wide english letter made from 1.0mm thick stainless steel sheet as directed by engineer in charge with all necessary tolls & plants etc. complete.**

The item covers the supplying and fixing of English Alphabet letters of 300 mm high and 150 mm width having stainless steel sheet thickness 1 mm. as directed by Engineer in charge.

The letters shall be fixed as and where directed by Engineer in Charge.

The payment shall be made on **No.** basis of letters supplied and fixed.

**Item No. 109 :- Providing and fixing in position 150mm high , English letter made from 1.0mm thick stainless steel sheet as directed by engineer in charge with all necessary tolls & plants etc. complete.**

The item covers the supplying and fixing of English Alphabet letters of 150 mm high and 150 mm width having stainless steel sheet thickness 1 mm. as directed by Engineer in charge.

The letters shall be fixed as and where directed by Engineer in Charge.

The payment shall be made on **No.** basis of letters supplied and fixed.



**ITEM NO 110**

**Providing water proofing agent for RCC ( Perma - plast SL for M-25 Concrete) as per Approved quality of ASTM C494 conforming IS 9103-2007 & 2645-2003.**

As per description and applying as per site in charge.

**ITEM NO 111**

**Providing water proofing agent for Plastering ( Perma Grout - 500) ( Only Wall Qty.**

As per description and applying as per site in charge.

**ITEM NO 112**

**Providing perma bitu coat for foundation ( Water proofing agent as well as antitermite treatment for footing and columns,**

As per description and applying as per site in charge.

**Item No. 113**

**Providing & laying cement concrete 1:4:8 (1 Cement : 4 Coarse sand : graded B.T. stone aggregate 40mm nominal size) Curing comp. including cost of form work in foundation and plinth**

Providing and laying ordinary cement concrete 1 : 4 : 8 for foundation including cost of formwork if required using cement, sand and machine crushed stone aggregates of 40mm nominal size.

1. In no case of ordinary cement concrete mix is not required to be designed by preliminary tests and proportions of cement, fine aggregates and coarse aggregates are specified by volume as given in item,
2. The ordinary cement concrete mix shall general be specified by volume for cement which normally cement in bags and is available by weight, volume shall be worked out taking 50 Kg. cement as 0.035 Cu.M. in volume. While measuring aggregate by volume, shaking ramming or hammering shall not be done. Proportioning of sand shall be as per its dry volume incase it is damp allowance for bulking shall be made as IS : 2386 {Part III}
3. Ingredient required for ordinary cement concrete containing one 5 Kg. bag of cement for different proportions of mix shall be as given the table below.

Grade of Concrete	Sand in Cu.M.	Aggregates in Cu.M.
1	2	3
1:4:8	0.135	0.27
1:5:10	0.165	0.33

**4. Cement :-**

Cement shall be ordinary Portland stab cement as per IS 1975 properties of cement as per IS 455 1976.

**5. Sand**

- 5.1 Sand shall be natural sand, clean well graded, hard strong, durable and gritty particularly free from immures amounts of dust, clay, kankar modules, soft or flaky particles shell, alkali slats, organic matter, lean mica or other deleterious substances and shall be got approved from the Engineer in charge. The sand shall not contain more than 8 percent of silt as determined by field test, if necessary the sand.

**5.2 Coarse sand :-**

The fineness modules of coarse sand shall not be less than 2.5 and shall not exceeds 3.0. The sieve analysis of coarse sand be as under.

I..S. Sieve Designation	% by weight passing
-------------------------	---------------------

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

### 5.3 Fine sand :-

The fineness module shall not exceeds 1.0 to sieve analysis of fine sand be as under :-

I..S. Sieve Designation	% by weight passing
4.75 mm	100
2.36 mm	100
1.18 mm	75 to 100
600 MC	40 to 85
300 MC	0 to 50
150 MC	00 to 10

### 6.0 Stone coarse aggregates for nominal mix concrete :-

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

The aggregates shall be generally be cubical in shape unless special stones of particular quarries are mentioned aggregated shall be machine crushed from the best black trap of equivalent hand done as approved. Aggregates shall have no deleterious reaction with cement. The size of the coarse aggregates for plain concrete and ordinary reinforced cement. The concrete shall generally be as per the table given below, if however in case of reinforced cement concrete the minimum limit may be restricted to unless that the minimum lateral clean distance between bars or 6mm less that the cover whatever is smaller.

I..S. Sieve Designation	Percentage passing for single sized aggregates of nominal size		
	40 mm	20 mm	16 mm
80 mm	--	--	--

63 mm	100	--	--
40 mm	85-100	100	0
20 mm	0-20	85-100	100
16 mm	--	--	85-100

I..S. Sieve Designation	Percentage passing for single sized aggregates of nominal size		
	40 mm	20 mm	16 mm
12.5 mm	--	--	--
10 mm	0.50	0.20	0.30
4.75 mm	--	0.50	0.50
2.35 mm	--	--	

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

The grading test shall be taken in the beginning and at the change of source of material. The necessary test indicates in IS 383-1970 and IS 456-1976 shall have to carried out to ensure the acceptability. Aggregates shall be stored separately and handled win such a manner as to prevent to the intermixing of different aggregate. If the aggregates are covered with dust, they shall be washed with water to make then clean.

7. All materials shall be stored as to prevent their deterioration or destruction of their quality and fitness for the work. Any material which has deteriorated or has been damaged or is otherwise considered defective by the Engineer in charge shall not be used in the works.
8. Cement shall be stored above the ground level in perfectly dry and watertight sheds and shall be stocked not more than eight bags high. Cement more than 3 to 4 months old shall invariably be tested to ascertain that the acceptability requirements. The aggregates shall be stored in such a way as to prevent admixture of foreign materials different sizes of the fore or coarse aggregates shall be stored in separate stock piles sufficiently removed from each other to prevent into mixing the materials at the edge of the piles.
9. The water for mixing shall be potable water to satisfaction of the Engineer in charge. The quality of water shall be just sufficient to produce a dense concrete of required workability for the job.
10. **Material :**  
Before starting concreting the road of foundation trenches shall be cleared \of all loose materials leveled, watered and rammed as directed.

**11. Mixing:-**

The concrete shall be mixed in a mechanical mixer. If quantity of cement concrete is very small after taking prior permission of Engineer in charge. Mixing shall be done on a smooth water tight platform large enough to allow efficient turning over of the ingredients of concrete before and after adding water. Mixing platform shall be so arranged that no foreign material shall be mixed with concrete nor does the mixing water flow out. Cement in required numbers of bags shall be placed in a uniform layer on top of the measured quantity of fine and coarse aggregates, which shall also be spread in a layer of uniform thickness on the mixing platform. Dry coarse and fine aggregates and cement shall then be mixed thoroughly by turning over to get a mixture of uniform colour, enough water shall then be gradually added thoroughly by and the mass turned over till a mix of required consistency is obtained. In hand mixing quantity of cement shall be increased by 10 percent above that specified.

12. For mass concrete work, the concrete shall be mixed in mechanical mixer. The method of transporting and placing concrete shall be approved by the Engineer in charge. Concrete shall be so transported and placed that no contamination, segregation or loss of its constituent material take place. All formwork and reinforcement contained in it shall be cleared and made free from standing water, dust, snow or ice immediately before placing of concrete. No concrete shall be placed in any part of the structure until the approval of the Engineer in charge has been obtained. 13. Unless otherwise agreed to by the Engineer in charge concrete shall not be dropped into place from a height exceeding 2 meter. When trenching or chutes are used they shall be kept clean and used in such a way as to avoid segregation. When concrete has to be resumed on a surface which has hardened, it shall be roughening, swept, clean, thoroughly wetted, and covered with a 13mm thick layer of mortar composed cement and sand in the same ratio as in the concrete mix itself. This 13mm layer of mortar shall be freshly mixed and placed immediately before placing on new concrete. Where concrete has not fully hardened all balance shall be removed by scrubbing the wet surface with wire or bristle brushes, care should be taken to avoid dislodgement of any particles of coarse aggregates. The surface shall then be thoroughly wetted, all free water removed, and the coated with neat cement grout. The first layer of concrete to be placed on this surface shall not exceed 150mm in thickness and shall be well rammed against old work particular attention being given to corners and close spots.

**14. Formwork if required.**

Form work shall include all temporary or permanent forms required for forming the concrete. Together with all temporary construction required for their support. Forms for concrete shall be constructed of metal or timber suitably line and be of substantial and rigid construction true to shape and dimensions shown on the drawings. Where metal forms are used, all bolts and rivets shall be countersunk and well ground to provide a smooth and plane surface. Where timber is used it shall be well seasoned. For exposed concrete

faces, timbers for shuttering shall be wrought on all faces in contractor with concrete.

15. The Engineer in charge shall be informed in advance by the contractor of his intention to strike any formwork. While fixing the time for removal of formwork due consideration shall be given to local conditions, character or the structure. The weather and other conditions that influence the setting of concrete and of the materials used in the mix. Vertical forms of beams, columns and walls maybe removed after 2 days. All formwork shall be removed without causing any damage to the concrete.
16. The payment shall be made on **Cu.M.** basis for the finished work.
17. The unit rate of concrete shall include the cost of all labour tools and plant required for mixing, placing in position, compacting, finishing as per directions of the Engineer in charge, curing and all other incidentals 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 centers and forms required for the work.

#### Item No. 114

**Providing and laying controlled cement concrete M-250 and curing complete including the cost of form work but excluding the cost of reinforcement concrete work in Foundation footing bases of column.**

#### 1. . DESCRIPTION

The work shall consist of producing, transporting, placing and compacting of structural concrete including fixing formwork and temporary works etc. and incidental construction in accordance with these Specifications and in conformity with the lines, grades and dimensions, as shown on the drawings or as directed by the Engineer.

#### 1703 GRADES OF CONCRETE

1703.1 The grades of concrete shall be designated by the characteristic strength as given in Table 1700-1, where the characteristic strength is defined as the strength of concrete below which not more than 5 percent of the test results are expected to fall.

Table 1700-1: Grades of Concrete

Type of Concrete / Grade Designation			Characteristic Strength in MPa
Nominal Mix Concrete	Standard Concrete	High Performance Concrete	
M15	M15		15

M20	M20		20
	M25		25
	M30	M30	30
	M40	M35	35
	M45	M40	40
	M50	M45	45
		M50	50
		M55	55
		M60	60
		M65	65
		M70	70
		M75	75
		M80	80
		M85	85
		M90	90

1. Normal Mix Concrete is made on the basis of nominal mix proportioned by weight of its main ingredients - cement, coarse and fine aggregates and water.
2. Standard concrete is made on the basis of design mix proportioned by weight of its ingredients, which in addition to cement, aggregates and water, may contain chemical admixtures to achieve certain target values of various properties in fresh condition, achievement of which is monitored and controlled during production by suitable tests. Generally concrete of grades up to M50 are included in this type.
3. High Performance Concrete is similar to standard concrete but contains additional one or more mineral admixtures providing binding characteristics and partly acting as inert filler material which increases its strength, reduces its porosity and modifies its other properties in fresh as well as hardened condition. Concrete of grades upto M90 are included in this type.
4. For concrete of grades higher than M90, the design parameters may be obtained from specialized literature and experimental results.

**1703.2** The minimum grades of concrete and corresponding minimum cement content and maximum water/cement ratios for different exposure conditions shall be as indicated in Table 1700-2.

**1703.3** For concrete subjected to sulphate attack the minimum grades of concrete, minimum cement content and maximum water/cement ratios and types of cement for different concentration of sulphate content shall be as indicated in Table 1700-3.

**Table 1700-2: Requirement of Concrete for Different Exposure Condition using 20 mm Aggregate**

Exposure Condition	Maximum Water	Minimum Cement	Minimum Grade of Concrete
--------------------	---------------	----------------	---------------------------

	Cement Ratio	Content, kg/m <sup>3</sup>	
Moderate	0.45	340	M25
Severe	0.45	360	M30
Very Severe	0.40	380	M40

**Note:**

- All three provisions given in the above table for a particular exposure condition, shall be satisfied.
- The term cement for maximum w/c ratio and minimum cement content shown in Table includes all cementitious materials mentioned in Clause 1715.2. The maximum limit of fly ash and ground granulated blast furnace slag in the blended cement shall be as specified in 18:1489 (Part 1) and 18:455 respectively.
- For plain cement concrete, with or without surface reinforcement, the minimum grade of concrete can be lowered by 5 MPa and maximum water/cement ratio exceeded by 0.05.

Cement content shown in the above table shall be increased by 40 kg/m<sup>3</sup> for use of 12.50 mm nominal size aggregates and decreased by 30 kg/m<sup>3</sup> for use of 40 mm nominal size aggregates.

**Table 1700-3: Requirement of Concrete Exposed to Sulphate Attack**

Class	Concentration of Sulphates as SO <sub>3</sub>			Type of Cement (Note ii)	Minimum Cement Contact kg/m <sup>3</sup>	Maximum Water/ Cement Ratio	Minimum Grade of Concrete
	In Soil		In Ground Water, g/l				
	Total SO <sub>3</sub> %	SO <sub>3</sub> in 2:1 Water: Soil Extract, g/l					
1	Traces	<1.0	<0.3	-OPC, PPC or PSC	280	0.5	M25
2	2.0 to 0.5	1.0 to 1.9	0.3 to 1.2	-OPC, PPC or PSC -SRPC	330	0.5	M25
3	0.5 to 1.0	1.9 to 3.1	1.2 to 2.5	-SRPC, -PPC or PSC	330 350	0.5 0.45	M25 M30
4	1.0 to 2.0	3.1 to 5.0	2.5 to 5.0	-SRPC	370	0.45	M35
5	>2.0	>5.0	>5.0	-SRPC with protective coating	400	0.4	M40



**Note:** If the requirements of maximum water/cement ratio, minimum grade of concrete and minimum cement content from other durability considerations as given in Table 1700-2 are more stringent than those given in this table, then the former will govern.

**OPC :** Ordinary Portland Cement, **PPC:** Portland Pozzolona Cement. **PSC:** Portland Slag Cement, **SRPC:** Sulphate Resisting Portland cement.

The minimum cement content shall be as low as possible but not less than the quantities specified in Table 1700-2 and 1700-3.

The maximum cement content excluding any mineral admixtures (Portland cement component alone) shall not exceed 450 kg/cu.m.

**1703.4** Concrete used in any component or structure shall be specified by designation along with prescribed method of design of mix i.e. 'Design Mix' or 'Nominal Mix'. For all items of concrete, only design mix shall be used, except where nominal mix concrete is permitted as per drawing or by the Engineer. Nominal mix may be permitted only for minor bridges and culverts or other incidental construction, where strength requirements are up to M 20 only. Nominal mix may also be permitted for non-structural concrete or for screed below open foundations.

**1703.5** If the Contractor so proposes, the Engineer may permit the use of concrete of higher grade than that specified on the drawing, provided the higher grade concrete meets the specifications applicable. The additional cost of such higher grade concrete shall be borne by the Contractor.

## 1704 PROPORTIONING OF CONCRETE

Prior to the start of construction, the Contractor shall design the mix in case of design mix concrete or propose nominal mix in case of nominal mix concrete, and submit to the Engineer for approval, the proportions of materials, including admixtures to be used. Water-reducing admixtures (including plasticisers or super-plasticisers) may be used at the Contractor's option, subject to the approval of the Engineer.

### 1704.1 Requirements of Consistency

The mix shall have the consistency which will allow proper placement and compaction in the required position. Every attempt shall be made to obtain uniform consistency. Slump test shall be used to measure consistency of the concrete.

The optimum consistency for various types of structures shall be as indicated in Table 1700-4, or as directed by the Engineer. The slump of concrete shall be checked as per IS:516.

Table 1700-4: Requirements of Consistency

Typ e	Slump (mm) (at the Time of Placing of Concrete 25
1 a) Structure with exposed inclined surface requiring low slump	

concrete to allow proper compaction

	b) Plain Cement concrete	25
3	RCC structure with widely spaced reinforcements; e.g. solid columns, piers, abutment, footing, well steining	40-50
3	RCC structure with fair degree of congestion of reinforcement; e.g. pier and abutment caps, box culverts, well curb, well cap, walls with thickness greater than 300 mm	50-75
4	RCC and PSC structure with highly congested reinforcements e.g. deck slab girders, box girder, walls with thickness less than 300 mm	75-125
5	Under water concreting through tremie e.g. bottom plug, cast in-situ piling	150-200

Not with standing the optimum consistency indicated against Sl. No. 1 to 3, the situation should be property assessed to arrive at the desired workability with the adjustment of admixture in each case, where the concrete is to be transported through transit mixer and placed using concrete pump. Under these circumstances, the optimum consistency during placement for the items of work of Sl. No. 1 to 3, can be considered ranging from 75 mm to 150 mm. This is, however, subject to satisfying the other essential criteria of strength, durability etc. and approval of the Engineer.

## 1704.2 Requirements for Design Mixes

### 1704.2.1 Target Mean Strength

The target mean strength of specimen shall exceed the specified characteristic compressive strength by at least the current margin.

The current margin for a concrete mix shall be determined by the Contractor shall be taken as 1.64 times the standard deviation of sample test results taken from at least 40 separate batches of concrete of nominally similar proportions produced at site by the same plant under similar supervision, over a period exceeding 5 days, but not exceeding 6 months.

Where there is insufficient data to satisfy the above, the current margin for the initial design mix shall be taken as given in Table 1700-5 :

Table 1700-5: Current Margin for Initial Design Mix

Concrete Grade	Current Margin (MPa)	Target Mean Strength (MPa)
M15	10	25
M20	10	30

M25	11	36
M30	12	42
M35	12	47
M40	12	52
M45	13	58
M50	13	63
M55	14	69
M60	14	74
M65	15	80
M70	15	85
M75	15	90
M80	15	95
M85	16	101
M90	16	106

The initial current margin given in Table 1700-5 shall be used till sufficient data is available to determine the current margin as per Sub-Clause 1704.2.1 (i).

