

# Name of work:- Construction of Anganvadi No.135 Building at village Moja.

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## 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 or aspect, the provisions on these particular points, or aspects in the relevant Indian Standards shall be referred to.
4. All measurements and computations, unless otherwise specified, shall be carried out nearest to the following limits
 

(i)	Length, width and depth (height)	0.01 Metre.
(i)	Areas	0.01 Sq. Mt.
(iii)	Cubic Contents	0.01 Cu.Mt.
- In recording dimensions of work, the sequence of length, width and height (depth) or thickness shall be followed.
5. 'The distance which constitutes lead shall be determined along the shortest practical route and not necessarily the route actually taken. The decision of the Engineer-in-charge in this regard shall be taken as final.
6. Where no lead is specified, it shall mean 'all leads'.
7. Lift shall be measured from plinth level.
8. Upto "floor two level" means actual height of floor (Maxi. 4 M.) upto 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 work is in the form of a designation containing the number of the specification of the material and prefix 'M-5'.
11. Approval to the samples of various materials given by the Engineer-in-charge, shall not absolve the contractor from the responsibility of replacing defective material brought on site or materials used in the work found defective at a later date. The contractor shall have no claim to any payment or compensation whatsoever on account of any such materials being rejected by the Engineer-in-charge.
12. The contract rate of the item of work shall be for the work completed in all respects.
13. No collection of materials shall be made before it is 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 overloading of the various components of the structure during execution or after completion of the structure.
20. Special modes of construction not adopted in general Engineering practice, if proposed to be adopted by the Contractor, shall be considered only if the contractor provides satisfactory evidence that such special mode of construction is safe, sound and helps in speedy construction and completion of work to the required strength and quality. Acceptance of the same by the Engineer-in-charge shall not, however, absolve the contractor of the responsibility of any adverse effects and consequences of adopting the same in the course of execution of completion of the work.
21. All installations pertaining to water supply and fixtures thereof as well as drainage lines and sanitary fittings shall be deemed to be completed only after giving satisfactory tests by the Contractor.
22. The contractor shall be responsible for observing the rules and regulations imposed under "Minor Minerals Act". and such other laws and rules prescribed by Government from time to time.
23. All necessary safety measures and precaution (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 unless recovery at one percent towards using charges is separately made.
25. Approval to any of the executed items for the work does not in any way relieve the contractor of his responsibility for the correctness, soundness and strength of the structure as per the drawings and specification.

## SPECIFICATIONS OF MATERIALS

### M-1 Water

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

**1.2.** If required by 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 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 be 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 test shall be carried out as per I.S. 6932 (Part I to X), 1973.

**2.2** The following field tests for times 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 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. 455-197,6.

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

**4.1** The white cement shall conform to I.S. 804112-E 1978.

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

**5.1** Coloured cement shall be with white or gray 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 shall be properly grounded 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 particle free from injurious amounts of dust clay, kankar nodules, soft or flaky particles shale, alkali, salts organic matter, loam, mica or other deleterious substance 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.

L S. Sieve Designation	Percentage by Weight Passing sieve	I S. Sieve Designation	Percentage by Weight Passing through 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:

L S. Sieve Designation	Percentage by Weight Passing 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

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

**7. 1.** This shall be obtained from crushing hard black trap or equivalent. it shall not contain 'more than 8%" silt as determined by field test with measuring cylinder. The method of determining silt contents- by field test is given as under:

**7.2.** A sample of stone dust to be tested shall be placed without. drying in 200 mm. measuring cylinder. The quantity of the sample shall be such, that it fills the cylinder upto 100 mm. mark. The clean water shall be added upto 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 silt content within the allowable limit.

**7.4.** The fineness modulus of stone dust shall not be less than 1.80.

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

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

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

L S. Sieve Designation	Percentage by Weight Passing sieve	I S. Sieve Designation	Percentage by Weight Passing through sieve
12.50 mm	100 %	4.75 mm	0-20 %
10.00 mm	80-100 %	2.36 mm	0-25 %

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

8.4. The necessary tests for 'grit shall carried out as per the requirements of I.S. 2386 (Parts I to VII) 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 well 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 free from clay, dirt, ash or other deleterious matter.

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

L S. Sieve Designation	Percentage Passing	I S. Sieve Designation	Percentage Passing
20 mm	100	4.75 mm	70
10 mm	86	2.36 mm	52

#### **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 the item. The slaked lime and sand 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 the 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 rain 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 is prepared. But in no case mortar made earlier than 36 hours shall be permitted for use.

#### **M- 11. Cement Mortar**

11. 1. Water shall conform to specification M71. Cement shall conform to specification M-3. Sand shall conform to

##### **M-6. 11. 2. Proportion of Mix**

11.2.1. Cement and sand shall be mixed to specified proportion, sand being measured by-measuring boxed.

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 homogenous 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 Coares Aggregate for Nominal Mix Concrete**

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

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

However in case (if 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 Nominalsize			I.S. Sieve Designation	Percentage passing for single sized aggregates of Nominalsize		
	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 some what by 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 test indicated in I.S. 383-19710 and I.S. 456-1978 shall have to be carried out to ensure the acceptability. The aggregates shall be stored separately and handled in such a manner as to prevent the intermixing of different aggregates. If the aggregates are covered with dust, they shall be washed with water to make them clean.

#### **M- 13. Blak Trap or Equivalent Hard Stone Coares.**

**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 reaction 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 brick. 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. to 50 mm. size unless otherwise specified in the item. The underburnt over burnt brick bats shall not be allowed.

**14.2.** The brick bats shall be measured by volume by suitable boxes or as directed.

#### **M- 15. Brick**

**15. 1.** The bricks shall be hand or machine moulded and made from suitable soils and klin-burnt. They shall be free from crack 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 + 1/81"(3.0 mm.) Width: + 1/1611 (1.50 mm.) Height:  $\pm 1/611$  (1.50 mm.)

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

#### **M- 16 Stone**

**16.1.** The stone shall be of the specified variety such as Granite / Trap Stone / Quarzite or any other type of good hard stones. The stones shall be obtained only from the approved quarry and shall be hard, sound, durable and free from defects like cavities, cracks, sand holes, flaws, injurious veins, patches of loose or soft materials etc. and weathered portions and other structural defects or imperfections tending to affect their soundness and strength. The stone with round surface shall not be used. The percentage of water absorption shall not be more than 5% of dry weight, when tested in accordance with I.S. 1134- 1974. The minimum crushing, strength of the 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 "or khanki facing in required shape and size. The face of stone shall be so dressed that the bushing, on the exposed face shall riot 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 patches. It shall have a 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, 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-11) 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 upto 100 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 be either cold twisted or hot rolled, shall conform to I.S. 11739-1966 and I.S. 11,39-1966 respectively.

**19.2.** Other provision and requirements shall conform to No. M-18 for Mild steel bars.

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

**20.1.** The high tensile wires for the use in prestressed 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 I.S. 1785-1962. Testing, shall be done per I.S. requirements.

**20.3.** The high tensile steel shall be free from loose mill scale, rust oil, grease, or any other harmful matter. Cleaning of steel bars may be carried out by immersion in solvent solution, wire brushing or passing through a pressure box containing carborundum.

**20.4.** The high tensile wire shall be obtained from manufacturers in coil having diameter not less than 350 times the diameter of wire itself so that wire springs back straight on being uncoiled.

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

**21.1.** The mild steel wire shall be of 1.63 mm. or 1.22 mm. (16 or 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. 226-1965. The steel shall be in I.S. 226- 1975 and shall have a smooth finish. The material shall be free from other defects affecting the strength and durability. Rivet bars shall conform

**22.2.** When the steel is supplied by the Contractor test certificates 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 specified in item. The G.I. Sheets shall conform to I.S. 277-1977. The sheets shall be undamaged in carriage and handling either by rubbing off of zinc coating or otherwise they shall have clean and bright surface and shall be free from dents, holes, rust or white powdery deposit.

**23.2.** The length and width of G.I. sheet 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 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 or 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 suitable for the type of sheets and locations.

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

#### **M-25. Mangalore 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 ballies properly cross braced together so as to make the centering rigid. In places of bulgie props, brick pillar of adequate SDR 13.5 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 not 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 ballies having 100 mm minimum diameter measured at mid length and 80 mm. at thin end and shall be placed as per design requirement. These shall rest squarely on wooden sole plates 40 mm. thick and minimum bearing area of 0-10 sq. in. 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 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 manufacturer 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 metre (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 joint filler. i.e. preformed strip of expansion joint filler shall not get deformed, or broken by twisting, bending or other handling when exposed to atmospheric condition. Pieces of joint filler that have been damaged shall be rejected.

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

**27.4** Premoulded bituminous joint filler shall conform to I.S. 1838-1961/

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

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

**28.2** Copper sheet shall be of 1.25 mm. thick and of 1.25 min. width with 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 copperplate to be



embedded in the concrete work shall be 25 mm Depth all 'U' 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 fibres 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 of its usefulness for the purpose for which it is required. The colour shall be uniform as far as possible. Any effort like painting, using any adhesive or resins 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 & sound knots, more than 6 sq. cm. size and the aggregate area of such knots shall not be more than 1% (, f 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 aggregate area of such knots shall not exceed 2% of the area of piece.

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

The non teak-wood shall be chemically treated, seasoned as per IS 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, Kalali; Siras, Behda, Jamun, Sisoo will be used for door frames where as only Kalali, Siras, Halda. Kalam etc. will be permitted for shutters after proper seasoning and chemical treatment.