#### 1704.2.2 Trial Mixes

The Contractor shall give notice to the Engineer to enable him to be present at the time of carrying out trial mixes and preliminary testing of the cubes. Prior to commencement of trial mix design, all materials forming constituents of proposed design mix should have been tested and approval obtained in writing from the Engineer. Based on test results of material draft mix design calculation for all grades of concrete to be used in the works, shall be prepared after taking into account the provisions in the Contract Technical Specifications Guidelines of IS:10262, IS:SP:23 and IRC:112 and submitted to the Engineer for approval.' Prior to commencement of concreting, trial mix design shall be performed for all grades of concrete and

trial mix which has been found successful, shall be submitted by the Contractor and approval obtained. During concreting with the approved trial mix design, if source of any constituents is changed, the mix design shall be revised and tested for satisfying the strength requirements.

The initial trial mixes shall be carried out in a laboratory approved by the Engineer. However, Engineer may permit the initial trial mixes to be prepared at the site laboratory of the Contractor, if a full fledged concrete laboratory has been established well before the start of construction, to his entire satisfaction. Sampling and testing procedures shall be in accordance with these Specifications.

When the site laboratory is utilized for preparing initial mix design, the concrete production plant and means of transport employed to make the trial mixes shall be similar to those proposed to be used in the works.

For each trial mix, a set of six cubes shall be made from each of three consecutive batches for purposes of testing. Three cubes from each set of six shall be tested at an age of 28 days and three at an earlier age approved by the Engineer. The cubes shall be made, cured, stored, transported and tested in accordance with these Specifications. The mean strength of the nine cubes at 28 days shall exceed the specified characteristic strength by the current margin minus 3.5 MPa.

### 1704.2.3 Control of Strength of Design Mixes

- **Adjustment to Mix Proportions**

Adjustment to mix proportions arrived at in the trial mixes, shall be made subject to the Engineer's approval, in order to minimize the variability of strength and to maintain the target mean strength. Such adjustments shall not be taken to imply any change in the current margin.

- **Change of Current Margin**

When required by the Engineer, the Contractor shall recalculate the current margin in accordance with clause 1704.2.1. The recalculated value shall be adopted as directed by the Engineer, and it shall become the current margin for concrete produced thereafter.

- **Additional Trial Mixes**

In case any changes are observed in the properties of fresh concrete and/or strength of hardened concrete on the basis of early age tests, additional mixes and tests shall be carried out during production, so as to control and bring the quality of concrete within acceptable limits. In case of any change in the source or properties of materials, the design of mix shall be established afresh.

### 1704.3 Requirements of Nominal Mix Concrete

Requirements for nominal mix concrete unless otherwise specified shall be as given in Table 1700-6.

Table 1700-6: Requirements for Nominal Mix Concrete

Concrete Grade	Total Quantity of dry Aggregate by mass per 50 kg of cement to be taken as the Sum of individual masses of fine and coarse Aggregate	Proportion of Fine to Coarse Aggregate (by Mass)	Maximum Quantity of water for 50 kg of Cement (Litres)	
			PCC	RCC
M 15	350	Generally 1:2, subject to upper limit 1:1.5 and lower limit of 1:2.5	25	
M 20	250		2	22

### 1704.4 Additional Requirements

Concrete shall meet any other requirements as specified on the drawing or as directed by the Engineer. The overall limits of deleterious substances in concrete shall be as follows:

Total acid soluble chloride content in the concrete mix expressed as chloride ions shall not exceed the following values by mass of cement.

Prestressed concrete 0.10 percent

Reinforced concrete (in severe, very severe or extreme exposure condition)

0.20 percent Reinforced concrete in moderate exposure condition

0.30 percent

The total water soluble sulphate content of the concrete mix expressed as SO<sub>3</sub>, shall not exceed 4 percent by mass of cement in the mix.

For concrete made with Portland pozzolona cement, Portland blast furnace slag cement or mineral admixtures, the setting time and rate of gain of strength are different from those for concrete made with OPC alone. Such modified properties shall be taken into account while deciding the de-shuttering time, curing period, early age loading and time of prestressing. Additional cube samples may be required to be taken for verifying the concrete properties.

#### 1704.5 Suitability of Proposed Mix Proportions

The Contractor shall submit the following information for the Engineer's approval : Nature and source of each material

Quantities of each material per cubic metre of fully compacted concrete Either of the following :

Appropriate existing data as evidence of satisfactory previous performance for the target mean strength, current margin, consistency and water/cement ratio and any other additional requirement (s) as specified. full details of tests on trial mixes.

Statement giving the proposed mix proportions for nominal mix concrete

Any change in the source of material or in the mix proportions shall be subject to the Engineer's prior approval.

#### 1704.6 Checking of Mix Proportions and Water/Cement Ratio

In proportioning concrete, the quantity of both cement and aggregate shall be determined by weight. Where the weight of cement per bag as given by the manufacturer is accepted, a reasonable number of bags shall be weighed separately to check the net weight. Where cement is weighed from bulk stock at site and not by bag, it shall be weighed separately from the aggregates. Water shall either be measured by volume in calibrated tanks

or weighed. All measuring equipment shall be maintained in a clean and serviceable condition. Their accuracy shall be periodically checked.

The specified water/cement ratio shall always be kept constant and at its correct value. To this end, moisture content in both fine and coarse aggregates shall be determined as frequently as possible, the

frequency for a given job being determined by the Engineer according to the weather conditions. The amount of water to be added shall then be adjusted to compensate for variations in the moisture content. For the determination of moisture content in the aggregates 18:2386 (Part III) shall be referred. Suitable adjustments shall also be made in the weight of aggregates to allow for their variation in weight due to variation in their moisture content.

#### 1704.7 Grading of Aggregates for Pumped Concrete

Materials for pumped concrete shall be batched consistently and uniformly. Maximum size of aggregate shall not exceed one-third of the internal diameter of the pipe.

The grading of aggregates shall be continuous and shall have sufficient ultra fine materials (material finer than 0.25 mm). Proportion of fine aggregates passing through 0.25 mm shall be between 15 and 30 percent and that passing through 0.125 mm sieve shall not be less than 5 percent of the total volume of aggregate. Admixtures to increase workability can be added. When pumping long distances and in hot weather, set- retarding admixtures can be used. Fluid mixes can be pumped satisfactorily after adding plasticisers and super plasticisers. Suitability of concrete shall be verified by trial mixes and by performing pumping test.

#### 1705 ADMIXTURES

##### 1705.1 Chemical Admixtures

Chemical admixtures such as superplasticisers, or air entraining, water reducing, accelerating and retarding agents for concrete, may be used with the approval of the Engineer.

**As the selection of an appropriate concrete admixture is an integral part of the mix design, the manufacturers shall recommend the use of any one of their products only after obtaining complete information of all the actual constituents of concrete as well as methodologies of manufacture, transportation and compaction of concrete proposed to be used in the work. Admixtures/additives conforming to IS:9103 may be used subject to approval of the Engineer. However, admixtures/additives generating hydrogen or nitrogen and containing chlorides, nitrates, sulphides, sulphates or any other material likely to adversely affect the steel or concrete, shall not be permitted.**

The general requirements for admixtures are given in Clause 1007 of these Specifications.

Compatibility of the admixtures with the cement and any other pozzolona or hydraulic addition shall be ensured by for avoiding the following problems :

Requirement of large dosage of super plasticiser for achieving the desired workability, Excessive retardation of setting,

Excessive entrainment of large air bubbles,  
Unusually rapid stiffening of concrete, Rapid loss of slump

Excessive segregation and bleeding.

#### 1705.2 Mineral Admixtures

For use of mineral admixtures, refer Clauses 1714.1 and 1715.2.

#### 1706 SIZE OF COARSE AGGREGATES

The size (maximum nominal) of coarse aggregates for concrete to be used in various components shall be as given in Table 1700-7.

Table 1700-7: Maximum Nominal Size of Coarse Aggregates

Components		Maximum Nominal Size of Coarse Aggregate (mm)
i)	RCC well curb	20
ii)	RCC/PCC well steining	40
iii)	Well cap or Pile Cap Solid type pier and abutment	40
iv)	RCC work in girder, slabs wearing coat, kerb, approach slab, hollow piers and abutments, pier/abutment caps, piles	20
V)	PSC Work	20
vi)	Any other work	As specified by the Engineer

Maximum nominal size of aggregates shall also be restricted to the smaller of the following values: 10 mm less than the minimum lateral clear distance between individual reinforcements

10 mm less than the minimum clear cover to the reinforcement  
One quarter of minimum thickness of member

The proportions of the various individual sizes of aggregates shall be so adjusted that the grading produces the densest mix and the grading curve corresponds to the maximum nominal

#### 1707 EQUIPMENT

Unless specified otherwise, equipment for production, transportation and compaction of concrete shall be as under:

## Production of Concrete :

For overall bridge length of less than 200 m - batch type concrete mixer, diesel or electric operated, with a minimum size of 200 litres automatic water measuring system and integral weigher (hydraulic/pneumatic type).

For overall bridge length of 200 m or more - concrete batching and mixing plant fully automatic, with minimum capacity of 15 cum per hour.

All measuring devices of the equipment shall be maintained in a clean and serviceable condition. Their accuracy shall be checked over the range in use, when set up at each site and thereafter, periodically as directed by the Engineer. Size adopted for the concrete mix.

The accuracy of the measuring devices shall fall within the following limits : Measurement of Cement  $\pm 3$  percent of the quantity of cement in each batch

Measurement of Water  $\pm 3$  percent of the quantity of water in each batch  
Measurement of Aggregate  $\pm 3$  percent of the quantity of aggregate in each batch  
Measurement of Admixture  $\pm 3$  percent of the quantity of admixture in each batch

### Transportation of Concrete:

Concrete dumpers minimum 2 tonnes capacity

Powered hoists minimum 0.5 tonne capacity  
Chutes

Buckets  
handled by  
cranes  
Transit truck  
mixer

Concrete  
pump

Concrete  
distributor  
booms  
Belt conveyor

Cranes  
with skips  
Tremies

### For Compaction of Concrete:

Internal vibrators size 25 mm to 70 mm

Form vibrators minimum 500 watts

Screed vibrators full width of carriageway (upto two lanes)



## 1708 BATCHING, MIXING, TRANSPORTING, PLACING AND COMPACTION

### 1708.1 General

Prior to start of concreting, the Contractor shall submit for approval of the Engineer, his programme along with list of equipment proposed to be used by him for batching, mixing, transporting and placing concrete.

#### 1708.2 Batching of Concrete

##### In batching concrete:

The quantity of cement, aggregate and mineral admixtures, if used, shall be determined by mass. Chemical admixtures, if solid, shall be determined by mass.

Liquid admixtures may be measured in volume or mass, and

Water shall be weighed or measured by volume in a calibrated tank.

The concrete shall be sourced from on-site or off-site batching and mixing plants, or from approved Ready Mixed Concrete plants, preferably having quality certification.

Except where supply of properly graded aggregate of uniform quality can be maintained over a period of work, the grading of aggregate should be controlled by obtaining the coarse aggregate in different sizes and blending them in the right proportions when required, the different sizes being stocked in separate stock piles. The materials should be stock piled several hours, preferably a day before use. The grading of coarse and fine aggregate should be checked as frequently as possible to ensure that the specified grading is maintained.

The water/cement ratio shall always be maintained constant at its correct value. To this end, determination of moisture content in both fine and coarse aggregates shall be made as frequently as possible, depending on weather conditions. The amount of added water shall be adjusted to compensate for any observed variations in the moisture content. To allow for the variation in mass of aggregate due to variation in

moisture content, suitable adjustment in the mass of aggregate shall also be made. Accurate control shall be kept on the quantity of mixing water, which when specified, shall not be changed without approval.

### 1708.3 Mixing Concrete

#### 1708.3.1 Mixing at Site

All concrete shall be machine mixed. In order to ensure uniformity and good quality of concrete the ingredients shall be mixed in a power driven batch mixer with hopper and suitable weigh batching arrangement or in a central mix plant. Hand mixing shall not be permitted. The mixer or the plant shall be at an approved location considering the properties of the mixes and the transportation arrangements available with the Contractor. The mixer or the plant shall be approved by the Engineer.

Mixing shall be continued till materials are uniformly distributed, a uniform colour of the entire mass is obtained and each individual particle of the

coarse aggregate shows complete coating of mortar containing its proportionate amount of cement. In no case shall mixing be done for less than 2 minutes. It shall be ensured that the mixers are not loaded above their rated capacities and are operated at a speed recommended by the manufacturer. When mineral admixtures are added at the mixing stage, their thorough and uniform blending with cement shall be ensured, if necessary by longer mixing time. The addition of water after the completion of the initial mixing operation shall not be permitted.

Mixers which have been out of use for more than 30 minutes shall be thoroughly cleaned before putting in a new batch and also before changing from one type of cement to another.

#### 1708.3.2 Ready Mix Concrete

Use of ready mix concrete proportioned and mixed off the project site and delivered to site in a freshly mixed and unhardened state conforming to 18:4926, shall be allowed with the approval of the Engineer.

#### 1708.4 Transporting Concrete

Mixed concrete shall be transported from the place of mixing to the place of final deposit as rapidly as possible by methods which will prevent the segregation or loss of the ingredients. The method of transporting or placing of concrete shall be approved by the Engineer. Concrete shall be transported and placed as near as practicable to its final position so that no contamination, segregation or loss of its constituents materials take place.

Concrete may be transported by transit mixers or properly designed buckets or by pumping. Transit mixers or other hauling equipment when used should be equipped with the means of discharge of concrete without segregation. During hot or cold weather, concrete shall be transported in deep containers. Other suitable methods to be reduce the loss of water by evaporation in hot weather and heat loss in cold weather may also be adopted.

When concrete is conveyed by chute, the plant shall be of such size and design as to ensure practically continuous flow. Slope of the chute shall be so adjusted that the concrete flows without excessive quantity of water and without any segregation of its ingredients. The delivery end of the chute shall be as close as possible to the point of deposit. The chute shall be thoroughly flushed with water before and after each working period and the water used for this purpose shall be discharged outside the formwork.

In case concrete is to be transported by pumping, the fresh concrete should have adequate fluidity and cohesiveness to be pumpable. Proper concrete mix proportioning and initial trials should ensure this. The conduit shall be primed by pumping a batch of mortar through the line to lubricate it. Once the pumping is started, it shall not be interrupted, as concrete standing idle in the line is liable to cause plug. The operator shall ensure that some concrete is always there in the pumps receiving hopper during operation. The lines shall always be maintained clean and free of dents.

Pipelines from the pump to the placing area shall be laid with minimum bends. For large quantity placements, standby pumps shall be available.

Suitable air release valves, shutoff valves etc. shall be provided as per site requirements. The pumping of priming mix i.e. rich mix of creamy consistency, to lubricate the concrete pump and pipelines, shall precede the pumping of concrete. Continuous pumping shall be done to the extent possible. After concreting, the pipelines and accessories shall be cleaned immediately. The pipes for pumping shall not be made of material which has adverse effect on concrete. Aluminium alloy pipelines shall not be used.

#### 1708.5            Placing of Concrete

All formwork and reinforcement contained in it shall be cleaned and made free from standing water, dust, snow or ice immediately before placing of concrete.

No concrete shall be placed in any part of the structure until the approval of the Engineer has been obtained. If concreting is not started within 24 hours of the approval being given, the approval shall have to be obtained again from the Engineer. Concreting shall proceed continuously over the area between the construction joints. Fresh concrete shall not be placed against concrete which has been in position for more than 30 minutes, unless a proper construction joint is formed.

The concrete shall be deposited as nearly as practicable in its original position to avoid re-handling. Methods of placing should be such as to preclude segregation. Care should be taken to avoid displacement of reinforcement or movement of formwork. To achieve this, concrete should be lowered vertically in the form and horizontal movement of concrete inside the forms should, as far as practicable, be minimised.

The concrete shall be placed and compacted before its initial setting so that it is amenable to compaction by vibration. The workability of concrete at the time of placement shall be adequate for the compaction equipment to be used. If there is considerable time gap between mixing and placing of concrete, as in the case of ready mixed concrete plants or off-site batching and mixing plants, concrete mix shall be designed to have appropriately higher workability at the time of discharge from the mixer, in order to compensate the loss of workability during transit. This is generally achieved by suitable chemical admixtures. Keeping these considerations in view, the general requirement for ready mixed concrete plants or off-site batching and mixing plants, is that concrete shall be discharged from the truck mixer within two hours of the time of loading. A longer period may be permitted if suitable retarding admixtures are used.

In wall forms, drop chutes attached to hoppers at the top should preferably be used to lower concrete to the bottom of the form. As a general guidance, the permissible free fall of concrete may not exceed 1.5 metres and under no circumstances shall it be more than 2 metres. When free fall of larger height is involved, self

compacting concrete having adequate fluidity, cohesiveness and viscosity and which uniformly and completely fills every corner of the formwork by its own weight without segregation, shall be used.

Except where otherwise agreed to by the Engineer, concrete shall be deposited in horizontal layers to a compacted depth of not more than 450 mm when internal vibrators are used and not more than 300 mm in all other cases.

Concrete when deposited shall have temperature of not less than 5°C and preferably not more than 30°C and in no case more than 40°C. In case of site mixing, fresh concrete shall be placed and compacted in its final position within 30 minutes of its discharge from the mixer. When the concrete is carried in properly designed agitator operating continuously, the concrete shall be placed and compacted within 1 hour of the addition of cement to the mix and within 30 minutes of its discharge from the agitator. It may be necessary to add retarding admixtures to concrete, if trials show that the periods indicated above are unacceptable. In all such matters, the Engineer's decision shall be final.