The non-teak wood shall be free from large, loose, (lead of cluster knots, flows, shakes, warps, bends or any other defect. It shall be uniform in substance and of straight fibers as far as possible. It shall be free from rots, decay harmful fungi and other defects of nature which 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 wetc. shall be sawn in straight lines and planes in the direction of grain and 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 as 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 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-1) 1980. The timber shall be free from decay and insect attack. Knots and knot holes less than half the width of cross-SDR 13.5 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. The hopping rebating opening of glazing, venation etc, shall be provided if specified in the drawing.

**30.3.** All edges of the door shutter's 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-I) 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-Y) 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 delamination more than 80 mm. in length and more than 3 mm. in depth has occurred in the assembly glue lines between the plywood face and the style and rail. Delamination at the corner shall be measured continuously around the corner. Delamination at the knots, knot holes and other permissible wood defects shall not be considered in assessing the sample.

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

In Normal thickness  $\pm 1.2$  mm.

In Normal height  $\pm 3$  mm.

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

### **M-31. Aluminium doors, windows, louvers**

**31.1** Aluminium alloy used in the manufacture of extruded window SDR 13.5s shall conform to I.S. designation HEA-WP of I.S. : 733-1975 and also to I.S. Designation WVG-WP of I.S. 1285-1975. The SDR 13.5 shall be as specified in the drawing and design. The -fabrication shall be done as directed.

**3 1.2.** The hinges shall be cast ~or extruded aluminium hinge of same type as in window but of large size.

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

### **M-32. Rolling Shutters**

**32.1.** The rolling shutters shall conform to I.S. 6248-19-19. Rolling shutters shall be supplied of specified type with accessories. The size of the rolling shutters shall be specified-in the drawings. The shutter shall be constructed with interlocking lath SDR 13.5s formed from cold rolled steel strips not less than 0.9 mm. thick and 80 mm. wide for shutters upto 3.5 mm., width not less than 1.25 min. thick and 80 mm. wide for shutters 3.5 mm in width and above unless otherwise specified.

**32.2.** Guide channels shall be of mild steel deep channel SDR 13.5 and of rolled pressed or built tip (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 0.92 min. thickness. 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 or strip of adequate strength to balance the shutters in all position. The spring pipe shaft etc. shall be supported on strong M.S. or, 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 type tip to 8 Sq. in. clear area without ball bearing and up to 12 Sq.m clear area with ball bearing. If the rolling shutters are larger, then gear operated type shu6rs shall be used.

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

**32.7.** The shutters shall be completed with door suspension shafts, locking 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 SDR 13.5s unless otherwise shown on drawings. The distance centre to centre of pickets shall be 12 cms. with an opening of 10 Cms.

**(b)** Pivoted M.S. flats shall be 20 mm x 6 mm.

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

**(d)** The, fittings like stoppers, fixing hold fasts, 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 from cold drawn steel wire "as drawn" or galvanised steel conforming to I.S. 226-1975 with longitudinal and transverse wire securely connected at every, interSDR 13.5 by a process of electrical resistance welding and conforming, to I.S. 4948-1974. It shall be fabricated and finished in workmanlike manner and shah 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 size of wire for square as 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 size permit.

### **M-35. Expanded Metal Sheets**

**35.1.** The expanded metal sheets shall be free from flaws, joints, broken strands, laminations and other harmful surface. Expanded metal steel sheet shall conform to I.S. 412-1975, except that blank sheets need not be with guaranteed mechanical properties. The size of the diamond mesh of expended metal and dimensions of strands (width and thickness) shall be as specified. The tolerance in nominal weight of expanded metal sheets shall be of  $\pm 10$  percent.

**3.3.2.** Expanded metal in pannels, shall be in one whole piece panel each as far as stock size 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 galvanised, 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- 1975.

Plywood is made by cementing together thin boards or sheets of wood into panels. There are always an odd. number of layers 3 ), 5, 7, 9 ply etc. The plies are placed so that grain of each layer is right angle -to the grain in the adjacent layer.

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

**37.3.** Usually synthetic resins are used for gluing, pherolic resins are usually cured in a hot press which compresses and simultaneously heats [he 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 times 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 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 three grades namely BWR, WWR and CWR, depending upon the adhesives used for bonding and veneers, and it will be further classified into six types namely AA, AB, AC, BB, BC and CC based on the quality of the two faces, each face being of three kinds namely, A, B. and C. After pressing, the finished plywood should be reconditioned to a moisture content not less than 8 percent and not more than 16 percent.

**3 7.6.** Thickness of plywood Boards:

**TABLE**

Board	Thicknes s	Board	Thicknes s	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 best quality, free from specks, bubbles, smokes, veins, air holes blisters and other defects. The kind of glass to be used shall be mentioned in the item or specification or in the special provisions or as shown in detailed drawings. Thickness of glass panes shall be uniform. The specifications or 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 upto 600 mm x 600 mm.

**38.2.2.** For panes larger than 600 mm. x 600 mm. and upto 800 mm. x 800 mm. the glass weighing not less than K75 Kg/Sq.m. shall be used. For bigger panes upto 900 mm x 900 mm. glass weighing not less than 11,25 Kg/Sq. in. 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. : 1,761-1960. 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 960 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 arid parallel and polished to obtain clear, undistrubed 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 drfawings or as specified or as directed.

### **38.5. Wired Glass**

38.5.1. Glass shall be with wire netting embedded in a sheet of plate glass electrically welded 13 mm Georgian square mesh may 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 sheet shall be of thickness as specified in the item and of an specified shape and size as the case may be. Panels may be flat or curved. It should be light in weight. It shall be colour less or coloured or opaque as specified in the item. Colourless sheet shall be as transparent as the finest optical glass. Its light transmission rate shall be about 95%. Transparency shall not be affected for the sheets of larger thickness. It shall be extremely resistant to sunlight, weather and low temperatures'. It shall not show any significant yellowing or change in physical properties or loss of light- transmission over a longer period of use. The sheet shall be impact resistant also. Sheets should be available in complete range of standard transparent, translucent and opaque colours. Sheets shall be of such quality that they can be cut, bent and jointed as desired. Solution for the joints shall be used as per the requirement of manufacturer.

### **M-40. Particle board .**

**40. 1.** The particle boards used for face panels shall be of best quality free from any defects. The particle boards shall be made with phenolmaldehyde adhesive. The particle boards shall conform to I.S. : 3087-1965. "Specification for wood particle board for general purpose". The size and the thickness shall be as indicated.

### **M-41. Expanded polystyrene of framed styroper slabs .**

**41.1.** The expanded polystyrene ceiling boards and files shall be of approved make and shall be of size, 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 slab of Thermocole etc.

### **M-42. Resin bonded fibre glass**

**42.1** The resin bonded fibre glass tiles, or rolls shall 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 blanket shall be with following coverings on one or both sides as indicated.

(1) Bituminised hessian Kraft, paper suitable for use in position where moisture has to be excluded,

(2) Hessian cloth or Kraft paper for keeping out (Just.

(3)) G.I. wire netting, suitable for surfaces to be plastered 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 stopper, casement window fasteners, casement stays and louvers catch shall be made of the metal as specified in the item 'or its specifications.

**43.1.2.** They shall be of iron, brass, aluminium, chromium plated iron, chromium plated brass, copper oxidised iron, copper oxidised brass or anodised aluminium 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 ensure ease of operation.

**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. Sliding 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 Stoppers**

**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 Catch**

**43.10.1.** Door catch shall be fixed at a height of about 900 mm. from the floor level so 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 60 mm x 40 mm shall be fixed on the doorframe with a hinge 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:**

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

### **43.13. Casement stays (Straight Peg Stay) :**

**43.13. 1.** The stays shall be made from a channel SDR 13.5 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 300mm. 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 base 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 shade, and as approved. The ready mixed paints shall only be used. However, if ready mixed paint or specific 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 following general requirements

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

(ii) The paint as received shall brush easily, possess good levelling 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 as mentioned 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 shape shall be prepared with the below mentioned ingredients and other necessary materials

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

**45.2.** The french polish so prepared shall conform to I.S. ~- 348- 1968.

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

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

**46.2.** The size of various colours of marble chips ranging from the smallest upto 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. h("pt as above, the chips shall conform to I.S. : 2114-1962.



## **M-4 7. Flooring Tiles:**

### **4 7. 1. (A) Plain Cement tiles**

**47.1.1.** The plain cement tiles shall be 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 a 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 the marble chips aggregate in the wearing layer of the tiles shall be three parts of cement to one part 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 conditions 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 plain, free from projections, depressions and cracks and shall be reasonably parallel to the back face of the tile. All angles shall be right and all edges shall be sharp and true.

**47.1.4.** The size of tiles shall generally be square shape 24.85. Cm. x 24.85 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 millimetre. Tolerance on thickness shall be plus 5 mm.

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

**47.2.2.** The pigment 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 the same specifications 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 upto 20 mm. size. The minimum thickness of the tiles shall be 6 mm. For pattern of chips to be used on the wearing face, a few samples with or without their full size photographs as directed shall be presented to the Engineer-in-charge for approval.

**47.3.4.** Any particular samples, if found suitable shall be approved by the Engineer-in-charge, or he may ask for a few more samples to be prepared indicating roughly the particular sized chips to be more or less in tile samples presented. The samples 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 portland cement generally depending upon the colour of tiles to be used or as directed.

### **47.4. (a) Chequered Tiles**

**47.4.1.** Chequered tiles shall be plain cement tiles or marble mosaic tiles. The former shall be same specification as per (A) above and the latter as per marble mosaic tiles as per (C) except as mentioned below.

**47.4.2.** Tile 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 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 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 One 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 as per (D) above except in following respects;



(1) The length of a tile including nose shall be 330 mm. (2) The minimum thickness shall be 28 mm. (3) Tile 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 centre 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 colour stones 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.** Tolerance of minus 30 mm. on account of chisel dressing of edges shall be permitted for length as well as breadth. Tolerance in thickness shall be + 3 mm.

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

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

#### **M-49. Polished Kotah Stones**

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

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

#### **M-50. Dholpur Stone Slab :**

**50.1** Dholpur stone slab shall be of best quality as approved by the Engineer-in-charge. The stone slab shall be even, sound and durable, regular in shape and of uniform colour.

**50.2.** The size of the stone shall be specified in the item or detailed drawings 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 provisions 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 chiselled or polished as specified in the item of work and all the four edges shall be machine cut.

All angle and edges of the stone slab shall be true and plane.

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

#### **M-51. Granite Slab**

**51.1.** Granite Slab shall be white or of other colour and of best quality as approved by the Engineer-in-charge.

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

**51.3.** Granite 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 450 mm x 450 mm. and preferable 600 mm x 600 mm. However, smaller sizes will be allowed to be used to 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 Granite Slabs shall conform to I.S. 1130-1969.

#### **M-52. Granite Stone Slab**

**52. 1.** Granite shall be of approved colour and quality. The stone shall be hard, even, sound regular in shape and generally uniform in colour. It shall be without any soft veins, cracks or flaws.

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

**52.3.** All exposed face shall be double polished to tender truly smooth and the 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 homogeneous flexible type, conforming to I.S. 3452-1966. 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 hessain or other woven fabric. The following tolerances shall be applicable on the nominal dimension of the sheet rolls or tiles

**(a) Thickness :**  $\pm 0.15$  mm

**(b) Length or Width -**

- |                         |                |                         |                    |
|-------------------------|----------------|-------------------------|--------------------|
| 1. 300 mm. Square Tiles | $\pm 0.20$ mm. | 3.9.00 mm. square tiles | $\pm 0.60$ mm.     |
| 2. 600 mm. Square Tiles | $\pm 0.40$ mm. | 4. Sheets and rolls     | $\pm 0.10$ percent |

#### **53.4. Adhesive**

**53.4. 1.** The adhesive for PVC flooring shall be of the type and make recommended by the manufacturers of PVC sheet / tiles

#### **M-54. Facing Tiles**

**54.1.** The facing tiles (burnt clay facing bricks) shall be free from cracks, flaws and nodules of free lime. They shall be thoroughly burnt and shall have plane rectangular faces with parallel sides and sharp straight right edged faces, The texture of the finished surface that will be exposed when in place, shall conform to an approved sample consisting not less than four stretcher bricks each representing the texture desired. The facing tiles shall have a pleasing appearance, sufficient resistance to penetration by rain 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. 1077-1976.

**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 in dimensions specified above shall be follows.

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

**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 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 brick, 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 not 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, chipped 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 from 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. 777-1970..

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

**56.1.** Galvanised iron pipe 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 a suitable means of connection for insertion in a pipe line for controlling, or stopping tile 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.	0.215 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 be of approved quality. These shall be gun metal fitted with wheel and shall be of gate valve opening full way and of the size as specified. These shall conform 4) 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 the item, Wash basin shall be of one piece construction with continued over-flow arrangements. All internal angles shall be designed so as to facilitate cleaning. Wash basin shall have single tap hole or two holes as specified. Each basin shall have a circular waste hole which is either rabated or bevelled 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 recess which shall fully (train into the bowl).

**59.2** White glazed pedestal of the quality and colour as that. of the basin shall be provided where specified in the 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 tile height from floor to top of the rim of basin 750 mm. to 800 mm. as directed.

**M-60. European type water closet with low level Bushing:**

**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 less than 50 mm. The solid plastic seat and cover shall be of the best Indian make conforming to I.S. 2548-1980. They shall be made of moulded syntketic materials which shall be tough and hard with high resistance to solvents and shall be free from blisters and other surface defects and shall have chromium plated brass hinges and rubber 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. 2556 (Part-111) 1981 and relevant specification of Indian type water closet except that, pan will be with tile integral squatting pan of size 580 mm. x 440 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 ring of suitable type with adequate number of holes alround as directed to have satisfactory flushing. It shall also have an inlet at back or front for connecting flush pipe as directed. The inside of the bottom of the pan shall have sufficient slope from tile 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 seat and 50 mm. diameter vent horn.

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

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

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

**63.1.** The glazed earthen-ware sink shall be specified size, colour and quality. The sink shall conform to I.S. 771 Part-11-1979. 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. 4044962 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/comer type urinal.**

**64. 1** The lipped type urinal shall be flat back or corner type as specified in the item and shall conform to 771-1979. It shall be of best Indian make and size as specified and approved by the Engineer-in-charge. The flat back or 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 litres 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. diametre. 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 litres 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 outlet shall be connected to lead pipe of 32 mm. diameter. Tile lead pipe shall conform to I.S. 404 (Part-D) 1962. For fixing G.I. inlet pipes and overflow pipe 20 mm. dia. inlet and outlet shall be provided. The flushing cistern shall be provided with galvanised iron chain and pull of sufficient length and shall be got approved from the Engineer-in-charge. The cast iron flushing cistern shall be painted with one coat of anticorrosive paint and two coats of paints. The flushing cistern shall be fixed on two C.I. brackets. The C.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 tile description of the item. The flush cock shall conform to relevant Indian Standard,

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

**68.1** All soil. waster, vent and antisiphonage pipes and fittings shall conform to I.S. 1729-1964. The pipe shall have spigot and socket ends with head on spigot end. The pipes and fittings shall be true to shape, smooth, cylindrical, their inner and outlet surfaces being as nearly as practicable concentric. They shall be sound and nicely cast and shall be free from cracks, laps, pinholes or other 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 cast iron pipes shall be of tile diameter as specified in the description and shall be in lengths of 1.5 M, 1.8 M. and 2 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 cars 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 upto minus 10 per cent may however be allowed against these standard weights.

Sr. No.	Nominal dia. of bore	Thickness	Overall Weight of Pipe excluding ears		
			1.5 in. long,	1.8 in. 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 upto minus 15 percent in thickness and 20 mm. in length will be allowed. For fittings tolerance in lengths shall be plus 15 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 tolerances in weights and thickness shall be the same as for straight pipes.

**M-69. Nahni Trap :**

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

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

**69.3.** The Nalini trap provided shall be with deep seal, minimum 50 mm, except at places where trap with deep seal can not be accommodated. The covet, shall be cast iron. Perforated cover shall be provided oil the trap of appropriate size.

**M-70. Gully Trap :**

**70.1** Gully trap shall conform to I.S. 651-1980. It shall be sound, free, from defects such as fire cracks. The glaze of the traps shall be free from crazing. They shall give a shart 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 dimension, 300,fiun. x 300 mm., the cover 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. Glaze Stone Ware Pipe And Fitting .**

**71.1.** Tile 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 crack and other imperfactions. Which effect the, serviceability. The inner an() outer surfaces shall be smooth and perfectly glazed. The pipe shall be capable to withstand pressure of 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 l mm. around the pipe.

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

**M- 72. Wall Peg Rail**

**72.1.** Tile aluminium wall peg rail shall have three. aluminium pegs of 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.L Water Spot**

**73.1.** The G.L. 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 the outside end tee and bend cut at half the length shall be provided and at other end coupling shall be provided to have better fixing. The water spout shall be provided as per detailed drawing or as directed.

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

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

**M-75. Crydon Ball Valve**

**75.1.** Ball valve of screwed type including polythene float and necessary lever 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 fibre bases, and shall be type 2, soil' finished 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 item. 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 (lie 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 as not to interfere with any constructional activities and in proper stacks.

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

**M-78. 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 type-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 spacings shall be as specified above. The permissible, deviation from (lie 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 twisting two Point. wires, each two turns, lightly round one line wire, making altogether four complete turns. The barbs shall be so finished that the four points are set and locked at right angles to each other. 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 axis of the wire forming the barbs.

**78.3.** The line and point wire shall be circular SDR 13.5, free from scale and other defects and shall be uniformly galvanized. The line wire shall be in continuous length and shall not contain any weld other than those in the rod before it is drawn. The distance between two successive splices shall not be less than 15 metres.

**78.4.** The lengths per 100 My. of barbed wire I.S. type I shall be as under

Nominal	1000 metre	Minimum	934 Meter	Maximum	1066 Metre.
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# **Name of work:- Construction of Anganvadi No.135 Building at village Mojab.**

## **:: ITEMWISE DETAILED SPECIFICATIONS FOR THIS WORK ::**

### **Item No.01:- Excavation for foundation in Dense or Hard soil including sorting out and stacking of useful materials and disposing off the excavated stuff with all lead and lift**

#### **1.0 Dense or Hard Soil**

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

#### **2.0. Clearing the site**

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

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

#### **3.0. Setting out**

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

#### **4.0. Excavation**

The excavation in foundation shall be carried out in true line and level and shall have the width and depth as shown in the drawings or as directed. The contractor shall do the necessary shoring and shutting or providing necessary slopes to a safe angle, at his own cost. The payment for such precautionary measures shall be paid separately 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 bringing it to level. If by mistake or any excavation is made deeper or wider than, that shown on the plan or directed. The extra depth or width shall be made up with concrete of same proportion as specified for the foundation concrete at the cost of the contractor. The excavation up to 1.5 m depth shall be measured under this item.