#### 1708.6            **Compaction of Concrete**

Concrete shall be thoroughly compacted by vibration or other means during placing and worked around the reinforcement, tendons or duct formers, embedded fixtures and into corners of the formwork to produce a dense homogeneous void-free mass having the required surface finish. When vibrators are used, vibration shall be done continuously during the placing of each batch of concrete until the expulsion of air has practically ceased and in a manner that does not promote segregation. Over-vibration shall be avoided to minimize the risk of forming a weak surface layer. When external vibrators are used, the design of formwork and disposition of vibrator shall be such as to ensure efficient compaction and to avoid surface blemishes. Vibrations shall not be applied through reinforcement and where vibrators of immersion type are used, contact with reinforcement and all inserts like ducts etc., shall be avoided.

When internal vibrators are used, they shall be inserted vertically to the full depth of the layer being placed and ordinarily shall penetrate the layer below for a few centimetres. The vibrator should be kept in place until air bubbles cease escaping from the surface and then withdrawn slowly to ensure that no hole is left in the concrete, care being taken to see that it remains in continued operation while being withdrawn. The internal vibrators shall be inserted in an orderly manner and the distance between insertions should be about one and half times the radius of the area visibly affected by vibration. Additional vibrators in serviceable condition shall be kept at site so that they can be used in the event of breakdown.

Mechanical vibrators used shall comply with 18:2502, 18:2506, 18:2514 and 18:4656.

#### 1709            **CONSTRUCTION JOINTS**

Construction joints shall be avoided as far as possible. In no case shall the locations of such joints be changed or increased from those shown on the drawings except with the express approval of the Engineer. Joints should be positioned where they are readily accessible for preparation and concreting. Construction joints should be positioned to minimize the effects of the discontinuity of the durability, structural integrity and

appearance of the structure. As far as possible, joints should be provided in non-aggressive zones, but if joints in aggressive zones cannot be avoided, they should be sealed. Joints should be located away from the regions of maximum stress caused by loading; particularly where shear and bond stresses are high.

In beams and slabs joints should not be near the supports. Construction joints between slabs and ribs in composite beams shall be avoided. For box girders, there shall be no construction joint between the soffit and webs.

Joints should be either vertical or horizontal. For a vertical construction joint, the lifts of concrete shall finish level or at right angles to the axis of the member. Concreting shall be continued right up to the joint. Before resuming work at a construction joint when concrete has not yet fully hardened, all laitance shall be removed thoroughly. The surface shall be roughened, taking care to avoid dislodgement of coarse aggregates. Concrete shall be brushed with a stiff brush soon after casting, while the concrete has only slightly stiffened. If the concrete has partially hardened, it may be treated by wire brushing or with a high pressure water jet, followed by drying with an air jet, immediately before the new concrete is placed. Fully hardened concrete shall be treated with mechanical hand tools or grit blasting, taking care not to split or crack aggregate particles. The practice of first placing a layer of mortar or grout when concreting joints, shall be avoided. The old surface shall be soaked with water, without leaving puddles, immediately before starting concreting. The new concrete shall be thoroughly compacted against it.

Where there is likely to be a delay before placing the next concrete lift, protruding reinforcement shall be protected. In all cases, where construction joints are made, the joint surface shall not be contaminated with release agents, dust, or sprayed curing membrane and reinforcement shall be firmly fixed in position at the correct cover.

The sequence of concreting, striking of forms and positioning of construction joints for every individual structure, shall be decided well in advance of the commencement of work.

#### 1710 CONCRETING UNDER WATER

When it is necessary to deposit concrete under water, the methods, equipment, materials and proportions of mix to be used, shall be got approved from the Engineer before any work is started.

Concrete shall not be placed in water having a temperature below 5°C. The temperature of the concrete, when deposited, shall not be less than 16°C, nor more than 30°C.

**Coffer dams or forms shall be sufficiently tight to ensure still water conditions, if practicable, and in any case to reduce the flow of water to less than 3 m per minute through the space into which concrete is to be deposited. Coffer dams or forms in still water shall be sufficiently tight to prevent loss of mortar through the joints in the walls. Pumping shall not be done while concrete is being placed, or until 24 hours thereafter.**

To minimize the formation of laitance, care shall be exercised not to disturb the concrete as far as possible while it is being deposited.

All under water concreting shall be carried out by tremie method only. The number and spacing of the tremies should be worked out to ensure proper concreting. However, it is necessary to have a minimum number of 2 tremies for any concreting operation, so that even if one of the tremies goes out of commission during concreting, the other one can be used to complete the work. The tremie concreting when started should continue without interruption for the full height of the member being concreted. The capacity of the concrete production and placement equipment should be sufficient to enable the underwater concreting to be completed uninterrupted within the stipulated time. The top section of the tremie shall have a hopper

large enough to hold one full batch of the mix or the entire contents of the transporting bucket, as the case may be. The tremie pipe shall not be less than 200 mm in diameter and shall be large enough to allow a free flow of concrete and strong enough to withstand the external pressure of the water in which it is suspended, even if a partial vacuum develops inside the pipe. Preferably, flanged steel Pipe of adequate strength shall be used. A separate lifting device shall be provided for each tremie pipe with its hopper at the upper end. Unless the lower end of the pipe is equipped with an approved automatic check valve, the upper end of the pipe shall be plugged with a wadding of gunny sacking or other approved material before delivering the concrete to the tremie pipe through the hopper, so that when the concrete is forced down from the hopper to the pipe, it will force the plug (and along with it any water in the pipe) down the pipe and out of the bottom end, thus establishing a continuous stream of concrete. It will be necessary to raise the tremie slowly in order to allow a uniform flow of concrete. At all times after placing of concrete is started and until all the required quantity has been placed, the lower end of the tremie pipe shall be kept below the surface of the plastic concrete and shall not be taken out of concrete. This will cause the concrete to build up from below instead of flowing out over the surface and thus avoid formation of layers of laitance. It is advisable to use retarders or suitable super plasticizers to retard the setting time of concrete, which shall be established before the commencement of work.

## 1711 CONCRETING IN EXTREME WEATHER

### 1711.1 Concreting in Cold Weather

Where concrete is to be deposited at or near freezing temperature, precautions shall be taken to ensure that at the time of placing, it has a temperature of not less than 5°C and that the temperature shall be maintained above 4°C until the concrete has hardened. When necessary, concrete ingredients shall be heated before mixing but cement shall not be heated artificially other than by the heat transmitted to it from other ingredients of the concrete. Stock-piled aggregate may be heated by the use of dry heat or steam. Aggregates shall not be heated directly by gas or on sheet metal over fire. In general, the temperature of aggregate or water shall not exceed 65°C. Salt or other chemicals shall not be used for the



prevention of freezing. No frozen material or materials containing ice shall be used. All concrete damaged by frost shall be removed. Concrete exposed to freezing weather shall have entrained air and the water content of the mix shall not exceed 30 litres per 50 kg of cement. To counter slower setting of concrete, accelerators can be used with the approval of the Engineer. However, accelerators containing chloride shall not be used.

#### 1711.2 Concreting in Hot Weather

When depositing concrete in hot weather, precautions shall be taken so that the temperature of wet concrete does not exceed 30°C while placing. This shall be achieved by using chilled mixing water, using crushed ice as a part of mixing water, shading stock piles of aggregates from direct rays of the sun, sprinkling the stock piles of coarse aggregate with water to keep them moist, limiting temperature of cement below 30°C at the time of use, starting curing before concrete dries out and restricting time of concreting as far as possible to early mornings and late evenings. When ice is used to cool mixing water, it will be considered as part of the water in design mix. Under no circumstances shall the mixing operation be considered complete until all ice in the mixing drum has melted. The Contractor will be required to state is

methodology for the Engineer's approval when temperatures of concrete are likely to exceed 30°C during the work.

#### 1712 PROTECTION AND CURING

##### 1712.1 General

Concreting operations shall not commence until adequate arrangements for concrete curing have been made by the Contractor. Curing and protection of concrete shall start immediately, after compaction of the concrete.

The concrete shall be protected from:

Premature drying out particularly by solar radiation and wind  
High internal thermal gradients

Leaching out by rain and flowing water

Rapid cooling during the first few days after placing  
Low temperature or frost

Vibration and impact which may disrupt the concrete and interfere with its bond to the reinforcement. Vibration caused by traffic including construction traffic.

Concrete shall be protected, without allowing ingress of external water, by means of wet (not dripping) gunny bags, hessian etc. Once the concrete has attained some degree of hardening (approximate 12 hrs after mixing), moist curing shall commence and be continued through the requisite period. Where members are of considerable size and length, with high cement content, accelerated curing methods may be applied, as approved by the Engineer.

## 1712.2 Water Curing

Water for curing shall be as specified in Section 1000 of these specifications.

Sea water shall not be used for curing. Sea water shall not come into contact with concrete members before they have attained adequate strength.

The concrete should be kept constantly wet by ponding or covering or use of sprinklers/ perforated pipes for a minimum period of 14 days after concreting, except in the case of concrete with rapid hardening cement, where it can be reduced to 5 days. Water should be applied on surfaces after the final set. Curing through watering shall not be done on green concrete. On formed surfaces, curing shall start immediately after the forms are stripped. The concrete shall be kept constantly wet with a layer of sacking, canvas, hessian or similar absorbent material.

## 1712.3 Steam Curing

Where steam curing is adopted, it shall be ensured that it is done in suitable enclosure to contain the live steam in order to minimize moisture and heat losses. The initial application of the steam shall be after about four hours of placement of concrete to allow the initial set of the concrete to take place.

Where retarders are used, the waiting period before application of the steam shall be increased to about six hours.

The steam shall be at 100 percent relative humidity to prevent loss of moisture and to provide excess moisture for proper hydration of the cement. The application of steam shall not be directly on the concrete.

Steam curing is applied in enclosures or tunnels through which concrete members are transported on a conveying system. Alternatively, portable enclosures or plastic covers are placed over precast members and steam is supplied to the enclosures. The rate of increase or decrease of temperature should not be more than 10°C to 20°C per hour and the maximum temperature shall be about 70°C. The maximum temperature shall be maintained until the concrete has attained the desired strength required at the end of steam curing period and shall be decided by prior trials. When steam curing is discontinued, the air temperature shall not drop at a rate exceeding 10°C per hour, until a temperature of about 10°C above the ambient temperature outside has been reached. Steam curing of concrete shall be followed by water curing for at least 7 days. The concrete shall not be exposed to temperatures below freezing for at least six days after curing.

## 1712.4 Curing Compound

Membrane forming curing compounds consisting of waxes, resins, chlorinated rubbers etc. may be permitted by the Engineer in special circumstances. Curing compounds shall not be used on any surface which requires further finishing to be applied. All construction joints shall be moist cured and no curing compound shall be permitted in locations where concrete surfaces are required to be bonded together.



Liquid membrane forming compounds shall conform to ASTM C 309 and the curing efficiency shall be as per ASTM C 156.

Curing compounds shall be continuously agitated during use. All concrete cured by this method shall receive two applications of the curing compound. The first coat shall be applied immediately after acceptance of concrete finish. If the surface is dry, the concrete shall be saturated with water and curing compound applied as soon as the surface film of water disappears. The second application shall be made after the first application has set. Placement in more than two coats may be required to prevent streaking.

The membrane formed shall be stripped off after 14 days, when curing is complete. Impermeable membranes, such as sheet materials for curing concrete conforming to ASTM C 171 or polyethylene sheeting covering closely the concrete surface, may also be used to provide effective barrier against Evaporation.

## 1713 FINISHING

Immediately after the removal of forms, exposed bars or bolts, if any, shall be cut inside the concrete member to a depth of at least 50 mm below the surface of the concrete and the resulting holes filled with cement mortar. All fins caused by form joints, all cavities produced by the removal of form ties and all other holes and depressions, honeycomb spots, broken edges or corners, and other defects, shall be thoroughly cleaned, saturated with water and carefully pointed and rendered true with mortar. The mortar shall be of cement and fine aggregate mixed in the proportions used in the grade of concrete that is being finished and of as dry a consistency as possible. Considerable pressure shall be applied in filling and pointing to ensure thorough filling in all voids. Surfaces which have been pointed shall be kept moist for a period of twenty four hours. Special pre-packaged proprietary mortars shall be used where appropriate or where specified in the drawing.

All construction and expansion joints in the completed work shall be left carefully tooled and free from any mortar and concrete. Expansion joint filler shall be left exposed for its full length with clean and true edges.

Immediately on removal of forms, the concrete work shall be examined by the Engineer before any defects are made good. The work that has sagged or contains honeycombing to an extent detrimental to structural safety or architectural appearance of the member, shall be rejected. Surface defects of a minor nature may be accepted. On acceptance of such work, the same shall be rectified as directed by the Engineer.

## 1714 CONCRETE WITH BLENDED CEMENTS OR MINERAL ADMIXTURES

### 1714.1 Production of Concrete

In order to improve the durability of the concrete, use of blended cement or blending of mineral admixtures, is permitted. The maximum limit of flyash and ground granulated blast furnace slag in concrete, shall be as specified in Clause 1715.2. Blending at site shall be permitted only through a specific facility with complete automated process control to achieve the specified design quality or through RMC plants with similar facility.

## 1714.2 Modified Properties

For concrete made with Portland Pozzolona Cement, Portland Blast furnace slag cement or mineral admixtures, the setting time and rate of gain of strength are different from those of concrete made with OPC alone. Cognizance of such modified properties shall be taken in deciding de-shuttering time, initial time of prestressing, curing period and for early age loading.

## 1714.3 Compatibility of Chemical Admixtures

Compatibility of chemical admixtures and super plasticizers with Portland Pozzolona cement Portland blast furnace slag cement and mineral admixtures shall be ensured by trials outlined in Clause 1705.

## 1714.4 Additional Tests

In addition to the strength tests prescribed in other Sections of these Specifications, the following additional tests are required to be carried out from considerations of durability.

### Rapid Chloride Ion Permissibility Test

Rapid Chloride Ion permeability test on as per ASTM C 1202 at 56 days for extreme, very severe and severe conditions of exposure. The permissible value of Chloride-Ion permeability for extreme condition 800 Coulombs very severe condition 1200 coulombs and severe exposure condition 1500 coulombs.

### Water Permeability Test

Water permeability test as per DIN: 1048 Part 5-1991 shall be carried out as described in Clause 1717.2.5.5.

## 1715 HIGH PERFORMANCE CONCRETE

### 1715.1 General

High Performance Concrete shall be used where special performance requirements of high strength, high early strength, high workability, low permeability and high durability for severe service environments, are required. Production and use of such concrete in the field shall be carried out with high degree of uniformity between batches and very stringent quality control.

### 1715.2 Materials

Cement, mineral admixtures, chemical admixtures, aggregates and water shall conform to Section 1000 of these Specifications and this Section.

Flyash when used, shall neither be less than 20 percent nor shall be greater than 35 percent of the total by mass of ordinary Portland cement and flyash and shall conform to grade-1 of IS:3812.

Ground granulated blast furnace (GGBS) slag when used, shall neither be less than 50 percent nor greater than 70 percent of the total mass of ordinary Portland cement and GGBS and shall conform to 18:12089.

Silica fume conforming to 18:15388 shall be used.

The cement content of concrete inclusive of any mineral admixtures shall not be less than 380 kg/m<sup>3</sup>. The cement content excluding any mineral admixtures (Portland cement content alone) shall not exceed 450 kg/m<sup>3</sup>. The water/cement (cement plus all cementitious materials) ratio should generally not exceed 0.33 but in no case shall be more than 0.40.

### 1715.3 Compatibility of Admixtures

Compatibility of the superplasticiser and admixtures with the cement and any other Pozzolanic or hydraulic dilutes shall be ensured by trials as outlined under Clause 1705.

### 1715.4 Characteristic Strength and Target Mean Strength

Characteristic strength and the initial target mean strength of concrete shall be as given in Table 1700-8. The target mean strength shall be calculated as per Clause 1704.2 after obtaining data on standard deviation from sufficient samples.

**Table 1700-8: Characteristic Compressive Strength and Target Mean Strength**

Grade Designation	Specified Characteristic Compressive Strength at 28 days (MPa)	Target Mean Strength (MPa)
M40	40	52
M45	45	58
M50	50	63
M55	55	69
M60	60	74
M65	65	80
M70	70	85
M75	75	90
M80	80	95
M85	85	101
M90	90	106

### 1715.5 Workability and Other Requirements

Workability, concrete mix design, field trial mixes, chloride and sulphate contents shall be laid down in other Sections of these Specifications.

### 1715.6 Mixing of Concrete

The concreting plant and means of transportation employed to make trial mixes and to transport them to representative distances shall be similar to the corresponding plant and transport to be used in the works.

The temperature of concrete at the time of placement shall not exceed 25°C. The temperature of concrete at the mixing stage should be lower, to allow for rise in temperature during transport. When considerable distance of transport is involved, particular attention should be paid to ensure retention of slump as targeted for placement.

#### 1715.7 Prototype Testing

Mock-up trials or prototype testing may be carried out to ensure that the concrete can be satisfactorily placed and compacted, taking into account the location of placement and provision of reinforcement, and required adjustments made in concrete mix design and/or detailing of reinforcement.

#### 1715.8 Curing of Concrete

High performance concrete containing silica fume is more cohesive than normal mixes hence, there is a little or no bleeding and no bleed water to rise to the surface to offset water loss due to evaporation. Plastic shrinkage cracking is possible, if curing is not proper. Initial curing should commence soon after initial setting of concrete. Concrete should be covered with moist covers, opaque colour plastic sheets or suitable curing compound. Final moist curing should commence after final setting of concrete and continue for at least 14 days.

#### 1715.9 Additional Tests for Concrete

Apart from the strength tests prescribed in other Sections of these Specifications, the additional tests as specified under Clause 1714.3 shall also be carried out.

#### 1716 TOLERANCES

Tolerances for dimensions/shape of various components shall be as indicated in these Specifications or shown on the drawings or as directed by the Engineer.