#### **5.0 Disposal of the excavated stuff**

**5.0.** 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.

**5.1.** 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 measurements & payment**

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

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

**E. E.**

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### **Item No. 02 :: Excavation for foundation including sorting out and stacking of useful materials and disposing of the excavated in Hard Murrum with all lead and lift.**

#### **1. 0. Hard murrum**

The hard murrum shall be clean of good binding quality and of approved quality obtained from approved quarries, of disintegrated rocks which contain siliceous material and natural mixture of clay of calcareous origin, The size of hard murrum shall not be more than 20 mm.

#### **2. 0. Workmanship**

##### **2.1. Clearing the site**

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

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

##### **2.3 Setting out**

After clearing the site, the center lines will be given by the Engineer-in-charge. The contractor shall assume full responsibility for alignment, elevation and dimension of each and all parts of the work. Contractor shall supply



labourers, materials, etc. required for setting out the reference marks and bench marks and shall maintain them as long as required and directed.

#### **2.4 Excavation :**

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

#### **2.5 Disposal of the excavated stuff:**

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

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

#### **3.0. Mode of measurement and payment:**

**3. 1.** The measurement of excavation in trenches for foundation shall be made according to the SDR 13.5s of trenches shown on the drawing or as per SDR 13.5s given by the Engineer-in-charge. No payment shall be made for surplus excavation made in excess of above requirements or due to slopping and sloping back as found necessary on account of conditions of soil and requirements of safety.

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

**E. E.**

### **Item No. 03 :- Providing and laying cement concrete 1:3:6(1-Cement : 3 Coarse sand : 6 graded stone aggregate 40 mm nominal size) and curing complete excluding cost of formwork in Foundation and Plinth.**

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

**1.1.** Water shall conform to M-1. Cement shall conform to M-3. Sand shall conform to M-6. Grit shall conform to M-8. Graded stone aggregate 20 mm. nominal size shall conform to 12.

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

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

#### **2. 7. General:**

**2.7.1.** The concrete mix is not required to be designed by preliminary tests. The proportion of the concrete mix shall be 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm. nominal size) by volume. Concrete work shall have exposed concrete surface or as specified in the item.

**2.7.2.** The designation. Ordinary M-100, M-150, M-200, M-250 specified as per I.S. Corresponding approximately to 1:3:6, 1:2:4, 1:1½:3 and 1:1:2 nominal mix of ordinary concrete by volume respectively.

**2.7.3.** The ingredients required for ordinary concrete containing one bag of cement of 50 Kg. by weight (0.0342 Cum) for different proportions of mix shall be as under:

Grade of concrete	Total quantity of dry aggregate by volume per 50 Kgs. of cement to be taken as the sum of individual volume of fine and coarse aggregates, maximum	Proportion of fine aggregate to coarse aggregate	Quantity of water per 50 Kgs. of cement maximum.
1	2	3	4
M-100 (1:3:6)	300 Liters	Generally 1 2 for fine aggregate to coarse aggregate by volume but subject to and upper limit of 1 : 1 1/2 and lower limit 1 : 3	34 Liters
M-150 (1:2:4)	220 Liters		32 Liters
M-200 (1:1 1/2: 3)	160 Liters		30 Liters
M-250 (1:1:2)	100 Liters		27 Liters

**2.7.4.** The water cement ratios shall not more than those specified in the above table. The cement content of the mix specified in the table shall be increased if the quantity of water in mix has to be increased to overcome the difficulties of placement and compaction so that the water cement ratio specified in the Table is not exceeded.

2.7.5. Workability of the concrete shall be controlled by maintaining a water-cement-ratio that is bound to give a concrete mix which is just sufficiently wet to be placed and compacted without difficulty with the means available.

2.7.6. The maximum size of coarse aggregate shall be as large as possible within the limits specified but in no case greater than one fourth of the minimum thickness of the member, provided that the concrete can be placed without difficulty so as to surround all reinforcement thoroughly and to fill the corners of the form.

2.7.7. For reinforced concrete work, coarse aggregates having a nominal size of 20 mm. are generally considered satisfactory.

2.7.8. For heavily reinforced concrete members as in the case of ribs of main beams, the nominal maximum size of coarse aggregate should usually be restricted to 5 mm. less than the minimum clear distance between the main bars, or 5 mm. less than the minimum cover to the reinforcement whichever is smaller.

2.7.9. Where the reinforcement is widely spaced as in solid slabs, limitations of size of the aggregate may not be important and the nominal maximum size may sometimes be as great as or greater than the minimum cover.

2.7.10. Admixture may be used in concrete only with approval of Engineer-in-charge based upon the evidence that with the passage of time, neither the compressive strength of concrete is reduced nor are other requisite qualities of concrete and steel impaired by the use of such admixtures.

### **3.0. Proportion of Mix:**

3.1. The Proportion of ' cement, sand and coarse aggregate shall be one part of cement, 2-parts of sand, 4-parts of Crushed stone aggregates and shall so measured by volume.

### **4.0. Mixing**

4.1. For all work. concrete shall be mixed in a mechanical mixer which along with other accessories shall be kept in first class -working condition and so maintained throughout the construction. Measured quantity of aggregate, sand, cement required for each batch shall be poured into the drum of the mechanical mixer while it is continuously running. After about half a minute of dry mixing, measured quantity of water required for each batch of concrete mix shall be added gradually and mixing continued for another one and a half minute. Mixing shall be continued till materials are uniformly distributed and 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 the mixing be done for less than 2 minutes after all ingredients have been put into the mixer.

4.2. When hand mixing is permitted by the Engineer-in-charge for small jobs or for certain other reasons, it shall be done on the smooth water tight platform large enough to allow efficient turning over the ingredients of concrete before and after adding water. Mixing platform shall be so arranged that no foreign material gets mixed with concrete- nor does the mixing water flow out. Cement in required number of bags shall be placed in a uniform layer on top of the measured quantity of fine and coarse aggregate, which shall also be spread in a layer of uniform thickness on the mixing platform. Dry coarse and fine aggregate and cement shall then be mixed thoroughly by turning over to get a mixture to uniform colour. Specified quantity of water shall then be added gradually through a rose-can 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.

4.3. Mixers which have been out of use for more than 30 minutes shall be thoroughly cleaned before putting in a new batch. Unless otherwise agreed to by the Engineer-in-charge the first batch of concrete from the mixture shall contain only two thirds of normal quantity of coarse aggregate. Mixing plant shall be thoroughly cleaned before changing from one type of cement to another.

### **5.0 Curing**

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

### **6.0. Consistency:**

6.1. The degree of consistency which shall depend upon the nature of the work and methods of vibration of concrete shall be determined by regular slump tests in accordance with I.S. 1199-1959. The slump of 10 mm. to 25 mm. shall be adopted when vibrators are used and 80 mm. when vibrators are not used.

### **7.0. Inspection:**

7.1. Contractor shall give the Engineer-in-charge due notice before placing any concrete in the forms to permit him to inspect and accept the false work and forms as to their strength, alignment, and general fitness but such inspection shall not relieve the contractor of his responsibility for the safety of men, machinery, materials and for results obtained. Immediately before concreting, all forms shall be thoroughly cleaned.

7.2. Centering design and its erection shall be got approved from the Engineer-in-charge. One carpenter with helper shall invariably be kept present throughout the period of concreting. Movement of labour and other persons shall be totally prohibited for reinforcement laid in position. For access to different parts, suitable mobile platforms shall be provided so that steel reinforcement in position is not disturbed. For ensuring proper cover, mortar blocks of suitable size shall be cast and tied to the reinforcement. Timber, kapachi or metal pieces shall not be used for this purpose.

### **8.0. Transporting and laying:**

8.1. The method of transporting and placing concrete shall be as approved. Concrete shall be so transported and placed that no contamination, segregation or loss of its constituent material takes place.

All form work shall be cleaned and made free from standing water, (lust, show 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.

**8.2.** Concreting shall proceed continuously over the area between construction joints. Fresh concrete shall not be placed against concrete which has been in position for more than 30 minutes unless a proper construction joint is formed. Concrete shall be compacted in its final position within 30 minutes of its discharge from the mixer. Except where otherwise agreed to by the Engineer-in-charge concrete shall be deposited in horizontal layers to a compacted depth of not more than 0.45 meter when internal vibrators are used and not exceeding 0.30 meter in all other cases.

**8.3.** Unless otherwise agreed to by the Engineer-in-charge, concrete shall not be dropped into place from a height exceeding 2 meters. When trunking or chutes are used they shall be kept close and used in such a way as to avoid segregation. When concreting has to be resumed on a surface which has hardened, it shall be roughened, swept clean, thoroughly wetted and covered with a 13 mm. thick layer of mortar composed of cement and sand in the same ratio as in the concrete mix itself. This 13 mm. layer of mortar shall be freshly mixed and placed immediately before placing of new concrete. Where concrete has not fully hardened, all laitance shall be removed by scrubbing the wet surface with wire or bristle, brushes, care being taken to avoid dislodgement of any particles of coarse aggregate. The surface shall then be thoroughly wetted, all free water removed and then coated with a neat cement grout. The first layer of concrete to be placed on this surface shall not exceed 1.50 m, in thickness and shall be well rammed against old work, particular attention being given to corners and close spots.

**8.4.** All concrete shall be compacted to produce a dense homogeneous mass with the assistance of vibrators, unless, otherwise permitted by the, Engineer-in-charge for exceptional cases, such as concreting under water, where vibrators cannot be used. Sufficient vibrators in serviceable condition shall be kept at site so that spare equipment is always available in the event of breakdowns.