#### 1717 TESTS AND STANDARDS OF ACCEPTANCE

**1717.1** Concrete shall conform to the surface finish and tolerance as prescribed in these Specifications for respective components.

**1717.2** Random sampling and lot by lot acceptance inspection shall be made for the 28 days cube strength of concrete.

**1717.3** Concrete under acceptance, shall be notionally divided into lots for the purpose of sampling before commencement of work. The basis of delimitation of lots shall be as follows:

No individual lot shall be more than 30 cu.m in volume

Different grades of mixes of concrete shall be divided into separate lots. Concrete of a lot shall be used in the same identifiable component of the bridge. **1717.4 Sampling and Testing**

Concrete for preparing 3 test cubes shall be taken from a batch of concrete at point of delivery for construction, according to procedure laid down in 18:1199.

A random sampling procedure shall be adopted which ensures that each of the concrete batches forming the lot under acceptance inspection has equal chance of being chosen for taking cubes.

150 mm cubes shall be made, cured and tested at the age of 28 days for compressive strength in accordance with 18:516. The 28 day test strength result for each cube shall form an item of the sample. Tests at other age shall also be performed, if specified.

Where automated batching plant/Ready Mixed Concrete Plant is located away from the place of use and the time gap between production and placement is more than the initial setting time or where any ingredients are added subsequent to mixing, separate sets of samples shall be collected and tested at batching plant and at location of placement. The results shall be compared and used to make suitable adjustment at batching plants so that properties of concrete at placement are as per the requirements.

#### 1717.5 Test Specimen and Sample Strength

Three test specimens shall be made from each sample for testing at 28 days. Additional cubes may be required for various purposes such as to determine the strength of concrete at 7 days or for any other purpose.

The test strength of the sample shall be the average of the strength of 3 cubes. The individual variation should not be more than  $\pm 15$  percent of the average. If variation is more, the test results of the sample are invalid.

#### 1717.6 Frequency

The minimum frequency of sampling of concrete of each grade shall be in accordance with Table 1700-9.

Table 1700-9: Minimum Frequency of Sampling

Quantity of Concrete in Work, m <sup>3</sup>	No. of Samples
1 - 5	1
6 - 15	2
16 - 30	3
31 - 50	4
50 and above	4 plus one additional sample for each additional 50 m <sup>3</sup> or part thereof

At least one sample shall be taken from each shift of work.

#### 1717.7 Acceptance criteria

##### 1717.7.1 Compressive Strength

Cubes

The concrete shall be taken as having the specified compressive strength when both the following conditions are met:

The mean strength determined from any group of four consecutive non-overlapping samples exceeds the specified characteristic compressive strength by 3 MPa.

Strength of any sample is not less than the specified characteristic compressive strength minus 3 MPa.

The quantity of concrete represented by the test results include the batches from which the first and last samples were taken, together with all intervening batches.

#### Cores

When the concrete does not satisfy both the conditions given in (1) above, representative cores shall be extracted from the hardened concrete for compression test in accordance with the method described in IS: 1199 and tested to establish whether the concrete satisfies the requirement of compressive strength.

Evaluation of compressive strength by taking cores may also be done in case of doubt regarding the grade of concrete used either due to poor workmanship or based on results of cube strength tests.

The locations from which core samples are to be taken and their number shall be decided so as to be representative of the whole of the concrete under consideration. However, in no case shall fewer than three cores be tested. Cores shall be prepared and tested as described in IS:516. Concrete in the member represented by a core test shall be considered acceptable if the average equivalent cube strength of the cores is equal to at least 85 percent of the cube strength of the grade of concrete specified for the corresponding age and no individual core has strength less than 75 percent of the specified strength.

#### 1717.7.2 Chloride and Sulphate Content

The total chloride and sulphuric anhydride (SO<sub>3</sub>) content of all the constituents of concrete as a percentage of mass of cement in the mix shall not exceed the values given in this Section.

#### 1717.7.3 Density of Fresh Concrete

Where minimum density of fresh concrete is specified, the mean of any four consecutive non-overlapping samples shall not be less than the specified value and any individual sample result shall not be less than

97.5 percent of the specified value.

#### 1717.7.4 Density of Hardened Concrete

Where minimum density of hardened concrete is specified, the mean of any four consecutive non-overlapping samples shall not be less than the specified value and any individual sample result shall not be less than 97.5 percent of the specified value.

#### 1717.7.5 Permeability Test

Water permeability test as per DIN:1048 Part 5-1991 shall be carried out as described below: A cylindrical test specimen 150 mm dia. and 160 mm high shall be prepared.

After 28 days of curing, the test will be conducted between 28 and 35 days. The test specimen shall be fitted in a machine such that specimen can be

subjected to a water pressure of up to 7 bars. A typical machine is shown in Appendix-1700/1.

The concrete specimen shall be subjected to a water pressure of 0.5 N/mm<sup>2</sup> from the top for a period of 3 days. The pressure shall be maintained constant throughout the test period. If the water penetrates through to the underside of the specimen, the test may be terminated and the specimen rejected as failed.

After 3 days, the pressure shall be released and the sample shall be taken out. The specimen shall be split in the middle by compression applied on two round bars on opposite sides above and below.

When the split faces show signs of drying (after 5 to 10 minutes) the maximum depth of penetration in the direction of height shall be measured with the scale and extent of water penetration established.

The mean of maximum depth of penetration obtained from three specimens thus tested, shall be taken as the test result and it shall not exceed 25 mm.

**1717.7.6** If the concrete is not able to meet any of the standards of acceptance as prescribed, the effect of such deficiency on the structure shall be investigated by the Contractor as directed by the Engineer. The not found to be acceptable even after investigation, the Contractor shall remove the rejected concrete forthwith.

**1717.7.7** When durability of concrete is desired the rapid chloride ion permeability test as stated under Clause 1714.3.1 shall also be performed in addition to above tests.

## **1718 MEASUREMENTS FOR PAYMENT**

**Structural concrete shall be measured in cubic metres.** In reinforced or prestressed concrete, the volume occupied by reinforcement or prestressing cables and sheathing shall not be deducted. The slab shall be measured as running continuously through and the beam as the portion below the slab.

## **1719 RATE**

The contract unit rate for structural concrete shall cover costs of all materials, labour, tools, plant and equipment required for mixing, transporting and placing in position, vibrating and compacting, finishing and curing as per this Section or as directed by the Engineer, including all incidental expenses, sampling and testing, quality assurance and supervision. Unless mentioned separately as an item in the contract, the contract unit rate for concrete shall also include the cost of providing, fixing and removing formwork required for concrete work as per **Section 1500** of these Specifications.

If the concrete is found to be acceptable by the Engineer as sub-standard work, the Contractor shall be subjected to reduction in his contract unit rate. For deficiency in compressive strength of concrete when accepted by the Engineer, the reduction in rate shall be applied as under:

$$\text{Percentage reduction in rate} = \frac{\text{Design Strength} - \text{Observed Strength}}{\text{Design Strength}} \times 100$$

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

**Item no 115**

Providing and laying ordinary cement concrete M200 using B.T. stone aggregate for R.C.C. coping curing etc. complete including the cost of form work but excluding the cost of reinforcement.

Same as above item

**Item no 128**

Providing and laying controlled cement concrete M.250 and curing complete including the cost of formwork and reinforcement for reinforced concrete work in(A)

Foundations, footings, Base of columns and Mass concrete

Same as above item



**Item No. 116 :- Providing 15mm thick cement plaster in single coat on fair side of bricks/ concrete wall for interior plastering upto floor two level finished even and smooth in cement mortar 1:4 ( 1 cement :4 sand ) etc. complete.**

**1.0. Materials**

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

**2.0. Workmanship**

**2.1. Scaffolding:**

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

**2.2. Preparation of back ground :**

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

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

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

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

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

- 2.3.3.** In suspending the work at the end of the day, the plaster shall be left out clean to the line both horizontally and vertically, when recommencing the plaster, the edges of the old work shall be scraped clean and wetted with cement putty before plaster is applied to the adjacent areas to enable the two to properly join together. Plastering work shall be closed at the end of the day on the body of the wall and nearer than **15 cm.** to any corners or arises. It shall not be closed on the body of features such as plaster bands and cornices not at the corners or arises. Horizontal joints in plaster work shall not also occur on parapet tops and copings as these invariably lead to leakage. No portion of the surface shall be left out initially to be packed up later on.
- 2.3.4.** Each coat shall be kept damp continuously till the next coat is applied or for a minimum period of 7 days. Moistening shall commence as soon as plaster is hardened sufficiently. Soaking of walls shall be avoided and only as much water as can be readily absorbed shall be used, excessive evaporation on the sunny or windward side of building in hot air or dry weather shall be prevented by hanging matting or gunny bags on the outside of the plaster and keeping them wet.
- 2.3.5.** The plastering work shall be in single coat on rough (similar) side of single or half brick walls for interior plastering up to floor two level, finished even and smooth **in C.M. 1:4.**
- 2.3.6** The coat of cement and fine sand 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 to 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, labour and scaffolding etc. involved in the operations described under workmanship.
- 3.2.** All plastering shall be measured in square meters unless otherwise specified. Length breadth or height shall be measured correct to a centimeter.
- 3.3.** Thickness of the plaster shall be exclusive of the thickness of the key i.e. grooves or open joints in brick work, stone work etc. or space between laths. Thickness of plaster shall be average thickness with minimum **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 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 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. 117:- Providing and fixing M.S. grill of required pattern to wooden frame of windows etc. with M.S. flats of required spacing in frames around square or round bars with round headed bolts and nuts or by screws of windows or clearstory windows ( A ) Plain grill**

**As per description & applying as per site in charge.**

**Item No. 118:- Providing and fixing M.S. grill of required pattern to wooden frame of windows etc. with M.S. flats of required spacing in frames around square or round bars with round headed bolts and nuts or by screws of windows or clearstory windows ( A ) Plain grill**

**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 to alluminum frames of window / wooden / stone frames of doors, railing etc. with M.S. flats at required spacing and frames around, square or round bars fixed with round headed bolts and nuts or by screws.

**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 of 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**.

**tem No. 120 :-** Providing and fixing mild steel door with 40 x 40 x 6 mm angle for frame and for shutter frame 30 x 30 x 3 angle. For windows frame of angle 35 x 35 x 5 & for shutter windows 25 x25 x 3 mm size angle and 18 gauge sheet for panels & 10 mm dia bars at 10 cm c/c for grill and 40 x 6 mm flats on edge of shutter, & 20 x 6 mm binding patti, including one coat of primer and two coats of oil painting etc. comp. as per detail / as directed by Engineer in charge.

**WORKMANSHIP** as per instruction and direction given by Engineer-in-charge.

#### **MODE OF MEASUREMENT & PAYMENT**

The rate shall be made on kg. base of one work done.

**Item No. 123 :- Providing cement vata (10 cm x 10 cm size) quarter round in cement mortar 1:1 including neat cement finishing, watering etc. complete.**

**1.0. Materials**

1.1. Water shall conform to M-1. Cement mortar shall conform to M-11.

**2.0. Workmanship**

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

**3.0. Mode of measurements and payment**

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

3.2. The rate shall be for a One running meter.



**Item no. 124 :- Providing and fixing C.I. Manhole cover 0.60 M. x 0.45M. size having weight not less than 35Kg.**

**1.0 Materials :**

C.I. Manhole cover of 0.60 x 0.45 cms. shall be of best quality . The weight of C.I. cover and frame shall not be less than 35 Kg. . The C.I. manhole cover shall be of light duty and conform relevant I.S.

**2.0 Workmanship**

2.1 C.I. Manhole cover shall be fixed as per relevant specification of item No. 24.44 except that the C.I. cover shall be fixed as and where directed.

**3.0 Mode of Measurement :**

3.1 The rate includes cost of all labour and materials required for satisfactory completion of this item.

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

### **Item No. 125**

**Box cutting the road surface to proper slope and camber for making a base of road work including removing the excavated stuff and depositing on the road side slopes as directed upto 50 mts. Lead.**

1. This work shall consist of excavation, removal and satisfactory disposal of all materials necessary for the construction of widening carriageway in accordance with requirements of these specifications and the lines, grades and cross sections shown in the drawings or as indicated by the Engineer.
2. After the site has been cleared the limits of excavation/ box cutting the road surface shall be set out true to lines, curves, slopes, grades and sections as shown on the drawings or as directed by the Engineer.
3. Box cutting shall be carried out in conformity with the directions laid here in under and in a manner approved by the Engineer. The work shall be so done that the suitable materials available from box cutting/ excavation are satisfactorily utilized as directed.
4. The contractor shall not excavate outside the limits of box cutting. Subject to the permitted tolerances, any excess depth/ width excavated beyond the specified levels/ dimensions on the drawings shall be made good at the cost of the contractor with suitable material of characteristics similar to that removed and compacted as directed.
5. Cutting shall be done in proper grade & camber as shown on drawing or as directed. Care must be taken that all slopes are evenly and truly dressed. Cutting shall be done to the exact depth required and shall be as per formation level in proper grade and the camber. If extra depth of cutting is done due to negligence of contractor the same shall be refilled with approved quality of materials duly consolidated to the satisfaction of the Engineer-in-charge (without extra cost).
6. The stuff received from the cutting of existing crust shall be screened on site and stone aggregates shall be stacked at suitable place which shall be reused for modified sub base as directed by the Engineer in charge. The unsuitable materials shall be removed from the site and same shall be used for filling and correcting side slopes of bank and earthwork for embankment as directed by the Engineer in charge with lead up to 50 mtr..
7. The measurement of box cutting shall be taken on level basis & level shall be taken at 30 mt. interval. Volume shall be computed in cubic meters by average area method.
8. The payment shall be made on **Cmt.** basis.
9. The rate includes cost of all labour, machineries required, cost of carting and spreading the cutting stuff with all lead and lift and leveling the dumping ground/ embankment, rolling and consolidation of subgrade level etc. complete.

## **ITEM No. 126**

**Supplying and laying, spreading and compacting coarse clean sharp specified sand (C.B.R. not less than 10%) below sub base course including carriage of material spreading in uniform layers manually on prepared base and compacted with power roller to achieve desired density including all materials, labours etc. complete. and spreading coarse clean sand as directed.**

### **GRANULAR SUB-BASE**

#### **401.1 Scope**

This work shall consist of laying and compacting well-graded material on prepared subgrade in accordance with the requirements of these Specifications. The material shall be laid in one or more layers as sub-base or lower sub-base and upper sub-base (termed as sub-base hereinafter) as necessary according to lines, grades and cross- sections shown on the drawings or as directed by the Engineer.

#### **402 Materials**

**401.2.1** The material to be used for the work shall be natural sand, crushed gravel, crushed stone, crushed slag, or combination thereof depending upon the grading required. Use of materials like brick metal, Kankar and crushed concrete shall be permitted in the lower sub-base. The material shall be free from organic or other deleterious constituents and shall conform to the gradings given in Table 400-1 and physical requirements given in Table 400-2. Gradings III and IV shall preferably be used in lower sub-base. Gradings V and VI shall be used as a sub-base-cum-drainage layer. The grading to be adopted for a project shall be as specified in the Contract. Where the sub-base is laid in two layers as upper sub-base and lower sub-base, the thickness of each layer shall not be less than 150 mm.

**401.2.2** If the water absorption of the aggregates determined as per IS:2386 (Part 3) is greater than 2 percent, the aggregates shall be tested for Wet Aggregate Impact Value (AIV) (IS:5640). Soft aggregates like Kankar, brick ballast and laterite shall also be tested for Wet AIV (IS:5640).

**Table 400-1: Grading for Granular Sub-Base Materials**

IS Sieve	Percent by Weight Passing the IS Sieve					
Designation	Grading I	Grading II	Grading III	Grading IV	Grading V	Grading VI
75.0 mm	100	-	-	-	1100	-

53.0 mm	80-100	100	100	100	80-100	100
26.5 mm	55-90	70-100	55-75	50-80	55-90	75-100
9.50 mm	35-65	50-80	-	-	35-65	55-75
4.75 mm	25-55	40-65	10-30	15-35	25-50	30-55
2.36 mm	20-40	30-50	-	-	10-20	10-25
0.85 mm	-	. -	-	-	2-10	-
0.425 mm	10-15	10-15	-	-	. 0-5	0-8
0.075 mm	<5	<5	<5	<5	-	0-3

**Table 400-2: Physical Requirements for Materials for Granular Sub-base**

Aggregate Impact Value (AIV)	IS:2386 (Part 4) or IS:5640	40 maximum
Liquid Limit	IS:2720 (Part 5)	Maximum 25
Plasticity Index	IS:2720 (Part 5)	Maximum 6
CBR at 98% dry density (at IS:2720-Part 8)	IS:2720 (Part 5)	Minimum 30 unless otherwise specified in the Contract

## **401.2 Construction Operations**

### **401.2.1 Preparation of Sub-grade**

Immediately prior to the laying of sub-base, the subgrade already finished to Clause 301 or 305 as applicable shall be prepared by removing all vegetation and other extraneous matter, lightly sprinkled with water, if necessary and rolled with two passes of 80-100 kN smooth wheeled roller.

### **401.3.2 Spreading and Compacting**

The sub-base material of the grading specified in the Contract and water shall be mixed mechanically by a suitable mixer equipped with provision for controlled addition of water and mechanical mixing. So as to ensure homogenous and uniform mix. The required water content shall be determined in accordance with IS:2720 (Part 8). The mix shall be spread on the prepared subgrade with the help of a motor grader of adequate capacity, its blade having hydraulic controls suitable for initial adjustment and for maintaining the required slope and grade during the operation, or other means as approved by the Engineer.

Moisture content of the mix shall be checked in accordance with IS:2720 (Part 2) and suitably adjusted so that, at the time of compaction, it is from 1 to 2 percent below the optimum moisture content.

Immediately after spreading the mix, rolling shall be done by an approved roller. If the thickness of the compacted layer does not exceed 100 mm, a smooth wheeled roller of 80 to 100 kN weight may be used. For a compacted single layer, up to 200 mm the compaction shall be done

with the help of a vibratory roller of minimum 80 to 100 kN static weight capable of achieving the required compaction. Rolling shall commence at the lower edge and proceed towards the upper edge longitudinally for portions having unidirectional cross fall or on super-elevation. For carriageway having cross fall on both sides, rolling shall commence at the edges and progress towards the crown.

Each pass of the roller shall uniformly overlap not less than one-third of the track made in the preceding pass. During rolling, the grade and cross fall (camber) shall be checked and any high spots or depressions which become apparent, corrected by removing or adding fresh material. The speed of the roller shall not exceed 5 km per hour.

Rolling shall be continued till the density achieved is at least 98 percent of the maximum dry density for the material determined as per IS:2720 (Part 8). The surface of any layer of material on completion of compaction shall be well closed, free from movement under compaction equipment and from compaction planes, ridges, cracks, or loose material. All loose, segregated or otherwise defective areas shall be made good to the full thickness of layer and re-compacted.

#### 401.4 Surface Finish and Quality Control of Work

The surface finish of construction shall conform to the requirements of Clause 902. Control on the quality of materials and works shall be exercised by the Engineer in accordance with Section 900.

#### 401.5 Arrangements for Traffic

During the period of construction, arrangements for the traffic shall be provided and maintained in accordance with Clause 112.

#### 401.6 Measurements for Payment

Granular sub-base shall be measured as finished work in position in **cubic metres**.

The protection of edges of granular sub-base extended over the full formation as shown in the drawing shall be considered incidental to the work of providing granular sub-base and as such no extra payment shall be made for the same.

#### 401.7 Rate

The Contract unit rate for granular sub-base shall be payment in full for carrying out the required operations including full compensation for:

- i. making arrangements for traffic to Clause 112 except for initial treatment to verges, shoulders and construction of diversions;
- ii. supplying all materials to be incorporated in the work including all royalties, fees, rents where applicable with all leads and lifts;

- iii. all labour, tools, equipment, and incidentals to complete the work to the Specifications;
- iv. carrying out the work in part widths of road where directed; and carrying out the required tests for quality control.

## **Item No 127**

**Providing and laying wet mix macadam (W.M.M.) using machine crushed black trap aggregate of 40 to 50 mm size in the material with water OMC in mechanically mix (pug mill) carriage of mix material by contractors own tipper to site of work including laying, spreading and compacting in sub base, base course on well prepared under base of compacting as per MOST Specification to achieve the desired density (Mechanically laid)**

### **406. WET MIX MACADAM SUB-BASE/BASE**

#### **406.1. Scope**

This work shall consist of laying and compacting clean, crushed, graded aggregate and granular material, premixed with water, to a dense mass on a prepared sub grade/sub-base/base or existing pavement as the case may be in accordance with the requirements of these Specifications. The material shall be laid in one or more layers as necessary to lines, grades and cross-sections shown on the approved drawings or as directed by the Engineer.

The thickness of a single compacted Wet Mix Macadam layer shall not be less than 75mm. When vibrating or other approved types of compacting equipment are used, the compacted depth of a single layer of the sub-base course may be increased to 200 mm approval of the Engineer.

#### **406.2. Materials**

##### **406.2.1. Aggregates**

**406.2.1.1. Physical requirements:** Course aggregates shall be crushed stone. If crushed gravel/shingle is used, not less than 90 per cent by weight of the gravel/shingle pieces retained on 4.75 mm sieve shall have at least two fractured faces. The aggregates shall conform to the physical requirements set forth in Table 400-10 below.

**TABLE 400-10. PHYSICAL REQUIREMENTS OF COARSE AGGREGATES FOR WET MIX MACADAM FOR SUB-BASE/BASE COURSES**

Test	Test Method	Requirements
------	-------------	--------------

1	* Los Angeles Abrasion value Or * Aggregate Impact value	IS:2386 (Part-4) IS:2386 (Part-4) or IS:5640**	40 per cent (Max)  30 per cent (Max)
2	Combined Flakiness and Elongation Indices (Total)***	IS:2386 (Part-1)	35 per cent (Max)

\* Aggregate may satisfy requirements of either of the two tests.

\* To determine this combined proportion, the flaky stone from a representative sample should first be separated out. Flakiness index is weight of flaky stone metal divided by weight of stone sample. Only the elongated particles are separated out from the remaining (non-flaky) stone metal. Elongation index is weight of elongated particles divided by total non-flaky particles. The value of flakiness index and elongation index so found are added up. If the water absorption value of the coarse aggregate is greater than 2 per cent, the soundness test shall be carried out on the material delivered to site as per IS: 2386(Part-5).

**406.2.1.2. Grading requirements:** The aggregates shall conform to the grading given in Table

**TABLE 400 - 11 GRADING REQUIREMENTS OF AGGREGATES FOR WET MIX  
MACADAM**

IS Sieve Designation Per cent by weight passing the IS Sieve	
53mm	100
45mm	95-100
26.5mm	--
22.40mm	60-90
11.20mm	40-60
4.75mm	25-40
2.36mm	15-30
600 Micron	8-22
75 Micron	0-8
Materials finer than 425 microns shall have Plasticity Index(PI) not exceeding 6	

The final gradation approved within these limits shall be well graded from coarse to fine and shall not vary from the low limit on one sieve to the high limit on the adjacent sieve or vice versa.

### **406.3. Construction Operations**

**406.3.1. Preparation of base:** Clause 404.3. 1 shall apply.

**406.3.2.** Provision of lateral confinement of aggregates: While constructing wet mix macadam, arrangement shall be made for the lateral confinement of wet mix. This shall be done by laying materials in adjoining shoulders along with that of wet mix macadam layer and following the sequence of operations described in Clause 407.4.1.

**406.3.3. Preparation of mix:** Wet Mix Macadam shall be prepared in an approved mixing plant of suitable capacity having provision for controlled addition of water and forced/positive mixing arrangement like pug mill or pan type mixer of concrete batching plant. For small quantity of wet mix work, the Engineer may permit the mixing to be done in concrete mixers.

Optimum moisture for mixing shall be determined in accordance with IS: 2720 (Part-8) after replacing the aggregate fraction retained on 22.4 mm sieve with material of 4.75mm to 22.4 mm size. While adding water, dew allowance should be made for evaporation losses. However, at the time of compaction, water in the wet mix should not vary from the optimum value by more than agreed limits. The mixed material should be uniformly wet and no segregation should be permitted.

**406.3.4. Spreading of mix:** Immediately after mixing, the aggregates shall be spread uniformly and evenly upon the prepared sub grade/sub- base/base in required quantities. In no case should these be dumped in heaps directly on the area where these are to be laid nor shall their hauling over a partly completed stretch be permitted.

The mix may be spread either by a paver finisher or motor grader. For portions where mechanical means cannot be used, manual means as approved by the Engineer shall be used. The motor grader shall be capable of spreading the material uniformly all over the surface. Its blade shall have hydraulic control suitable for initial adjustments and maintaining the same so as to achieve the specified slope and grade.

**The paver finisher shall be self-propelled, having the following features:**

(i)	Loading hoppers and suitable distribution mechanism
(ii)	The screed shall have tamping and vibrating arrangement for initial compaction to the layer as it is spread without rutting or otherwise marring the surface profile.
(iii)	The paver shall be equipped with necessary control mechanism so as to ensure that the finished surface is free from surface blemishes.

The surface of the aggregate shall be carefully checked with templates and all high or low spots remedied by removing or adding aggregate as may be required. The layer may be tested by depth blocks during construction. No segregation of



larger and fine particles should be allowed. The aggregates as spread should be of uniform gradation with no pockets of fine materials.

**406.3.5. Compaction:** After the mix has been laid to the required thickness, grade and cross fall / camber the same shall be uniformly compacted, to the full depth with suitable roller. If the thickness of single compacted layer does not exceed 100 mm, a smooth wheel roller of 80 to 100 KN weight may be used. For a compacted single layer up to 200 mm, the compaction shall be done with the help of vibratory roller of minimum static weight of 80 to 100 KN or equivalent capacity roller. The speed of the roller shall not exceed 5 km/h.

In portions having unidirectional cross fall / super elevation, rolling shall commence from the lower edge and progress gradually towards the upper edge. Thereafter, roller should progress parallel to the centre line of the road, uniformly over-lapping each preceding track by at least one third width until the entire surface has been rolled.

Alternate trips of the roller shall be terminated in stops at least 1 m away from any preceding stop.

In portions in camber, rolling should begin at the edge with the roller running forward and backward until the edges have been firmly compacted. The roller shall then progress gradually towards the centre parallel to the centre line of the road uniformly overlapping each of the preceding tracks by at least one-third width until the entire surface has been rolled.

Any displacement occurring as a result of reversing of the direction of a roller or from any other cause shall be corrected at once as specified and/or removed and made good.

Along forms, kerb, walls or other places not accessible to the roller, the mixture shall be thoroughly compacted with mechanical tampers or a plate compactor. Skin patching of an area without scarifying the surface to permit proper bonding of the added material shall not be permitted.

Rolling should not be done when the sub grade is soft or yielding or when it causes a wave-like motion in the sub-base/base course or sub grade. If irregularities develop during rolling which exceed 12 mm when tested with a 3-metre straight edge, the surface should be loosened and premixed material added or removed as required before rolling again so as to achieve a uniform surface conforming to the desired grade and cross fall. In no case should the use of unmixed material be permitted to make up the depressions.

Rolling shall be continued till the density achieved is at least 98 per cent of the maximum dry density for the material as determined by the method outlined in IS: 2720(Part-8)

After completion, the surface of any finished layer shall be well closed, free from movement under compaction equipment or any compaction planes, ridges, cracks and loose material. All loose, segregated or otherwise defective areas shall be made good to the full thickness of the layer and recomputed.

**406.3.6. Setting and drying:** After final compaction of wet mix macadam course, the road shall be allowed to dry for 24 hours.

**406.4. Opening to Traffic**

Preferably no vehicular traffic of any kind should be allowed on the finished wet mix macadam surface till it has dried and the wearing course lay.

**406.5. Surface Finish and Quality Control of Work**

**406.5.1. Surface evenness:** The surface finish of construction shall conform to the requirements of Clause 902.

**406.5.2. Quality control:** Control on the quality of materials and works shall be exercised by the Engineer in accordance with Section 900.

**406.6. Rectification of Surface Irregularity**

Where the surface irregularity of the wet mix macadam course exceeds the permissible tolerances or where the course is otherwise defective due to sub grade soil getting mixed with the aggregates, the full thickness of the layer shall be scarified over the affected area, reshaped with added premixed material or removed and replaced with fresh premixed material as applicable and recomputed in accordance with Clause 406.3. The area treated in the aforesaid manner shall not be less than 5 m long and 2m wide. In no case shall depressions be filled up with unmixed and un graded material or fines.

**406.7. Arrangement for Traffic**

During the period of construction, arrangement of traffic shall be done as per Clause 112.

**406.8. Measurements for Payment**

Wet mix macadam shall be measured as finished work in position in **cubic metres**,

**406.9. Rates**

The Contract unit rate for wet mix macadam shall be payment in full for carrying out the required operations including full compensation for all components listed in Clause 401.8.

**Item No. 129 :-** Compaction and finishing of cement concrete road by tremix process, providing extra labour charge for tremix ( Vacuum dewatering service ) process on cement concrete road surface by using vacuum dewatering pump floater surface vibrator including making groove 5mm width and filling with polyvynile polymer and rough finish to surface as per instruction including leveling etc. complete.

#### 1.0.

**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 expire 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 conceding 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, 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 130.**

**Providing and fixing junction board of M.S. plates and angles as per standardised IRC design including fixing in C.C. 1:4:8 with necessary excavation, painting, figuring and lettering on board etc. comp.**

**Placement and Operation of Road Signs**

Placement of road signs will be within road users' view. To aid in conveying proper meaning, road signs will be positioned with respect to the location or situation to which it applies. The location and legibility of the road sign will be such as to provide adequate response time to road users to read and take action at the operating speed.

**Orientation of Signs**

The signs will be placed at right angles to the line of travel of the approaching traffic. Where light reflection from the sign face is encountered to such an extent as to reduce legibility, the sign should be turned slightly away from the road. On horizontal curves, the sign should not be fixed normal to the carriageway but the angle of placement will be determined with regard to the course of the approaching traffic.

Sign faces will be normally vertical, but on gradients it may be desirable to tilt a sign forward or backward from the vertical to make it normal to the line of sight and improve the viewing angle.

Cautionary/warning and mandatory signs will be fabricated through process of screen printing. In case the facility is not locally available in the region of work, these signs and informatory signs may have inscription /message having cut letters of non-reflective black sheeting which shall be bonded well or the base sheeting as directed by Engineer in charge.

**1. Material for Signs:**

The various materials and fabrication of road signs shall conform to the following requirements:

**1.1 Concrete**

Concrete for footing shall be of the grade shown on the contract drawings or of minimum M15 grade conforming to section 800 of the specifications for MORD.

**1.2 Reinforcing Steel**

Reinforcing steel shall conform to the requirements of IS 1786 unless otherwise specified.

**1.3 Bolts, Nuts and Washers**

High strength bolts shall conform to IS 1367 whereas precision bolts, nuts, etc. shall conform to IS 1364.

#### 1.4 Plates and Supports

Plates and support sections for the signposts shall conform to IS 226 and IS 2062 or any other stated IS specification.

#### 1.5 Substrate

Aluminium Composite Material(ACM) conforming to following subsections.

##### a) Aluminium Sheet

Aluminium sheets used for sign boards shall be of smooth, hard and corrosion resistant aluminium alloy conforming to IS 736 - Material Designation 24345 or 1900.

##### b) Aluminum Composite Material (ACM)

ACM sheets used for sign boards is a sandwiched construction with a thermoplastic core of „Low Density Polyethylene” (LDPE) between two thick skins/sheets of Aluminium with overall thickness of 4 mm and 3 mm, and Aluminium skin thickness of 0.4 - 0.5 mm and 0.25 - 0.3 mm respectively on both sides. The retro reflective sheeting must be applied on the top surface with aluminum surface with recommended surface preparation from sheeting manufacturer. A fluorocarbon coating may be applied over the exposed surface of aluminium to ensure corrosion resistant and weatherability and shall conform to relevant ASTM. The mechanical properties of 4mm and 3mm ACM and that of its Aluminum skin shall conform to the requirement given in Table 1.1, when tested in accordance with the test methods mentioned against each of them

Table 1.1 Specifications for Aluminum Composite Material (ACM)

Sl No.	Description	Specification for 4mm		Specification for 3mm
		Standard test	Acceptable value	Acceptable value
A	<b>Mechanical Properties of ACM</b>			
1	Peel off strength with retro reflective sheeting. (Drum Peel Test)	ASTM D903	Min. 4 N/mm	Min. 4 N/mm
2	Tensile strength	ASTM E8	Min. 40 N/mm <sup>2</sup>	Min. 30 N/mm <sup>2</sup>
3	0.2% Proof Stress	ASTM E8	Min. 34 N/mm <sup>2</sup>	Min. 34 N/mm <sup>2</sup>
4	Elongation	ASTM E8	Min. 6 %	Min. 5 %
5	Flexural strength	ASTM C393	Min. 130 N/mm <sup>2</sup>	Min. 120 N/mm <sup>2</sup>
6	Shear strength with Punch shear test	ASTM D732	Min. 18 N/mm <sup>2</sup>	Min. 18 N/mm <sup>2</sup>
B	<b>Properties of Aluminium Skin</b>			
1	Tensile strength (Rm)	ASTM E8	Min. 150 N/mm <sup>2</sup>	Min. 130 N/mm <sup>2</sup>
2	Modulus of elasticity	ASTM E8	Min. 70,000 N/mm <sup>2</sup>	Min. 70,000 N/mm <sup>2</sup>

<b>3</b>	Elongation	ASTM E8	A <sub>50</sub> Min. 2%	A <sub>50</sub> Min. 2%
<b>4</b>	0.2 % Proof Stress	ASTM E8	Min. 110 N/mm <sup>2</sup>	Min. 110 N/mm <sup>2</sup>

### c) Plate Thickness

Shoulder mounted ground signs with a maximum side dimension not exceeding 600 mm shall not be less 3 mm thick with Aluminium Composite Material. All other signs shall be at least 4 mm thick with Aluminium Composite Material. The thickness of the sheet shall be related to the size of the sign and its support and shall be such that it does not bend or deform under prevailing wind and other loads. All overhead signs made with Aluminium Composite Material shall be minimum 4 mm thick to withstand wind and other loads without deformation.

## 1.6 Retro Reflective Sheeting

The retro reflective sheeting used on the signs shall consist of white or coloured sheeting having a smooth outer surface, which has the property of retro reflection over its entire surface. It shall be weather resistant and exhibit colour fastness. It shall be new and unused and show no evidence of cracking, scaling, and pitting, blistering, edge lifting or curling and shall have negligible shrinkage or expansion. A certificate of having the sheeting tested for coefficient of retro reflection, daytime colour and luminance, shrinkage, flexibility, liner removal, adhesion, impact resistance, specular gloss and fungus resistance, 3 years outdoor weathering and its having passed these tests shall be obtained from International/Government laboratory/Institute by the manufacturer of the sheeting and in case the certificate is obtained from international agency, it should also be obtained from Indian agency within 3 years of launching of product by the manufacturer in abroad. Alternatively, a certificate conforming to ASTM Specification (D 4956-09) on artificial accelerated weathering requirements from a reputed laboratory in India will be accepted. The supplier will have to submit performance guarantee of meeting the requirement of three years outdoor weathering of the sheeting.