Concrete shall be judged to be compacted when the mortar fills the spaces between the coarse aggregate and begins to cream up to form an even surface. Compaction shall be completed before the initial setting starts i.e. within 30 minutes of addition of water to dry mixture. During compaction, it shall be observed that needle vibrators are not applied on reinforcement which is likely to destroy the bond between concrete and reinforcement.

#### **9.0. Curing**

Immediately after compaction, concrete shall be protected from weather, including rain, running after shocks, vibration, traffic, rapid temperature changes, frost and drying out process. It shall be covered with wet sacking, hassain or other similar absorbent material approved, soon after the initial set and shall be kept continuously wet for a period of not less than 14 days from the date of placement. Masonry work over foundation concrete may be started after 48 hours of its laying but curing of concrete shall be continued for a minimum period of 14 days.

#### **10.0. Sampling and Testing of concrete**

**10.1.** Samples from fresh concrete shall be taken as per I.S. 1199-1959 and cubes shall be made, cured and tested at 7 days or 28 (days as per requirements in accordance with IS, 516-1959. A random sampling procedure shall be adopted to ensure that each concrete batch shall have a reasonable chance of being tested i.e. the sampling should be spread over the entire period of concreting and cover all mixing units., The minimum frequency of sampling of concrete of each grade shall be in accordance with following:

Quantity of concrete in the work	No. of samples	Quantity of concrete in the works	No. of samples
1-5 Cmt	1	16-30 cmt.	3
6-15 Cmt.	2	31-50 cmt.	4
51 and above	4 + one additional for each additional 50 M. or part thereof.		

**NOTE :** At least one sample shall be taken from each shift. Ten test specimens shall be made from, each sample, five for testing at 7 days and the remaining five at 28 days. The samples of concrete shall be taken on each day of the concreting as per above-frequency. The number of specimens may be suitably increased as deemed necessary by the Engineer-in-charge when procedure of tests given above reveals a poor quality of concrete and in other special cases.

**10.2.** The average strength of the group of cubes cast for each day shall not be less than the specified cube strength of 150 Kg/Cm<sup>2</sup> at 28 (days. 20% of the cubes cast for each day may have value less than the specified strength provided the lowest value is not less than 85% of the specified strength. If the concrete made in accordance with the proportions given for a particular grade, does not yield the specified strength, such concrete shall be classified as belonging to the appropriate lower grade. Concrete made in accordance with the proportions given for a particular grade shall not, however, be placed in a higher grade on the ground that the test strength are higher than the minimum specified.

#### **4.0. Mode of measurement and payment**

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

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

**E. E.**

**Item No. 04 :- Providing and laying cement concrete 1:3:6 (1- Cement : 3- Coarse sand : 6- crushed stone aggregates 20 mm nominal size) and curing complete including cost of formwork in Wall Caps / Coping**

**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.Graded stone aggregate 20 mm. nominal size shall conform to 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. Workmanship:**

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

**2.3. General:**

**2.3.1 Clearing and Treatment of forms:**

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

**2.3.3 Stripping time:**

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.

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

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

**2.5 Centering:**

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

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

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

**2.6 Scaffolding:**

2.6.1 All scaffolding, hoisting arrangements and ladders etc., required for the facilitating of concreting shall be provided and removed on completion of work by contractor at his own expense. The scaffolding, hoisting arrangements and ladders etc. shall be strong enough to 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.

2.6.2 The scaffolding, hoisting arrangements and ladder shall allow easy approach to the work spot and afford easy inspection.

**2.7. General:**

2.7.1. The concrete mix is not required to be designed by preliminary tests. The proportion of the concrete mix shall be 1:2:4 (1 cement :2 coarse sand : 4 graded stone aggregate 10 mm. nominal size) by volume. Concrete work shall have exposed concrete surface or as specified in the item.

2.7.2. The designation. Ordinary M-100, M-200, M-250 specified as per I.S. Corresponding approximately to 1:3:6, 1:2:4, 1:1 ½:3 and 1:1:2 nominal mix of ordinary concrete by volume respectively.

**2.7.3.** The ingredients required for ordinary concrete containing one bag of cement of 50 Kg. by weight (0.0342 Cum) for different proportions of mix shall be as under:

Grade of concrete	Total quantity of dry aggregate by volume per 50 Kgs. of cement to be taken as the sum of individual volume of fine and coarse aggregates, maximum	Proportion of fine aggregate to coarse aggregate 50 Kgs. of cement	Quantity of water per maximum.
1	2	3	4
M-100 (1:3:6)	300 Liters	Generally 1 2 for fine aggregate	34 Liters
M-150 (1:2:4)	220 Liters	to coarse aggregate by volume	32 Liters
M-200 (1:1 1/2: 3)	160 Liters	but subject to and upper limit	
30 Liters			
M-250 (1:1:2)	100 Liters	of 1 : 1 1/2 and lower limit 1 :3	27 Liters

2.7.4. The water cement ratios shall not more than those specified in the above table. The cement content of the mix specified in the table shall be increased if the quantity of water in mix has to be increased to overcome the difficulties of placement and compaction so that the water cement ratio specified in the Table is not exceeded.

2.7.5. Workability of the concrete shall be controlled by maintaining a water-cement-ratio that is bound to give a concrete mix which is just sufficiently wet to be placed and compacted without difficulty with the means available.

2.7.6. The maximum size of coarse aggregate shall be as large as possible within the limits specified but in no case greater than one fourth of the minimum thickness of the member, provided that the concrete can be placed without difficulty so as to surround all reinforcement thoroughly and to fill the corners of the form.

2.7.7. For reinforced concrete work, coarse aggregates having a nominal size of 20 mm. are generally considered satisfactory.

2.7.8. For heavily reinforced concrete members as in the case of ribs of main beams, the nominal maximum size of coarse aggregate should usually be restricted to 5 mm. less than the minimum clear distance between the main bars, or 5 mm. less than the minimum cover to the reinforcement whichever is smaller.

2.7.9. Where the reinforcement is widely spaced as in solid slabs, limitations of size of the aggregate may not be important and the nominal maximum size may sometimes be as great as or greater than the minimum cover.

2.7.10. Admixture may be used in concrete only with approval of Engineer-in-charge based upon the evidence that with the passage of time, neither the compressive strength of concrete is reduced nor are other requisite qualities of concrete and steel impaired by the use of such admixtures.

## 2.8 Re-Use:

2.8.1. 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.

(a) The bars shall be kept in position by the following methods :

(i) In case of beam and slab construction, sufficient number of precast cover blocks in cement mortar 1:2 (1 cement : 2 coarse sand) about 4 cms. x 4 cms. section and of thickness equal to the specified cover shall be placed between the bars and shattering as to secure and maintain the requisite cover of concrete over the reinforcement. In case of cantilevered or doubly reinforced beams or slabs, the main reinforcing bars shall be held in position by introducing chain spacers or supports bars at 1.0 to 1.2 meter centers.

(ii) In case of columns and walls, the vertical bars shall be kept in position by means of timber templates with slots accurately cut in them, the templates shall be removed after concreting has been done below it. The bars may be also be suitably tied by means of annealed steel wires to the shuttering to maintain their position during concreting.

(iii) All bars projecting from pillars, columns, beams, slabs etc, to which other bars and concrete are to be attached or bounded to later on, shall be protected with a coat of thin neat cement grout, if the bars are not likely to be incorporated with succeeding mass of concrete within the following 10 days. This coat of thin neat cement shall be removed before concreting.

## 3.0. Proportion of Mix:

3.1. The Proportion of ' cement, sand and coarse aggregate shall be one part of cement, 2-parts of sand, 4-parts of Crushed stone aggregates and shall so measured by volume.

## 4.0. Mixing

4.1. For all work, concrete shall be mixed in a mechanical mixer which along with other accessories shall be kept in first class -working condition and so maintained throughout the construction. Measured quantity of aggregate, sand, cement required for each batch shall be poured into the drum of the mechanical mixer while it is continuously running. After about half a minute of dry mixing, measured quantity of water required for each batch of concrete mix shall be added gradually and mixing continued for another one and a half minute. Mixing shall be continued till materials are uniformly distributed and 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 the mixing be done for less than 2 minutes after all ingredients have been put into the mixer.

**4.2.** When hand mixing is permitted by the Engineer-in-charge for small jobs or for certain other reasons, it shall be done on the smooth water tight platform large enough to allow efficient turning over the ingredients of concrete before and after adding water. Mixing platform shall be so arranged that no foreign material gets mixed with concrete- nor does the mixing water flow out. Cement in required number of bags shall be placed in a uniform layer on top of the measured quantity of fine and coarse aggregate, which shall also be spread in a layer of uniform thickness on the mixing platform. Dry coarse and fine aggregate and cement shall then be mixed thoroughly by turning over to get a mixture to uniform colour. Specified quantity of water shall then be added gradually through a rose-can 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.

**4.3.** Mixers which have been out of use for more than 30 minutes shall be thoroughly cleaned before putting in a new batch. Unless otherwise agreed to by the Engineer-in-charge the first batch of concrete from the mixture shall contain only two thirds of normal quantity of coarse aggregate. Mixing plant shall be thoroughly cleaned before changing from one type of cement to another.

## **5.0 Curing**

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

## **6.0. Consistency:**

**6.1.** The degree of consistency which shall depend upon the nature of the work and methods of vibration of concrete shall be determined by regular slump tests in accordance with I.S. 1199-1959. The slump of 10 mm. to 25 mm. shall be adopted when vibrators are used and 80 mm. when vibrators are not used.

## **7.0. Inspection:**

**7.1.** Contractor shall give the Engineer-in-charge due notice before placing any concrete in the forms to permit him to inspect and accept the false work and forms as to their strength, alignment, and general fitness but such inspection shall not relieve the contractor of his responsibility for the safety of men, machinery, materials and for results obtained. Immediately before concreting, all forms shall be thoroughly cleaned.

**7.2.** Centering design and its erection shall be got approved from the Engineer-in-charge. One carpenter with helper shall invariably be kept present throughout the period of concreting. Movement of labour and other persons shall be totally prohibited for reinforcement laid in position. For access to different parts, suitable mobile platforms shall be provided so that steel reinforcement in position is not disturbed. For ensuring proper cover, mortar blocks of suitable size shall be cast and tied to the reinforcement. Timber, kapachi or metal pieces shall not be used for this purpose.

## **8.0. Transporting and laying:**

**8.1.** The method of transporting and placing concrete shall be as approved. Concrete shall be so transported and placed that no contamination, segregation or loss of its constituent material takes place.

All form work shall be cleaned and made free from standing water, (lust, 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.

**8.2.** Concreting shall proceed continuously over the area between construction joints. Fresh concrete shall not be placed against concrete which has been in position for more than 30 minutes unless a proper construction joint is formed. Concrete shall be compacted in its final position within 30 minutes of its discharge from the mixer. Except where otherwise agreed to by the Engineer-in-charge concrete shall be deposited in horizontal layers to a compacted depth of not more than 0.45 meter when internal vibrators are used and not exceeding 0.30 meter in all other cases.

**8.3.** Unless otherwise agreed to by the Engineer-in-charge, concrete shall not be dropped into place from a height exceeding 2 meters. When trunking or chutes are used they shall be kept close and used in such a way as to avoid segregation. When concreting has to be resumed on a surface which has hardened, it shall be roughened, swept clean, thoroughly wetted and covered with a 13 mm. thick layer of mortar composed of cement and sand in the same ratio as in the concrete mix itself. This 13 mm. layer of mortar shall be freshly mixed and placed immediately before placing of new concrete. Where concrete has not fully hardened, laitance shall be removed by scrubbing the wet surface with wire or bristle, brushes, care being taken to avoid dislodgement of any particles of coarse aggregate. The surface shall then be thoroughly wetted, all free water removed and then coated with neat cement grout. The first layer of concrete to be placed on this surface shall not exceed 1.50 m, in thickness and shall be well rammed against old work, particular attention being given to corners and close spots.

**8.4.** All concrete shall be compacted to produce a dense homogeneous mass with the assistance of vibrators, unless, otherwise permitted by the, Engineer-in- charge for exceptional cases, such as concreting under water, where vibrators cannot be used. Sufficient vibrators in serviceable condition shall be kept at site so that spare equipment is always available in the event of breakdowns.

Concrete shall be judged to be compacted when the mortar fills the spaces between the coarse aggregate and begins to cream up to form an even surface. Compaction shall be completed before the initial setting starts i.e. within 30 minutes of addition of water to dry mixture. During compaction, it shall be observed that needle



vibrators are not applied on reinforcement which is likely to destroy the bond between concrete and reinforcement.

#### 9.0. Curing

Immediately after compaction, concrete shall be protected from weather, including rain, running after shocks, vibration, traffic, rapid temperature changes, frost and drying out process. It shall be covered with wet sacking, hassain or other similar absorbent material approved, soon after the initial set and shall be kept continuously wet for a period of not less than 14 days from the date of placement. Masonry work over foundation concrete may be started after 48 hours of its laying but curing of concrete shall be continued for a minimum period of 14 days.

#### 10.0. Sampling and Testing of concrete

10.1. Samples from fresh concrete shall be taken as per I.S. 1199-1959 and cubes shall be made, cured and tested at 7 days or 28 (lays as per requirements in accordance with LS, 516-1959. A random sampling procedure shall be adopted to ensure that each concrete batch shall have a reasonable chance of being tested i.e. the sampling should be spread over the entire period of concreting and cover all mixing units., The minimum frequency of sampling of concrete of each grade shall be in accordance with following:

Quantity of concrete in the work	No. of samples	Quantity of concrete in the works	No. of samples
1-5 Cmt	1	16-30 cmt.	3
6-15 Cmt.	2	31-50 cfnt.	4
51 and above	4 + one additional for each additional 50 M. or part thereof.		

**NOTE :** At least one sample shall be taken from each shift. Ten test specimens shall be made from, each sample, five for testing at 7 days and the remaining five at 28 days. The samples of concrete shall be taken on each day of the concreting as per above-frequency. The number of specimens may be suitably increased as deemed necessary by the Engineer-in-charge when procedure of tests given above reveals a poor quality of concrete and in other special cases.

10.2. The average strength of the group of cubes cast for each day shall not be less than the specified cube strength of 150 Kg/Cm<sup>2</sup> it 28 (lays. 20% of the cubes cast for each day may have valueless than the specified strength provided the lowest value is not less than 85% of the specified strength. If the c.r.i4w ma e in accordance with the proportions given for a particular grade, does not yield the specified strength, such concrete shall be classified as belonging to the appropriate lower grade. Concrete made in accordance with the proportions given for a particular grade shall not, however, be placed in a higher grade on the ground that the test strength are higher than the minimum specified.

#### 4.0. Mode of measurement and payment

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

4.2 The rate shall be including the form work

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

E. E.

**Item No. 05 :- PProviding and laying ordinary cement concret 1:1.5:3 (1- cement :1.5 coarse sand :3 graded stoneaggregates 20 m.m. nominal size) and finishing smooth with curing etc.complete including the cost of formwork but excluding the cost of reinforcement. for reinforced concrete work in foundation footing base coloumn & mass concrete etc.complete.**

#### 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.Graded stone aggregate 20 mm. nominal size shall conform to 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. Workmanship:

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

#### 2.3. General:

##### 2.3.1. Clearing and Treatment of forms:

2.3.2. 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 shaft prepared by dissolving yellow soap in water to get consistency of paint. Alternatively, a coat of raw linseed oil shall be applied after thoroughly cleaning the surface. Care shall be taken that the coating does not get on construction joint surface and reinforced bars.

### 2.3.3. Stripping time:

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

- (e) Sides of walls columns and vertical faces of beams.....24 to 48 hours.
- (f) Beam soffits, (props, left under).....7 days.
- (g) Removal of props slabs:
- (iii) Slabs spanning up to 4.5. m.....7 days.
- (iv) Spanning over 4.5 mm.....14 days.
- (h) Removal of props t beams and Arches:
- (i) Spanning up to 6 mm.....14 days.
- (ii) Spanning over 6 m.....21 days.

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

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

### 2.5. Centering:

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

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

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

### 2.6. Scaffolding:

2.6.1. All scaffolding, hoisting arrangements and ladders etc., required for the facilitating of 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.

2.6.2. The scaffolding, hoisting arrangements and ladder shall allow easy approach to the work spot and afford easy inspection.

### 2.7. General:

2.7.1. The concrete mix is not required to be designed by preliminary tests. The proportion of the concrete mix shall be 1:2:4 (1 cement :2 coarse sand : 4 graded stone aggregate 10 mm. nominal size) by volume. Concrete work shall have exposed concrete surface or as specified in the item.

2.7.2. The designation. Ordinary M-100, M-200, M-250 specified as per I.S. Corresponding approximately to 1:3:6, 1:2:4, 1:1 1/2:3 and 1:1:2 nominal mix of ordinary concrete by volume respectively.

2.7.3. The ingredients required for ordinary concrete containing one bag of cement of 50 Kg. by weight (0.0342 Cum) for different proportions of mix shall be as under:

Grade of concrete	Total quantity of dry aggregate by volume per 50 Kgs. of cement to be taken as the sum of individual volume of fine and coarse aggregates, maximum	Proportion of fine aggregate to coarse aggregate to 50 Kgs. of cement	Quantity of water per maximum.
1	2	3	4
M-100 (1:3:6)	300 Liters	Generally 1 2 for fine aggregate	34 Liters
M-150 (1:2:4)	220 Liters	to coarse aggregate by volume	32 Liters
M-200 (1:1 1/2: 3)	160 Liters	but subject to and upper limit	30
Liters			
M-250 (1:1:2)	100 Liters	of 1 : 1 1/2 and lower limit 1 :3	27 Liters

2.7.4. The water cement ratios shall not more than those specified in the above table. The cement content of the mix specified in the table shall be increased if the quantity of water in mix has to be increased to overcome the difficulties of placement and compaction so that the water cement ratio specified in the Table is not exceeded.

2.7.5. Workability of the concrete shall be controlled by maintaining a water-cement-ratio that is bound to give a concrete mix which is just sufficiently wet to be placed and compacted without difficulty with the means available.

2.7.6. The maximum size of coarse aggregate shall be as large as possible within the limits specified but in no case greater than one fourth of the minimum thickness of the member, provided that the concrete can be placed without difficulty so as to surround all reinforcement thoroughly and to fill the corners of the form.

2.7.7. For reinforced concrete work, coarse aggregates having a nominal size of 20 mm. are generally considered satisfactory.

2.7.8. For heavily reinforced concrete members as in the case of ribs of main beams, the nominal maximum size of coarse aggregate should usually be restricted to 5 mm. less than the minimum clear distance between the main bars, or 5 mm. less than the minimum cover to the reinforcement whichever is smaller.