All micro prismatic grade sheets will be as per ASTM D 4956-09 Type IV. The reflective sheeting

shall be made of micro prismatic retro-reflective material. The retro-reflective surface, after

cleaning with soap and water and in dry condition shall have the minimum coefficient of retro reflection (determined in accordance with ASTM D 4956-09), When totally wet, the sheeting shall show not less than 90 percent of the values, of retro-reflection indicated in 6.4. at the end of the 7 years, the sheeting shall retain at least 80 percent of its original retro-reflectance.

Table 6.4: Acceptable Minimum Coefficient of Retro-reflection for Type-IV Prismatic Grade

Sheeting (Candelas per Lux per Square Metre)

Observation Angle	Entrance Angle	White	Yellow	Orange	Green	Red	Blue	Brown	Fluorescent Yellow-Green	Fluorescent Yellow	Fluorescent Orange
0.1° <sup>B</sup>	-4°	500	380	200	70	90	42	25	400	300	150
0.1° <sup>B</sup>	+30°	240	175	94	32	42	20	12	185	140	70
0.2°	-4°	360	270	145	50	65	30	18	290	220	105
0.2°	+30°	170	135	68	25	30	14	8.5	135	100	50
0.5°	-4°	150	110	60	21	27	13	7.5	120	90	45
0.5°	+30°	72	54	28	10	13	6	3.5	55	40	22

<sup>A</sup>Minimum Coefficient of Retro reflection ( $R_A$ )(cd.lx<sup>-1</sup>.m<sup>-2</sup>).

<sup>B</sup>Values for 0.1° observation angles are supplementary requirements that shall apply only when specified by the purchaser in the contract or order.

**1.7 Messages/borders:** The message (legends, letters, numerals etc.) letter, numerals, symbols /legend/arrow etc. in Gujarati, Hindi and /or English, should either be screen-printed or to be cut out from durable transparent Overlay Electrocutable film or cut out from the same type of reflective sheeting for the cautionary /mandatory sign boards. The screen printing shall be processed and finished with materials and in a manner specified by the sheeting manufacturer. For the informative and other sign boards, the messages (legends, letters, numerals etc.) and borders shall be cut out from durable transparent overlay film or cut-out from the same reflective sheeting only. Cut out shall be from durable transparent overlay materials as specified by the sheeting manufacturer and shall be bonded with the sheeting in the manner specified by the manufacturer. For screen-printed transparent coloured areas on white sheeting, the coefficient of retro-reflection shall not be less than 50 per cent of the values of corresponding colour in the above table. Cut-out messages and borders, wherever used, shall be either made out of retro reflective sheeting or made out of durable transparent overlay except those in black which shall be of non-reflective sheeting or opaque in case of durable transparent overlay.

**1.8 Adhesives:** The sheeting shall have a pressure-sensitive adhesive of the aggressive-tack type requiring no heat, solvent or other preparation for adhesion to a smooth clean surface. The adhesive shall be protected by a removable liner (removable by peeling without soaking in water or other solvent) and shall be suitable for the type of material of the base plate used for the sign. The adhesive shall form a durable bond to smooth, corrosion and weather resistant surface of the base plate such that it shall not be possible to remove the sheeting from the sign base in one piece by use of sharp instrument. In case of pressure-sensitive adhesive sheeting, the sheeting shall be applied in accordance with the manufacturer's Specifications.



## **1.9 Fabrication:**

Surface to be reflectorised shall be effectively prepared to receive the retroreflective sheeting. The aluminum sheeting shall be de-greased either by acid or hot alkaline etching and all scale/dust removed to obtain a smooth plain surface before the application of retro-reflective sheeting. If the surface is rough, approved surface primer may be used. After cleaning, metal shall not be handled, except by suitable device or clean canvas gloves, between all cleaning and preparation operation and application of reflective sheeting/primer. There shall be no opportunity for metal to come in contact with grease, oil or other contaminants prior to the application of retro-reflective sheeting. Complete sheets of the material shall be used on the signs except where it is unavoidable. At splices, sheeting with pressure-sensitive adhesives shall be overlapped not less than 5 mm. Where screen printing with transparent colours is proposed, only butt joint shall be used. The material shall cover the sign surface evenly and shall be free from twists, cracks and folds. Cut-outs to produce legends and borders shall be bonded with the sheeting in the manner specified by the manufacturer.

## **1.10 Installation**

**1.10.1** Sign posts, their foundations and sign mountings shall be so constructed as to hold these in a proper and permanent position against the normal storm wind loads or displacement by vandalism. Normally, signs with an area upto 0.9 sq. m. shall be mounted on a single post, and for greater area two or more supports shall be provided. Sign supports may be of mild steel, reinforced concrete or galvanized iron (G.I.). Post(s) shall be firmly fixed to the ground by means of properly designed foundation. The work of foundation shall conform to relevant Specifications as specified.

**1.10.2** All components of sign and supports, other than the reflective portion and MS / G.I. posts shall be thoroughly descaled, cleaned, primed and painted with two coats of epoxy paint. Any part of mild steel (M.S.) post below ground shall be painted with three coats of red lead paint.

**1.10.3** The signs shall be fixed to the posts by welding in the case of steel posts and by bolts and washers of suitable size in the case of reinforced concrete or G.I. posts. After the nuts have been tightened, the tails of the bolts shall be furred over with a hammer to prevent removal.

### **1.10.4 Fixing**

#### **1.10.4.1 Materials**

The various materials and fabrication of the traffic signs shall conform to the following requirements:

**4.1.1. Concrete:** Concrete shall be of the M20 grade or as shown on the Contract drawings or otherwise as directed by the Engineer.

**4.1.2. Water:** Water shall conform to IS: 456-1978. Storage & handling of water shall be clean.

**4.1.3. Cement:** Cement shall conform to IS: 269-1976 or I.S: 455-1976.

**4.1.4. Sand, aggregates:** Sand, aggregate & its gradation shall conform to M6, M12 & M13 of General Technical Specifications for Building Works..

#### **1.10.4.2. Installation**

**4.2.1.** The supporting structure and signs shall be fabricated and erected as per details given in the plans.

**4.2.2.** The work of construction of foundation for sign supports including excavation and backfill, forms, steel reinforcement, concrete and its placement shall conform to the relevant Specifications given in these Specifications.

**4.2.3.** Signs posts, their foundations and sign mountings shall be so constructed as to hold signs in a proper and permanent position to adequately resist swaying in the wind or displacement by vandalism.

**4.2.4** After installation of sign is complete, the sign shall be inspected by the Engineer. If specular reflection is apparent on any sign, its positioning shall be adjusted by the Contractor to eliminate or minimize this condition.

**1.11 Warranty and durability:** The Contractor shall obtain from the manufacture a seven-year warranty for satisfactory field performance including stipulated retroreflectance of the retro-reflectance sheeting. And submit the same to the Engineer. The Contractor/supplier shall also furnish a certification that the signs and materials supplied against the assigned work meets all the stipulated requirements and carry the stipulated warranty. Processed and applied in accordance with recommended procedures, the reflective material shall be weather resistant and, following cleaning, shall show no appreciable discolouration, cracking, blistering or dimensional change and shall not have less than 50 per cent of the specified minimum reflective intensity values (Table 800-1 and 800-2) when subjected to accelerated weathering for 1000 hours, using type E or EH weatherometer (AASHTO Designation M 268).

#### **1.12 Measurements for Payment**

The measurement of standard cautionary, mandatory and information signs supplied and fixed, while for direction and place identification signs, these shall be measured in No. basis.

#### **1.13 Rate**

The Contract unit rate shall be payment in full for the cost of making the road sign, including all materials, installing it at the site and incidentals to complete the work in accordance with the Specifications.

**Item No. 131 :- Providing and laying cement concrete 1:2:4 ( 1 cement : 2 coarse sand : 4 graded stone aggregate 20mm nominal size ) and curing complete excluding cost of form work in (a) foundation and plinth.**

**1.0. Materials**

Water shall conform to M-1. Cement shall conform to M-3. Sand shall conform to M-6. Stone aggregate 20 mm. nominal size shall conform to M-12. Cement concrete of 1:2:4 proportion measured by volume shall conform to relevant specifications of ordinary grade 1:2:4 concrete.

**2.0. Workmanship**

**2.1.** The cement concrete flooring of 20 mm thick (Average) is to be laid as per the site condition.

The concrete shall be mixed in a mechanical mixer at the work. Hand mixing may however be allowed for smaller quantities of work and in case of failure of machineries or as permitted by the Engineer-in-charge. It shall be carried out on a water tight platform and care shall be taken to ensure that mixing is continued until the mass is uniform in colour and consistency. However in such cases 10% more cement than otherwise required shall have to be used without any extra cost. The mechanical mixing shall be done for period of 1.1/2 to 2 minutes. The quantity of water shall be just sufficient to produce a dense concrete of required workability for the purpose. Flooring of specified thickness shall be laid in accordance with approved pattern or as directed. Finishing operation shall depend upon the temperature and atmospheric conditions. The surface shall be left for some time till moisture disappears from it. Fresh quantity of cement shall be mixed with water to form a thick slurry and spread over the surface while the concrete is still green. Use of dry cement or cement and sand mixture sprinkled on this surface to stiffen the concrete or absorb excessive moisture shall not be permitted. The cement slurry shall then be properly pressed twice by means of iron floats, once when the slurry is applied and the second time when cement setting and finished floated smooth. The surface shall be marked with string or B.R.C. fabric jali to make the surface non-slippery as and when directed. The junction of floors with wall plaster, dado or skirting shall be rounded off where so required up to 25 mm. radius. Flooring in lavatories and bath rooms shall be laid after fixing of water closet and squatting pans and floor traps which shall be plugged while laying the floors and opened after the floors are completed. Any damage done to water supply or sanitary fittings during execution of work shall be made good.

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

**2.3.** The form work shall be provided if necessary as directed by Engineer-in-charge. Concreting shall be done as per alternate bay method with necessary centering either by mastic or cement mortar as directed.

**3.0. Mode of measurements & payment**

**3.1.** The rate shall include the cost of all materials and labour involved in all the operations described above. No deduction shall be made or extra paid for any opening up to 0.1 sq. mt. In area in the floor, nothing extra shall be paid for laying the floor at different levels in the same room or the counter yard.

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

### **Item no 132**

Providing and fixing 72 x 72 x 3.2mm thick M.S. pipe parking shed post & Rafter , MS 50 x 50 x 2mm pipe purlines with necessary M.S. plate 8mm thick including cutting , bending , grinding , welding , drilling for nut bolts including painting two coats of oil painting over primer coat etc. complete.

As per above description & applying as per site in charge.

### **Item no 133**

Providing and fixing 6mm thick polycarbonate multi wall roofing sheet fixed with hilti screw and rubber silicon sealer and aluminium strip of size 50x 3 mm etc complete as directed by engineer in charge

As per above description & applying as per site in charge.

Item No. 134 :- Providing water harvesting pit 2.40 mt dia x 2.40 mt depth with excavation in any strata filling the pit with brick bats in 0.60 mt depth, 0.30 mt with 25mm to 40mm kapchi 0.30 mt with 10mm to 20mm kapchi & 2.00 mm depth with coarse sand in layer including maing the lines (PVC) for water inlet etc. as directed including 250mm dia bore work with 6" PVC" pipe upto 35mt etc, comp.

As per site incharge instruction.

#### Item No. 135

**Plantation of tree in soil including digging 45 x 45 x 45 cm size pits preparing soil providing and mixing organic fertilizer watering planting and filling the pits as per direction including etc. complete.**

#### **1.0 WORKMANSHIP**

- 1.1** Site shall be cleaned by removing all type of impurities and waste material and all type of organic materials as directed by Engineer in charge.
- 1.2** Pits shall be digged as directed by Engineer in charge and Yellow soil shall be mixed with chemicals, Pesticides, Fungicides, hormones of approved make and quality shall be mixed in proportion as directed by Engineer in charge.
- 1.3** The tree guard shall be provided having size and shape of 37 cm. diameter weld mesh covered tree-guard 1.95 m. height including keeping 75mm. x 25mm. spacing in weld mesh jail of 3mm.thickness including 3 Nos. 10mm.dia mild steel rings round the weld mesh jail including 75cm.long 3 Nos. of 35mm. x 35mm. x 3mm. thick M.S. equal angles as shown in the drawing attached including 0.71 mm. thick (22 gauge) M.S. Plate of size 30cm. x 15cm shall be fixed as directed

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

**1.1.** The unit rate of **Plantation of tree** shall include the cost of all materials, tools and plant required for laying, the same to specified position as per drawings, and as directed by Engineer in charge, etc, and all other incidental expenses for producing item of border plantation work to complete the structure or its components as shown on the drawings, and as directed by Engineer in charge and according to these specifications. They shall also include the cost of making, mixing, recommended fertilizers, chemicals Pesticides fungicides, hormones etc.

**1.2.** The **Plantation of tree** work shall be measured for its **Number**, limiting dimensions to those specified on plan or as directed. The rate shall be for a unit of one square meter

**1.3.** The payment will be made on **Number** basis of the finished work.

#### **Item No. 136**

**Providing Tree Plants having minimum 1.00mt. Height and healthy growth of various kinds as like Peltandra, Palm, Gulmohore, Karanj, Amla, Rain tree, Saptparni, Cherry, Cryjeliya, Spethodiya, Paras Pipala, Garmalo, Neem, Borsalli, Kadam, Buch, Chanpo, Asopalav etc. as per instruction by engineer in charge.**

**Maintenance of Planted tree upto two year** shall be including filling necessary yellow soil as per requirements and watering periodically and regularly including providing and spreading fertilizers and chemicals as per periodical requirements. Only skilled persons having experience of gardening like Mali shall be employed for **Maintenance of Planted tree upto two year**. Yellow soil, fertilizers chemicals Pesticides Fungicides Hormones of approved brand and make, shall be used as directed by Engineer or Expert.

#### **1.0 WORKMENSHEEP**

- 1.1** Site shall be cleaned by removing all type of impurities and waste material and all type of organic materials as directed by Engineer in charge.
- 1.2** Yellow soil of approved quality shall be uniformly spread as per required thickness uniformly shall be dressed to required level and slope. The yellow soil shall be mixed with organic fertilizer in proportion as directed by Engineer in charge and recommended chemicals, Pesticides, Fungicides, hormones of approved make and quality shall be mixed in proportion as directed by Engineer in charge.
- 1.3** The Plants shall be Regularly watered throughout the area and plants shall be maintained as directed by Engineer in charge or expert
- 1.4** The Plants shall then be watered regularly.
- 1.5** The plants shall be regularly maintained by cleaning, sweeping, watering, spreading chemicals and Pesticides periodically as directed by Engineer in charge.
- 1.6** The plants shall be maintained for two years including watering throughout the area and applying anti termite treatment ones a month

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

**1.1.** The unit rate of **Maintenance of Planted tree upto two year** shall include the cost of all materials, tools and plant required for laying, the same to specified position as per drawings, and as directed by Engineer in charge or expert and all other incidental expenses for producing item of **Maintenance of Planted tree upto two year** work to complete the structure or its components as shown on the drawings, and as directed by Engineer in charge and according to these specifications. They shall also include the cost of making, mixing, recommended fertilizers, chemicals Pesticides fungicides, hormones etc. The unit rate also includes the cost of maintaining the same continuously for two years

The rate of **Maintenance of Planted tree upto two year** shall include the cost of all labour, materials, fertilizers chemicals, continuous maintenance for three months as required, tools and plant and all incidental expenses as described herein above.

**1.2.** The garden plot semi carpet 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

**1.3.** The payment will be made on **No.** basis of the finished work.

**Item no 137**

Providing and erecting open well type horizontal monoblock pumpset with C.I. body having following specification. (i) 1H.P. Single phase open well motor pumpset suitable for 145lpm ( ii) Suitable for 32 dia delivery pipe with control panel & 10mtr. Long

AS per site in charge direction.

**Item no 138**

Providing and fixing Drip Irrigation system of approved brand for Plantation including fixing with water supply line and planations per drawing and requirement

AS per site in charge direction.



**Item No. 139 :- Providing and fixing gun metal check or non return fullway controll wheel valve 50mm dia.**

**1.0. Materials :**

The gun metal check or not return full way wheel valve or specified dia. 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. 140 :- Providing and laying in trenches 10.0kg.f/ Sqcm working pressure PVC pipes for water sully line of the follwing outside dia having white colour complete with necessary fittings clamps etc. (B) 50mm**

**1.0. Materials**

- 1.1. The specified dia. of **10.0kg.f/ Sqcm working pressure PVC pipes** shall conform M-68.

**2.0. Workmanship**

- 2.1. Asbestos cement rain water pipes and fittings shall be of the diameter, size and type specified in the item. The pipe shall be full lengths of 2 meter as far as possible. All the pipes shall be fixed on wall face at locations indicated on drawings or as ordered by the Engineer-in-charge. Pipe shall be secured to face of wall below all joints by M.S. clamps with wooden gut ties.
- 2.2. The spigot of the upper pipe shall be properly fitted into the socket of the lower pipe such that there is uniform annular space for fitting with the jointing materials. One third depth of annular space between the item. The pipe shall be full lengths of 2 meter as far as possible. All the pipes shall be fixed on wall face at locations indicated on drawings or as ordered by the Engineer-in-charge. Pipe shall be secured to face of wall below all joints by M.S. clamps with wooden gut ties.
- 2.2. The spigot of the upper pipe shall be properly fitted into the socket of the lower pipe such that there is uniform annular space for fitting with the jointing materials. One third depth of annular space between the socket and the spigot shall be filled with spun-yarn soaked in bitumatic jointing compound and shall be pressed home by means of caulking tool. The remaining 2/3 depth of the joints shall be filled in with stiff cement mortar 1:2 and shall be pressed with caulking tool and finished smooth at top at an angle of 45 sloping up.
- 2.3 The joints shall be filled with cement mortar 1:2 (1 cement : 2 sand) span spun yarn. The joints shall be filled with cement mortar 1.2 (1 cement : 2 sand) and spurn yarn. The pipes without care shall be fixed to wall with M.S. clamps The pipes will earns shall be secured with 40 mm before steel or iron barrel distance pieces or boils and stout galvanised iron nails 10 cms long into hand wool plug fixed in walls. Access doors to fittings shall be provided with 3 mm. rubber insertion packing and secured without screws to made air and water tight
- 2.4. All soil pipes shall be earned up above the roof and shall have a wire ball on guarded or a cowl.
- 2.5. The ventilating pipe or shaft shall be carried out to a height of at least one meter above the outer covering of the roof of the building or in the case of windows in a gable wall or a dormer windows, it shall carried up to a ridge of the roof or at least tow meters above the top of the windows. In case of flat roof to which access for use is provided, it shall be carried out up to a height of at least on meter above the parapet or two meters measured vertically from the top of any windows or opening which any exist up to a horizontal distance of five meters from the vent pipe into such building and in no case shall be carried out to a height less then three meters.
- 2.6. Where ventilating pipes are carried in pipe shafts, the shaft shall be of a minimum size of one meter. If !he shells are also used to give fight and air to rooms, the ventilating pipes must be

carried out to a horizontal distance at root level not less than five meter from the site of the shaft.

- 2.7. The sand cast iron pipes above parapet shall be fixed with M.S. clamps and stays. The clamps shall be made from 1.5 mm. thick MS flat or 3 mm. width band to the required shape and size to fit tightly one the sockets when tightened with screw bolts. It shall be formed of two semi circular pieces with flanged ends on both sides, with holes to fit in the screw bolts and nuts 40 mm. dia. M.S. Bars, One end of the stay shall be bent to form a hook to be fixed with clamps by means of bolts and the other end shall be bent for embedding in wall in cement concrete block of size 200 mm. x 100 mm. x 100 mm. in 1:2:4 mix. The concrete shall be finished to match the surrounding surfaces.
- 2.8. The connection between the main pipe and branch pipes shall be made by using branches and bends with access doors for cleaning
- 2.9. The waste from lavatories, kitchens basins, sinks, baths and other floor traps shall be separately connected to respective stacks of upper floor. The waste stack of lavatories shall be connected directly to main hole while the waste stack of other shall be separately discharged over gulley trap.
- 3.0. **Mode of measurements and payment**
- 3.1. The length of pipe shall be measured including all fittings along its length in running meters correct to a centimeter. No allowance shall be made for the portion of pipe length entered in the sockets of the adjacent pipe of fittings.
- 3.2. The rate includes all labour and materials, tools and plant etc. required for satisfactory completion of this item.
- 3.3. The rate shall be for a unit of One running meter.

**Item No. 141 :- Providing and laying in trenches 10.0kg.f/ Sqcm working pressure PVC pipes for water sully line of the follwing outside dia having white colour complete with necessary fittings clamps etc. (A) 32mm**  
**AS per site incharge**

**Item no 143**

**Filling in Garden with selected soil in layers of 20 cm. thickness including watering, ramming and consolidating etc. comp.**

**As per above description and applying as per site incharge.**

**Item no 144**

**Planting of lawn of approved quality at 15 cms diagonally, maintenance of the lawn till virtual completion of soft landscape work : removal of all thatching through out the area: along with appropriate use of termite and of weedixite as and when required and grassing lawn.**

**As per above description and applying as per site incharge.**

### **Item No. 145**

**Earth work for embankment including breaking clods, dressing with all lead and lift (including watering and consolidation) including rolling of earth work in layers with power roller including filling indepressions which occur during the process. (D) From Borrow area within 2.0 Km. lead**

1.The land width on which the earth work is to be done shall be cleared off all the trees having girth of 30 cm and less, loose stones, vegetations, bushes, slumps and all other objectionable material shall be arranged in convenient stack along the road boundary or as directed at place within 50 meters lead and handed over to the department in convenient section. Unsuitable material shall be burnt or otherwise disposed off by the contractor at his own cost without causing any nuisance, inconvenience or damage to the works property or people in the neighborhood. In all cases the materials shall be disposed off in an a neat manner.

2.After cleaning the site, the alignment of the road shall be properly set out true to line, curves, slopes, graded and sections as shown on the plan or directed by the Engineer in charge. The contractor shall provide all labours and materials such as lime, strings, pegs, nails, bamboos, stone, mortar, concrete etc. required for setting out, establishing bench marks and giving profiles. The contractor shall be responsible for maintaining benchmarks, profiles, alignments and other marks as long as they are required for the work in the opinion of the Engineer in charge. If the contractor defaults in this respect they may be restored by the department at the cost of contractor.

3.When existing embankment is to be widened, continuous horizontal benches, each at least 0.30meter wide shall be cut into the existing slopes for insuring adequate bond with the fresh embankment material to be added. The material obtained from the cutting of benches can be utilized in the widening of the embankment. Where the width of widened portion, is insufficient to permit the use of rollers. Compaction shall be carried out with the help of tandem / sheep foot rollers, hand rollers, mechanical tampers or other approved plant. The dumping of material from trucks for widening operations shall be avoided except in difficult circumstances when the

extra width is too narrow to permit the movement of any other type of hauling equipment.

4.The soil to be used for the embankment shall be free from trees, slumps, roots, rubbish or any other objectionable materials. Only materials considered suitable by the Engineer in charge shall be used for the construction and that considered unsuitable other disposed off as directed by him. The selection the materials to be used in the construction of embankment shall be made after the soil surveys and investigations are carried out by the department. The embankment shall consist of earth available from road side borrow pits on either side with lead and all lifts and within land width in the manner specified in para 12 below. The road, if any required for the purpose haulage of earth by men, animals or vehicles will be constructed (if not existing) and maintained by the contractor at his own cost.

5.Department will extend all necessary cooperation in helping contractor to bet borrow area form nearby Government or Panchayat Land, if available. However, department is not responsible, if no such are is made available to the contractor in that case, contractor will have to make his own arrangement to get borrow area for borrowing earth of the approved quality even by making temporary arrangement with the private land owners.

5.The material satisfying the density requirements given in table below shall be employed for embankment construction

Type Of Work	Laboratory Dry Density when tested as per IS 2720 {Part VII)
Embankment Up to 3 meter Height	Not less than 1.44 gm/cc
Embankment exceeding 3 meter height or embankment of any height subject to lon period of inundation	Not less than 1.52 gm/cc
Top 0.50 meter of embankment below the sub grade level and shoulder ( where earth shoulder are specified	Not less than 1.65 gm/cc

Field density shall be percentage of laboratory density as recommended by Gujarat Engineering Research Institute. Location , shape and size of borrow pit shall be as indicated by Engineer In charge. Pit shall not be dug continuously. Ridges of not less than 8 meter width should be left at interval not exceeding 300 mete. Small drain shall be cut through ridges of facility drainage. The outer edge of borrow pit shall

be regulated that the bottom does not cut an imaginary line having a slope of 1 vertical to 4 horizontal projected from edge to final section of the bank, the maximum depth in any case being limited to 1.5 meter. Also no pits shall be dug within 5 meter of tow of the final section of road embankment.

5.1 No Borrow pits Shall be allowed at the following sites along the Road

- I. Up to 30 meter on either side of CD works;
- II. Up to 15 meter on either side of cart track crossing for which approaches are to be constructed.
- III. In the length in which earth obtained from cutting is specified to be used in embankment.

5.2 If there is, top layer of black cotton or other objectionable soils, the same shall be removed and disposed off elsewhere and usable material found at lower level will only be used in earthen embankment.

6. The embankment shall be constructed in uniform layers not exceeding 250mm in loose thickness. The soil shall be spread uniformly over the entire width of the embankment unless otherwise directed by the Engineer in charge. All clods of hard lumps of earth shall be broken to have maximum size of 15 cm, when being placed in the embankment and a maximum of size 5 cm when being placed in the top 45cm of the embankment and a maximum size of 15cm when being placed in the top 45cm of the embankment. The work of next layer shall be allowed only after the first layer below it has been thoroughly compacted to the density specified.

7. Where an embankment is to be placed on sloping ground the surface of the ground shall be benched in the steps of trenches or broken up in such a manner that the material shall have perfect bond with the existing surface. Where the embankment is to be laid over an existing road surface the surface shall be scarified to minimum depth of 5 cm so as to provide ample bond between the old and new material. However when the pavement shall be broken up in place not to exceeding 0.1 mt and may be left under the new embankment. If the existing road surface is of granular or bituminous type and line within 1 mt. of the new subgrade level the same shall be scarified to a depth of minimum 50mm so as to provide ample bond between the old and the new material.

8. To avoid interference with the construction of abutment, wing walls or return wall, culvers / bridge structures, the contractor shall at point to be determined by the Engineer in charge, suspend the work on embankment forming approaches to such structures, until such time as the construction of the latter is sufficiently

advanced to permit the completion of approaches without the risk of interference or damage to the bridge work. Unless directed otherwise the filling ground culverts, bridges and other structure upto a distance to twice the height of the embankment from the back of the embankment shall be carried out independent of the work on the main embankment. The fill material shall not be placed against any abutment or wing walls unless permission has been given by the Engineer in charge but in any case not until the concrete or masonry has been in position for 14 days. The embankment shall be brought up simultaneously with the laying of fill material. The material used for the filter shall conform to the requirements for filter medium and will be paid extra in the relevant item. Where it may be impracticable to use power roller or other heavy equipment, the compaction shall be carried out by mechanical tampers or other methods approved by the Engineer in charge. Care shall be taken to see that the compaction plant does not hit or come to close to any structural member so as to cause any damage to them.

9. The Embankment shall be finished in conformity with the alignment, levels, cross section and dimensions shown on the plans or as directed by Engineer in charge. Where the alignment of the road is a curve, the top of the embankment shall be formed with the super elevation and the increased width shown on the drawing or as the Engineer in charge may direct. Finishing operations shall include the work of shaping and dressing the shoulders, road bed and the side slopes to conform the cross section.

10. The earthwork measurements shall be paid on cross sectional measurements and computing the volumes of earthwork in cubic meter by average area method. The contractor shall sign day to day leveling work and also original cross section, longitudinal section etc., on token of his acceptance. The working section both longitudinal and cross of the ground shall be taken by the Engineer in charge before the actual work is started. The contractor or his authorized representative shall attend day to day leveling work and sign with date the field book daily, in token of his acceptance. If there is any disagreement, the contractor shall inform of it in writing the officer concerned with specified reference to the section officer before starting further work. Once the work is started, no cognizance of any complaint will be taken. Merely not signing of level books shall not be deemed as disagreement. The Executive Engineer shall also verify leveling work to the extent of 5% before



commencement of earthwork and on finalization. The contractor shall maintain the embankment by filling the rust, raincuts, depressions due to shrinkage etc. to proper formation and grade till this item is finally measured and accepted by the Department. The measurements shall be taken on compacted earthwork. No deduction for shrinkage shall be made from gross measured quantity of compacted earthwork. However the contractor shall have to bear loss of quantity due to all settlement as well as other types of deformations etc., if any, that might have taken place at the time of taking final measurements of this item. **The measurement may be taken on L x B x D basis. In this case 15.0 % shrinkage must be deducted from measurement. Net quantity is to be paid in cmt after deduction of shrinkage'**

11. The rate of earthwork includes clearing jungles, dogbelling, fixing profiles erecting necessary pillars for stones for bench marks for leveling purpose, excavating earth from borrow areas, breaking clods, conveying and spreading earth in layers with all lead and lift, finishing the entire embankment and incidentals necessary to complete the work to the specifications. The cutting stuff of cutting in ordinary soils, soft murrum, soft rock, hard murrum and hard rock shall be utilized in embankment construction under this item within the lead specified in that particular item. No payment shall be made under this item for the cutting stuff used in the embankment but labour for cutting will be paid as per specifications in that particulars item and only balance quantity of earthwork brought from borrow areas will be paid in this item.

## **Item No. 146**

**Drilling of 215mm dia. Bore in over burden strata (0-30) including lowering and fixing of 175 mm nominal dia UPVC pipe/175 mm dia ERW pipe upto required depth and further drilling of 165mm dia bore hole in rocky strata by DTH rig..**

### **GENERAL**

The work shall consist of Drilling of **150 mm diameter** bore hole for 175 mm diameter ERW/UPVC pipe up to required depth in over burden strata (maximum up to 30 meters or up to the depth and further drilling of 165 mm diameter bore hole in remaining rocky or sandstone strata up to 100 mtr. Depth or as suggested by Geologist / Hydrologist

Only trained personnel shall be employed for construction and supervision

### **1.0 DRILLING**

**1.1** Drilling of 150mm diameter bore hole for 175 mm diameter ERW/UPVC pipe up to required depth in over burden strata (maximum up to 30 meters or up to the depth as suggested by Engineer in Charge or Geologist / Hydrologist) and further drilling of 165 mm diameter bore hole in remaining rocky or sandstone strata up to 100 meter Depth or suggested by Geologist / Hydrologist. The drilling shall be done by the down the hole hammer type drilling Rig & lowering 175/200 mm diameter ERW/UPVC Pipes, Bore cap shall have to be provided by the Contractor Free of Cost. The carting of pipes and other materials etc. shall be carried out by contractor with all lead and lift to the site of work at his own cost.

**1.2.** Drilling work shall be carried out at the sites directed by the Engineer in Charge. The diameter of the hole shall be 150 mm in over burden strata and 165mm diameter in Rocky & Sandstone strata up to over all specified depth of 100 meters or as per suggested by Engineer in Charge or Geologist / Hydrologist. The Drilling shall be carried out in over burden strata up to maximum 30 Meters or up to the depth as suggested by Engineer in Charge or Geologist / Hydrologist. If further drilling can not be done due to overburden up to 30 meters, or in rocky & Hard or Sandstone strata due to Mechanical failure up to specified depth the drilling shall have to be stopped in consultation with Engineer-in- charge and no payment shall be made for such drilling carried out by the Contractor.

**1.3.** The 175mm diameter ERW / UPVC pipes should be lowered by the contractor in over burden strata. Contractor as desired by the Engineer in charge will carry out the jointing of pipes. Necessary jointing materials, steel bended plates etc. should be provided by the Contractor at his own cost.

### **2.0 DRILLING OPERATION**

**2.1.** The Drilling operation for drilling of Bores should be carried out by suitable rig to satisfy following.

**2.2.** For Drilling Through overburden:

1. The diameter of the bore in the over burden shall be sufficient for insection of 175mm diameter ERW/UPVC casing pipes with the joints and leaving sufficient annular space for grouting the casing pipe with sticky clay or local soil etc. Annular space between bore hole and casing pipe should be filled up with sticky clay on local materials etc
2. After completion of overburden strata, the bore should drilled up to 0.15 meters. In rocky Hard/Sandstone strata So that casing pipes can be properly embedded in the Rocky Hard/Sandstone formation.

3. After the casing pipe is embedded in the rock, the same is to be ground with materials like sticky clay or local materials etc. so, as to avoid leaking of drain water in the bore.
4. Drilling of 150 mm diameter bore in over burden strata is compulsory up to 30 mtrs. Or as directed by Engineer in Charge or as suggested by geologist Hydrologist.  
(A) For Drilling Through Rock :

**2.3.** Bore through rocks shall be of 150mm diameter and the total depth from the ground level of the bore shall up to 100 meters or as per the recommendation of the Hydrologist /Jr. Geologist.

### **3.0. LOWERING OF CASING PIPES**

- 3.1.** Casing pipes shall be properly socketed welded & forewed so as to ensure a continuous length lowered through the over burden, so as to reach at least 0.15 meter. Inside the hard rock. The length of casing pipes should be kept such that at least 0.30 meters. remains projected above the Ground Level After completion of the work at site the top of the casing pipes shall have to be closed either by a screwed or by welded cap plug (if required for HP Installation ) unless pump is fitted immediately after completion of the bore.
- 3.2.** The casing pipe shall be lowered in such a manner so that it remains vertical so as to ensure installation of pump.
  1. After completion of the bore the Contractor shall have to arrange for testing the yield of the bore by "V" notch at his own cost in presence of the Engineer in charge or his authorized representative. No extra payment shall be made for such testing.
  2. The depth of bore to be drilled as per the recommendation of Jr. Geologist Hydrologist shall be less or more depth. If the bore required to be drilled beyond the specific depth 100 meters. The contractor shall be bound to carry out such work at the rate mentioned in "Schedule - B ".
  3. All the tools and tackles or plants and other suitable machinery required for work for drilling developing gauging etc. for the Tube well shall be provided by the Contractor at his own cost at the site of work.
  4. In case of any item not covered by the specifications stated herein the Contractor shall carry out such work strictly, according to written instructions of Engineer in charge, which will be binding to the contractor and shall have to carry out such work at Departmental Schedule. The rate shall be mutually agreed upon, however the decision of the Engineer in charge will be final.
  5. During the Drilling Operation, if the water bearing strata found at a depth lesser than estimated depth the Executive Engineer or his representative shall have authority to instruct the Contractor to stop the work for reduction in the quantity of the work, the Contractor shall not be eligible for any compensation.
  6. If the bore is required to be drilled above the specified depth the Contractor shall be bound to carry out such additional work including drilling providing and lowering of casing pipes as may be necessary. The relevant specification regarding drilling providing and lowering pipe, taking yield test and strata sample etc. shall also apply in case of such additional work. The rates for a additional work be paid as per the rate fixed.
  7. Lowering and fixing of housing and casing shall be carried out in workman like manner. The contractor shall be responsible for workman compensation in case of any accident. In case of dispute or overlooked items the decision of the concerned Executive Engineer shall be final and binding to the Contractor.
  8. No further drilling of bore wells is allowed, if more than two bores will remain untested at a time. This clause will be applicable without any prejudice (i.e. compensation for delay)
  9. The contractor shall clear the site before of the work and after completion of the work and shall hand over the bore with final finishing of the work. As directed by the Engineer in charge which shall have to be done by the Contractor at his own cost.
  10. The approach roads to site of work may be Kachha roads and contractor shall have to make his own arrangements for repairing of the road and maintain the same for transporting his materials and equipment at his cost which shall be utilized by the department for inspection etc. purpose.