2.7.9. Where the reinforcement is widely spaced as in solid slabs, limitations of size of the aggregate may not be important and the nominal maximum size may sometimes be as great as or greater than the minimum cover.

2.7.10. Admixture may be used in concrete only with approval of Engineer-in-charge based upon the evidence that with the passage of time, neither the compressive strength of concrete is reduced nor are other requisite qualities of concrete and steel impaired by the use of such admixtures.

## **2.8 Re-Use:**

2.8.1. Before re-use, all forms 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.

(a) The bars shall be kept in position by the following methods :

(iv) In case of beam and slab construction, sufficient number of precast cover blocks in cement mortar 1:2 (1 cement : 2 coarse sand) about 4 cms. x 4 cms. section and of thickness equal to the specified cover shall be placed between the bars and shuttering as to secure and maintain the requisite cover of concrete over the reinforcement. In case of cantilevered or doubly reinforced beams or slabs, the main reinforcing bars shall be held in position by introducing chain spacers or supports bars at 1.0 to 1.2 meter centers.

(v) In case of columns and walls, the vertical bars shall be kept in position by means of timber templates with slots accurately cut in them, the templates shall be removed after concreting has been done below it. The bars may also be suitably tied by means of annealed steel wires to the shuttering to maintain their position during concreting.

(vi) All bars projecting from pillars, columns, beams, slabs etc, to which other bars and concrete are to be attached or bounded to later on, shall be protected with a coat of thin neat cement grout, if the bars are not likely to be incorporated with succeeding mass of concrete within the following 10 days. This coat of thin neat cement shall be removed before concreting.

## **3.0. Proportion of Mix:**

3.1. The Proportion of cement, sand and coarse aggregate shall be one part of cement, 2-parts of sand, 4-parts of Crushed stone aggregates and shall so measured by volume.

## **4.0. Mixing**

4.1. For all work, concrete shall be mixed in a mechanical mixer which along with other accessories shall be kept in first class working condition and so maintained throughout the construction. Measured quantity of aggregate, sand, cement required for each batch shall be poured into the drum of the mechanical mixer while it is continuously running. After about half a minute of dry mixing, measured quantity of water required for each batch of concrete mix shall be added gradually and mixing continued for another one and a half minute. Mixing shall be continued till materials are uniformly distributed and 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 the mixing be done for less than 2 minutes after all ingredients have been put into the mixer.

4.2. When hand mixing is permitted by the Engineer-in-charge for small jobs or for certain other reasons, it shall be done on the smooth water tight platform large enough to allow efficient turning over the ingredients of concrete before and after adding water. Mixing platform shall be so arranged that no foreign material gets mixed with concrete- nor does the mixing water flow out. Cement in required number of bags shall be placed in a uniform layer on top of the measured quantity of fine and coarse aggregate, which shall also be spread in a layer of uniform thickness on the mixing platform. Dry coarse and fine aggregate and cement shall then be mixed thoroughly by turning over to get a mixture of uniform colour. Specified quantity of water shall then be added gradually through a rose-can 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.

4.3. Mixers which have been out of use for more than 30 minutes shall be thoroughly cleaned before putting in a new batch. Unless otherwise agreed to by the Engineer-in-charge the first batch of concrete from the mixture shall contain only two thirds of normal quantity of coarse aggregate. Mixing plant shall be thoroughly cleaned before changing from one type of cement to another.

## **5.0 Curing**

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

## **6.0. Consistency:**

6.1. The degree of consistency which shall depend upon the nature of the work and methods of vibration of concrete shall be determined by regular slump tests in accordance with I.S. 1199-1959. The slump of 10 mm. to 25 mm. shall be adopted when vibrators are used and 80 mm. when vibrators are not used.

## 7.0. Inspection:

**7.1.** Contractor shall give the Engineer-in-charge due notice before placing any concrete in the forms to permit him to inspect and accept the false work and forms as to their strength, alignment, and general fitness but such inspection shall not relieve the contractor of his responsibility for the safety of men, machinery, materials and for results obtained. Immediately before concreting, all forms shall be thoroughly cleaned.

**7.2.** Centering design and its erection shall be got approved from the Engineer-in-charge. One carpenter with helper shall invariably be kept present throughout the period of concreting. Movement of labour and other persons shall be totally prohibited for reinforcement laid in position. For access to different parts, suitable mobile platforms shall be provided so that steel reinforcement in position is not disturbed. For ensuring proper cover, mortar blocks of suitable size shall be cast and tied to the reinforcement. Timber, kapachi or metal pieces shall not be used for this purpose.

## 8.0. Transporting and laying:

**8.1.** The method of transporting and placing concrete shall be as approved. Concrete shall be so transported and placed that no contamination, segregation or loss of its constituent material takes place.

All form work shall be cleaned and made free from standing water, (lust, show 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.

**8.2.** Concreting shall proceed continuously over the area between construction joints. Fresh concrete shall not be placed against concrete which has been in position for more than 30 minutes unless a proper construction joint is formed. Concrete shall be compacted in its final position within 30 minutes of its discharge from the mixer. Except where otherwise agreed to by the Engineer-in-charge concrete shall be deposited in horizontal layers to a compacted depth of not more than 0.45 meter when internal vibrators are used and not exceeding 0.30 meter in all other cases.

**8.3.** Unless otherwise agreed to by the Engineer-in-charge, concrete shall not be dropped into place from a height exceeding 2 meters. When trunking or chutes are used they shall be kept close and used in such a way as to avoid segregation. When concreting has to be resumed on a surface which has hardened, it shall be roughened, swept clean, thoroughly wetted and covered with a 13 mm. thick layer of mortar composed of cement and sand in the same ratio as in the concrete mix itself. This 13 mm. layer of mortar shall be freshly mixed and placed immediately before placing of new concrete. Where concrete has not fully hardened, ail laitance shall be removed by scrubbing the wet surface with wire or bristle, brushes, care being taken to avoid dislodgement of any particles of coarse aggregate. The surface shall then be thoroughly wetted, all free water removed and then coated with neat cement grout. The first layer of concrete to be placed on this surface shall not exceed 1.50 rhm, in thickness and shall be well rammed against old work, particular attention being given to corners and close spots.

**8.4.** All concrete shall be compacted to produce a dense homogeneous mass with the assistance of vibrators, unless, otherwise permitted by the, Engineer-in- charge for exceptional cases, such as concreting under water, where vibrators cannot be used. Sufficient vibrators in serviceable condition shall be kept at site so that spare equipment is always available in the event of breakdowns.

Concrete shall be judged to be compacted when the mortar fills the spaces between the coarse aggregate and begins to cream up to form an even surface. Compaction shall be completed before the initial setting starts i.e. within 30 minutes of addition of water to dry mixture. During compaction, it shall be observed that needle vibrators are not applied on reinforcement which is likely to destroy the bond between concrete and reinforcement.

## 9.0. Curing

Immediately after compaction, concrete shall be protected from weather, including rain, running after shocks, vibration, traffic, rapid temperature changes, frost and drying out process. It shall be covered with wet sacking, hassain or other similar absorbent material approved, soon after the initial set and shall be kept continuously wet for a period of not less than 14 days from the date of placement. Masonry work over foundation concrete may be started after 48 hours of its laying but curing of concrete shall be continued for a minimum period of 14 days.

## 10.0. Sampling and Testing of concrete

**10.1.** Samples from fresh concrete shall be taken as per I.S. 1199-1959 and cubes shall be made, cured and tested at 7 days or 28 (lays as per requirements in accordance with LS, 516-1959. A random sampling procedure shall be adopted to ensure that each concrete batch shall have a reasonable chance of being tested i.e. the sampling should be spread over the entire period of concreting and cover all mixing units., The minimum frequency of sampling of concrete of each grade shall be in accordance with following:

Quantity of concrete in the work	No. of samples	Quantity of concrete in the works	No. of samples
1-5 Cmt	1	16-30 cmt.	3
6-15 Cmt.	2	31-50 cfnt.	4
51 and above	4 + one additional for each additional 50 M. or part thereof.		

**NOTE :** At least one sample shall be taken from each shift. Ten test specimens shall be made from, each sample, five for testing at 7 days and the remaining five at 28 days. The samples of concrete shall be taken on each day of the concreting as per above-frequency. The number of specimens may be suitably increased as deemed necessary by the Engineer-in-charge when procedure of tests given above reveals a poor quality of concrete and in other special cases.

**10.2.** The average strength of the group of cubes cast for each day shall not be less than the specified cube strength of 150 Kg/Cm2 it 28 (lays. 20% of the cubes cast for each day may have valueless than the specified

strength provided the lowest value is not less than 85% of the specified strength. If the concrete made in accordance with the proportions given for a particular grade, does not yield the specified strength, such concrete shall be classified as belonging to the appropriate lower grade. Concrete made in accordance with the proportions given for a particular grade shall not, however, be placed in a higher grade on the ground that the test strength are higher than the minimum specified.

#### **4.0. Mode of measurement and payment**

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

4.2 The rate shall be including the form work

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

**E. E.**

**Item No. 06 :- Providing and laying ordinary cement concrete 1:1.5:3 (1- cement :1.5 coarse sand :3 graded stone aggregates 20 m.m. nominal size) and finishing smooth with curing etc.complete including the cost of formwork but excluding the cost of reinforcement. for reinforced concrete work in COLUMN etc. Complete.**

#### **1.0 Material:**

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.Graded stone aggregate 20 mm. nominal size shall conform to 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. Workmanship:**

2.3. 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 safeguard 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.