11. The list of the locations, where bore well are to be drilled will be provided on finalization of Tender and Similarly, the actual site of work will be given to the contractor by the Geologist or Engineer-in-charge from the respective Mechanical division Sub Division.
12. If a well is rejected on account of faulty workmanship or negligence on the part of the Contractor as well as if the verticality is not within the permissible limit the bore shall be rejected and the Contractor shall have to drill a new bore including lowering pipes etc. at his own cost.
13. If, further drilling can not be carried out due to encountering the sticky clay or over burden beyond limits (i.e. beyond 30 meters.) or in rocky / sandstone up to specified / suggested depth in a such a case the decision of the Engineer in Charge or recommendation of Hydrologist will be binding to the Contractor as finalized by Engineer in Charge and or Geologist / Hydrologist.
14. The Contractor will have to make arrangement at his own cost for cleaning of bore hole, if filled up by clay, sand, dust & boulders etc.
15. If bore is not completed up to design/ recommended depth due to Mechanical failure or any other reason, no payment shall be made for such abandoned bore.
16. On completion of drilling work up to the required depth, the bore is to be developed and cleaned by suitable capacity air compressor up to the sand free discharge or for minimum one hour.
17. The Contractor will have to make arrangement at his own cost for .....
  - (A) Rig Vehicles, Machineries etc.
  - (B) Facilities for moving bulky materials.
  - (C) Realizing the Transporting Materials.
  - (D) Keeping in custody Department Materials until finally taken over by the office –in-charge of the work.
  - (E) Repairing to the damages caused in the process of the executing works.
  - (F) Approach road to the site.

#### **4.0. MODE OF MEASUREMENT & PAYMENT :**

- 4.1. Drilling work shall be measured in its depth for each class of strata, limited to the dimensions shown on the drawing or as directed by the Engineer-in-charge drilling over increased diameter or depth shall be deemed as convenience for the contractor in executing the work and shall not be measured and paid for separately.
- 2.2. The contract under rate for the items of excavation for structures shall be paid in full for carrying out the required operations including:
- 2.3. Setting out and fixing bench marks and centre lines stones.
- 2.4. Removal of all logs, stumps, grubs and other deleterious matter and obstructions for placing the foundations including trimming of bottoms of excavations
- 2.5. Foundation sealing, dewatering including pumping;
- 2.6. All labour, materials, tools equipment, safeguards and incidentals necessary to complete the work to the specification.
- 2.7. Drilling work shall be for soil such as vegetation or organic soil, turf, sand, silt, loam, clay, mud, black cotton soil, soft shale or soft murrum, required drilling equipment
- 2.4. The drilling work shall be measured for its depth, limiting dimensions to those specified on plan or as directed. The rate shall be for a unit of one meter.

## **Item No 147**

**Providing and lowering 175 mm dia PVC 6 kg / sqcm. Casing pipe in bore hole with necessary fitting etc. complete.**

### **General**

This work shall consist of furnishing and placing **lowering of 175 mm dia PVC pipe** as directed by the Engineer in charge.

Lowering of PVC 175 mm dia pipe shall be done using all required tools and plant including labour charges required for the same only skilled persons shall be applied for this work Lowering shall be done at the risk and cost of the contractor in case of accidental dropping of the pump in bore hole the same shall be either pull out from the bore at the risk and cost of contractor or shall be replaced at the risk and cost of the contractor

## **2.0 WORKMAN SHIP**

**2.1.** PVC 175 mm dia pipe shall be lowered by contractor using only skilled persons and using most suitable tools and plant as directed by the Engineer in charge any damage or loss of material will be at the risk and cost of the contractor. Before joining with column pipe the treads of each pipe and coupling shall be checked carefully the pump shall be connected with electrical control panel board using suitable wire switches and other necessary electrical parts including testing with GEB's Test report

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

**3.1.** The unit rate of Lowering of PVC **175 mm dia** pipe shall include the cost of all materials, tools and plant required for fitting, the same to specified position as per drawings, and as directed by Engineer in charge finishing structure, etc, and all other incidental expenses for producing item of Lowering of PVC 175 mm dia pipe work to complete the structure or its components as shown on the drawings, and as directed by Engineer in charge 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 Lowering of PVC 175 mm dia pipe shall include the cost of all labour, materials, tools and plant scaffolding and all incidental expenses as described herein above.

**3.2.** The Lowering of PVC 175 mm dia pipe shall be measured for its Length, limiting dimensions to those specified on plan or as directed. The rate shall be for a unit of one Number.

**3.3.** The payment will be made on running meter basis of the finished work.

**Item No. 148 :- Providing and fixing M.S. Cap plug hinge type with frame of required design for 175 mm dia bore casing pipe**

## **1.0 MATERIAL**

### **1.1. M. S. Cap**

M.S. Cap shall be of best quality as approved by engineer in charge size and capacity of the M.S. Cap shall match as per provision in the item of Control valve. M.S. Cap shall be made of gun metal of approved Brand and manufacturer as approved by Engineer in charge.

## **2.0. WORKMANSHIP**

**2.1.** The M.S. Cap shall be fitted on the line as and where directed. The Control valve shall be well supported on line.

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

**3.1.** The unit rate M.S. Cap shall include the cost of all materials, tools and plant required for lifting to required height with all lead and lift, placing & fixing and fitting 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 Urinal work of specified size to complete the structure or its components as shown on the drawings and according to these specifications.

**3.2.** The M.S. Cap work shall be measured for its number limiting to specified capacity to those specified on plan or as directed. The rate shall be for a unit of one number.

**3.3.** The payment will be made on number basis of the finished work.

### **Item No. 149**

**Supplying of submersible pump set Three phase for 100 mm or more dia bore having motor capacity and discharge as under with necessary panel box motor rating 5 H.P. pump having capacity of 30 LPM at 90 mt. Head suitable for 32 mm dia delivery pipe Cat. II**

#### **General**

This work shall consist of furnishing and placing **Supplying of Submersible pump set suitable for bore of 100mm. dia having meter capacity not more than 5 H.P having discharge capacity of 30 L.P.M. against the total head 90 Mt.** conforming to these Specifications of an approved brand and make as approved by the Engineer in charge.

#### **1.1. Submersible pump set**

- 1.2. **Submersible pump set** of specified capacity and of I.S.I. mark of approved brand and make and quality shall be supplied
- 1.3. Specification of item no 9.4.1 of Electrical S O R Item form specification booklet of Electrical work shall be followed for this item

#### **2.0 WORKMAN SHIP**

**2.1. Submersible pump set** shall be approved quality and as per IS standard make. Material used in manufacturing tank shall be confirmed to relevant IS code. The

**2.2.** The **Submersible pump set** shall be fitted and installed properly in a desired position and making all required necessary connection as specified and as directed by the Engineer in charge

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

**3.1.** The unit rate of **Submersible pump set** shall include the cost of all materials, tools and plant required for fitting, the same to specified position as per drawings, and as directed by Engineer in charge finishing structure, etc, and all other incidental expenses for producing item of **Submersible pump set** work to complete the structure or its components as shown on the drawings, and as directed by Engineer in charge 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 **Submersible pump set** shall include the cost of all labour, materials, tools and plant scaffolding and all incidental expenses as described herein above.

**3.2.** The **Submersible pump set** shall be measured for its Number, limiting dimensions to those specified on plan or as directed. The rate shall be for a unit of one Number.

**3.3.** The payment will be made on number basis of the finished work.

**Item No. 150 :- Supplying and erecting submersible horizontal & vertical pump set following discharge& head 5 H.P. 3 Phase 400/ 440 VA.C. motor with following Cat. III section and discharge flange size (C) 405 LPM at 30 mtr. head with size 50 mm cat. II.**

**SUBMERSIBLE PUMP SET, 0.5 H.P. – TO – 30 H.P.**

The Submersible pump set shall confirm relevant standards. The Submersible pump set shall be either open well type or bore well type. The pump set shall be horizontal or vertical mono block type as specified or instructed by in charge Electrical Engineer.

The discharge and head of the pump set shall be as specified. The pump set shall be suitable for three phase A.C. 415 volts, 50 Hz power supply. The pump set shall be installed with suitable diameter of delivery pipe.

Necessary control panel with MCB – DP, starter, indication lamp shall be installed & connected complete with incoming power supply and pump set with 10 meter long. 3 core 1.5 mm<sup>2</sup> flat submersible cable. The pump set shall be new one and not having any mark of used before.

The pump set shall be electrically direct driver submersible type having completely water proof motor and its connecting block.

The general specification given in the tender booklet shall also be considered as a part of agreement. The Submersible pump set shall be of approved make as specified in category as per tender booklet and approved by in charge Electrical Engineer.

**For Head up to 30 meter.**



**Item No. 151 :-** Supplying & erecting approved make motor control cubical panel ( Direct -on - line ) made from 16 G. CRCA sheet duly epoxy powder coated in side and out side with hinged doors and locking arrangement consisting of suitable size of on-off isolator ( A.C. 3123 duty) main fuses single phasing prevented in dictating lamps for R-Y-B phases over load relay ammeter voltmeter each with two way selector switch incoming wires duly socket crimped main connector & over load, relay start stop push button the isolator over load relay and contactor will be of L & T , siemens cutler hammer make only (A) D.O.L. 5.0 H.P.

**As per above description and applying as per site incharge.**

**Item No. 152 :-** Supplying & erecting approved make motor control cubical panel ( Direct -on - line ) made from 16 G. CRCA sheet duly epoxy powder coated in side and out side with hinged doors and locking arrangement consisting of suitable size of on-off isolator ( A.C. 3123 duty) main fuses single phasing prevented in dictating lamps for R-Y-B phases over load relay ammeter voltmeter each with two way selector switch incoming wires duly socket crimped main connector & over load, relay start stop push button the isolator over load relay and contactor will be of L & T , siemens cutler hammer make only D.O.L. for 7.50 H.P.

**As per above description and applying as per site incharge.**

**Item No. 153 :- Lowering of submersible motor pump set complete with required nos. and size of casing pipes erected by means of proper chain pulley block & pipe wrenches after checking of threads of each pipe with coupline take the load of the pump set and pipe assembly fitted up with water (1) above 90 mt. and 120 mt.**

## **WORKMANSHIP**

The item provide for labour for lowering of Submersible Pump set complete with required No. and size of casing pipe erected by means of proper chain pulley block and pipe wrenches after checking of thread of each pipe with coupling to taken the load of pipe assembly filled with water with trial testing wiring G.E.B.'s test report. (A) upto 90 m. as per required standard as per instruction and direction given by Engineer-in-charge.

## **MODE OF MEASUREMENT & PAYMENT**

The rate shall be made on No. base of one work done.

**Item No. 154 : Providing and erecting PVC insulated flat flexible cable ISI marked approved make of (B) 3 core x 2.50 Sq.mm.**

The PVC insulated flat flexible cable should be I.S.I. standard and approved quality.

The rate include cost of flat flexible cable and erection of cable.

The measurement shall be on meter basis.

The payment shall be done on meter basis.

**Item No. 155 :- Providing and fixing H.D.P.E. PVC Column pipe heavy duty length and thread on both the ends with 8TPI or 11TPI as required as directed ( a) 40 mm dia**

**General**

This work shall consist of **providing and fixing in position .D.P.E. PVC Column pipe heavy duty length and thread on both the ends with 8TPI or 11TPI.** 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. Polythene pipes**

**1.0. Materials**

**1.1.** The low density polythene pipe of specified diameter with specified working pressure shall conform to I.S. 4985/1988. 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.

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

- 3.1.** The unit rate PVC pipe shall include the cost of all materials, tools and plant required for mixing, placing & 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 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.  
The rate of PVC pipe line shall include the cost of all labour, materials tools and plant scaffolding and all incidental expenses as described herein above.
- 3.2.** The pipe line work shall be measured for its length limiting dimensions to those specified on plan or as directed. The rate shall be for a unit of one running meter.
- 3.3.** The payment will be made on **running meter** basis of the finished work.

**Item No. 156 : Heavy duty clamp made from 4" x 1.5 " iron strips suitable for column pipe 1.5 to 2" length (A) 50 mm (1.5") dia pipe.**

## **MATERIALS**

All accessories like clamp bail plug, bore plug, pipe lifter etc. as per requirement should be of best quality I.S. standard and make as approved by the Engineer in charge and shall be tested quality.

## **WORKMANSHIP**

All installations of accessories should be as per requirement and should be tested with necessary test as required after installations and as per satisfaction of Engineer in charge.

## **MODE OF MEASUREMENTS & PAYMENT**

The rate includes cost of all labours, materials, tools and plant at site etc. required for satisfactory completion of this item.

**Item No. 157 :-** Providing and fixing window having extruded aluminum Colour anodized section frame main outer size 63.50 x 38.10 x 1.95 mm (of Jindal Section no:4605, @ Wt 1.094 Kg / Rmt), horizontal two track member size 61.85 mm x 31.75 mm x 1.20mm (of Jindal Section no: 8687 @ wt.of 0.695 Kg/mt), vertical member of size 61.85 mm x 31.75mm x 1.30 mm (of Jindal Section no:8758 @ wt.of 0.659 Kg/mt) with sliding shutters of horizontal member size 40mm x 18mm x 1.29mm (of Jindal Section no:8949 @ wt.of 0.456Kg/mt), vertical member of size 40mm x 18mm x 1.29mm (of Jindal Section no:8947 @ wt.of 0.456Kg/mt/ Section 8948, @ Wt. 0.457 Kg/mt) with 5 mm thick transparent bronze colour tinted float glass with powder coated aluminum fittings and fixtures and transparent silicon sealant glass fixing to frame as per details etc complete for window.

## **1.0 MATERIAL**

### **1.1 Aluminum standard section**

#### **1.1.1 Window having extruded aluminium colour anodized section**

Aluminum alloy used in the manufacture of window section shall confirm to I.S. designation HEA-WP of I.S. 733-1975 and also designation WVG-WP of I.S. 1285-1975 section shall be as specified in the drawing and design.

The work shall be included standard window having extruded aluminium colour anodized section frame main outer size 63.50mm x 38.10mm x 1.95mm (@wt. 1.094 Kg/mt.), horizontal Two track member size 61.85mm x 31.75 mm x 1.20mm (@wt. 0.695 Kg/mt.), vertical member of size 61.86mm x 31.75mm x 1.30mm (@wt. 0.659 Kg/mt.) with sliding shutters of horizontal member size 40mm x 18mm x 1.29mm (@wt. 0.456 Kg/mt.), vertical member of size 40 x 18 mm x 1.29mm (@wt. 0.456 Kg/mt., @wt. 0.458 Kg/mt) as directed by Engineer in charge.

All sections shall be free from any scratches or holes or any damages on surface. All section shall have finished luster surface on all sides

**1.1 Glass :** The transparent bronze colour tinted float glass shall be of approved make having thickness of **5mm**. The glass shall be clear and free from scratches and cracks. The glass shall be provided on wall panel and fixed with transparent silicon gasket

**1.2 Glazing clips:** Glazing clips (structural glass) shall be of size as directed by the Engineer in charge around the glass all over shall be free from any scratches or holes or any damage of on surface all section shall have finished luster surface on all sides.

#### **1.3 Rubber Gasket**

Rubber gasket shall be of approved make shall be free from any scratches or holes or any damages on surface, and shall have finished luster surface on all sides.

#### **1.4 Fixtures**

Hinges shall be of approved make shall be free from any scratches or holes or any damages on surface and shall have finished luster surface on all sides.

#### **1.5 Handles**

Handles shall be of approved make shall be free from any scratches or holes or any damages on surface, and shall have finished luster surface on all sides.

#### **1.6 Bolts**

All Bolts shall be of approved make shall be free from any scratches or holes or any damages on surface and shall have finished luster surface on all sides.

### **1.7 Stoppers**

Stoppers shall be of approved make shall be free from any scratches or holes or any damages on surface, and shall have finished luster surface on all sides.

Product is from reputed company having ISO 9001-2000 certificate and with three years performance guarantee.

### **2.0 WORKMANSHIP**

The work of window having extruded aluminium colour anodized section frame shall be done with extreme finishing the partial board shall be fixed in the bottom panel and glass shall be fitted on top panel as directed by Engineer in charge, using glazing clips and rubber gaskets as required. All the fixtures and fastenings shall be fitted at right place and as directed by Engineer in charge floor spring shall be fitted properly so as to align the window properly and shall be given trial of opening and closing properly.

### **3.0 Mode of Measurement & Payment**

**3.1.** The unit rate of window having extruded aluminium colour anodized section frame shall include the cost of all materials, cost of anodizing, cost of all necessary fixtures and fastenings, labour charges for fixing frames, shutters and fixing the window in wall at the place shown in drawing and as instructed by Engineer in charge, all tools and plant required for assembling and fixing in position, finishing as per direction of the Engineer-in-charge, and all other incidental expenses for preparing frame and shutter of specified size 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 making walls good by plaster patch colour etc as required.

**3.2.** The Window shall be measured for its improvising and fixing window having extruded aluminium colour anodized section frame having heavy handle, heavy lock, bracket, stoppers, 5mm thick transparent glass panel of approved make with S.S. fixtures and transparent silicon glass fixings to from as detail including PVC T in frame silicon based linings handles, locks two nos. PVC gasket screws aluminum joints special runner etc. complete.

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

**tem No. 153 :- Providing and fixing M.S.Pipe Flage post of required pattern & Drawing required diferance dia M.S. pipe and pulley with two coats of Oil paints with primer coats etc. complete.**

**WORKMANSHIP** as per instruction and direction given by Engineer-in-charge.

**MODE OF MEASUREMENT & PAYMENT**

The rate shall be made on kg. base of one work done.