#### **3.0 General:**

##### **3.1 Clearing and Treatment of forms:**

3.2 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.

Stripping time:

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

- (i) Sides of walls columns and vertical faces of beams.....24 to 48 hours.
- (j) Beam soffits, (props, left under).....7 days.
- (k) Removal of props slabs:
- (v) Slabs spanning up to 4.5. m.....7 days.
- (vi) Spanning over 4.5 m.....14 days.
- (l) Removal of props to beams and Arches:
- (iii) Spanning up to 6 m.....14 days.
- (iv) Spanning over 6 m.....21 days.

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

3.2.1 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

Centering:

3.2.2 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.

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

3.2.4 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.

Scaffolding:



3.2.5 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.

3.2.6 The scaffolding, hoisting arrangements and ladder shall allow easy approach to the work spot and afford easy inspection.

#### 4.0 General:

4.1. The concrete mix is not required to be designed by preliminary tests. The proportion of the concrete mix shall be 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 10 mm. nominal size) by volume. Concrete work shall have exposed concrete surface or as specified in the item.

4.2. The designation. Ordinary M-100, M-200, M-250 specified as per I.S. Corresponding approximately to 1:3:6, 1:2:4, 1:1 1/2:3 and 1:1:2 nominal mix of ordinary concrete by volume respectively.

4.3. The ingredients required for ordinary concrete containing one bag of cement of 50 Kg. by weight (0.0342 Cum) for different proportions of mix shall be as under:

Grade of concrete	Total quantity of dry aggregate by volume per 50 Kgs. of cement to be taken as the sum of individual volume of fine and coarse aggregates, maximum	Proportion of fine aggregate to coarse aggregate 50 Kgs. of cement	Quantity of water per maximum.
1	2	3	4
M-100 (1:3:6)	300 Liters	Generally 1 2 for fine aggregate	34 Liters
M-150 (1:2:4)	220 Liters	to coarse aggregate by volume	32 Liters
M-200 (1:1 1/2: 3)	160 Liters	but subject to and upper limit	30 Liters
M-250 (1:1:2)	100 Liters	of 1 : 1 1/2 and lower limit 1 :3	27 Liters

4.4. The water cement ratios shall not more than those specified in the above table. The cement content of the mix specified in the table shall be increased if the quantity of water in mix has to be increased to overcome the difficulties of placement and compaction so that the water cement ratio specified in the Table is not exceeded.

4.5. Workability of the concrete shall be controlled by maintaining a water-cement-ratio that is bound to give a concrete mix which is just sufficiently wet to be placed and compacted without difficulty with the means available.

4.6. The maximum size of coarse aggregate shall be as large as possible within the limits specified but in no case greater than one fourth of the minimum thickness of the member, provided that the concrete can be placed without difficulty so as to surround all reinforcement thoroughly and to fill the corners of the form.

4.7. For reinforced concrete work, coarse aggregates having a nominal size of 20 mm. are generally considered satisfactory.

4.8. For heavily reinforced concrete members as in the case of ribs of main beams, the nominal maximum size of coarse aggregate should usually be restricted to 5 mm. less than the minimum clear distance between the main bars, or 5 mm. less than the minimum cover to the reinforcement whichever is smaller.

4.9. Where the reinforcement is widely spaced as in solid slabs, limitations of size of the aggregate may not be important and the nominal maximum size may sometimes be as great as or greater than the minimum cover.

4.10. Admixture may be used in concrete only with approval of Engineer-in-charge based upon the evidence that with the passage of time, neither the compressive strength of concrete is reduced nor are other requisite qualities of concrete and steel impaired by the use of such admixtures.

#### Re-Use:

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.

(a) The bars shall be kept in position by the following methods :

(i) In case of beam and slab construction, sufficient number of precast cover blocks in cement mortar 1:2 (1 cement : 2 coarse sand) about 4 cms. x 4 cms. section and of thickness equal to the specified cover shall be placed between the bars and shattering as to secure and maintain the requisite cover of concrete over the reinforcement. In case of cantilevered or doubly reinforced beams or slabs, the main reinforcing bars shall be held in position by introducing chain spacers or supports bars at 1.0 to 1.2 meter centers.

(ii) In case of columns and walls, the vertical bars shall be kept in position by means of timber templates with slots accurately cut in them, the templates shall be removed after concreting has been done below it. The bars may be also be suitably tied by means of annealed steel wires to the shuttering to maintain their position during concreting.

(iii) All bars projecting from pillars, columns, beams, slabs etc, to which other bars and concrete are to be attached or bonded to later on, shall be protected with a coat of thin neat cement grout, if the bars are not likely to be incorporated with succeeding mass of concrete within the following 10 days. This coat of thin neat cement shall be removed before concreting.



## **5.0. Proportion of Mix:**

**5.1.** The Proportion of ' cement, sand and coarse aggregate shall be one part of cement, 2-parts of sand, 4-parts of Crushed stone aggregates and shall so measure by volume.

## **6.0. Mixing**

**6.1.** For all work, concrete shall be mixed in a mechanical mixer which along with other accessories shall be kept in first class -working condition and so maintained throughout the construction. Measured quantity of aggregate, sand, cement required for each batch shall be poured into the drum of the mechanical mixer while it is continuously running. After about half a minute of dry mixing, measured quantity of water required for each batch of concrete mix shall be added gradually and mixing continued for another one and a half minute. Mixing shall be continued till materials are uniformly distributed and 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 the mixing be done for less than 2 minutes after all ingredients have been put into the mixer.

**6.2.** When hand mixing is permitted by the Engineer-in-charge for small jobs or for certain other reasons, it shall be done on the smooth water tight platform large enough to allow efficient turning over the ingredients of concrete before and after adding water. Mixing platform shall be so arranged that no foreign material gets mixed with concrete- nor does the mixing water flow out. Cement in required number of bags shall be placed in a uniform layer on top of the measured quantity of fine and coarse aggregate, which shall also be spread in a layer of uniform thickness on the mixing platform. Dry coarse and fine aggregate and cement shall then be mixed thoroughly by turning over to get a mixture to uniform colour. Specified quantity of water shall then be added gradually through a rose-can 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.

**6.3.** Mixers which have been out of use for more than 30 minutes shall be thoroughly cleaned before putting in a new batch. Unless otherwise agreed to by the Engineer-in-charge the first batch of concrete from the mixture shall contain only two thirds of normal quantity of coarse aggregate. Mixing plant shall be thoroughly cleaned before changing from one type of cement to another.

## **7.0 Curing**

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

## **8.0. Consistency:**

**8.1.** The degree of consistency which shall depend upon the nature of the work and methods of vibration of concrete shall be determined by regular slump tests in accordance with I.S. 1199-1959. The slump of 10 mm. to 25 mm. shall be adopted when vibrators are used and 80 mm. when vibrators are not used.

## **9.0. Inspection:**

**9.1.** Contractor shall give the Engineer-in-charge due notice before placing any concrete in the forms to permit him to inspect and accept the false work and forms as to their strength, alignment, and general fitness but such inspection shall not relieve the contractor of his responsibility for the safety of men, machinery, materials and for results obtained. Immediately before concreting, all forms shall be thoroughly cleaned.

**9.2.** Centering design and its erection shall be got approved from the Engineer-in-charge. One carpenter with helper shall invariably be kept present throughout the period of concreting. Movement of labour and other persons shall be totally prohibited for reinforcement laid in position. For access to different parts, suitable mobile platforms shall be provided so that steel reinforcement in position is not disturbed. For ensuring proper cover, mortar blocks of suitable size shall be cast and tied to the reinforcement. Timber, kapachi or metal pieces shall not be used for this purpose.

## **10.0. Transporting and laying:**

**10.1.** The method of transporting and placing concrete shall be as approved. Concrete shall be so transported and placed that no contamination, segregation or loss of its constituent material takes place.

All form work shall be cleaned and made free from standing water, (lust, 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.

**10.2.** Concreting shall proceed continuously over the area between construction joints. Fresh concrete shall not be placed against concrete which has been in position for more than 30 minutes unless a proper construction joint is formed. Concrete shall be compacted in its final position within 30 minutes of its discharge from the mixer. Except where otherwise agreed to by the Engineer-in-charge concrete shall be deposited in horizontal layers to a compacted depth of not more than 0.45 metre when internal vibrators are used and not exceeding 0.30 metre in all other cases.

**10.3.** Unless otherwise agreed to by the Engineer-in-charge, concrete shall not be dropped into place from a height exceeding 2 metres. When trunking or chutes are used they shall be kept close and used in such a way as to avoid segregation. When concreting has to be resumed on a surface which has hardened, it shall be roughened, swept clean, thoroughly wetted and covered with a 13 mm. thick layer of mortar composed of cement and sand in the same ratio as in the concrete mix itself. This 13 mm. layer of mortar shall be freshly mixed and placed immediately before placing of new concrete. Where concrete has not fully hardened, laitance shall be removed by scrubbing the wet surface with wire or bristle, brushes, care being taken to avoid dislodgement of any particles of coarse aggregate. The surface shall then be thoroughly wetted, all free water

removed end then coated with neat cement grout. The first layer of concrete to be placed on this surface shall not exceed 1.50 m, in thickness and shall be well rammed against old work, particular attention being given to corners and close spots.

**10.4.** All concrete shall be compacted to produce a dense homogeneous mass with the assistance of vibrators, unless, otherwise permitted by the, Engineer-in-charge for exceptional cases, such as concreting under water, where vibrators cannot be used. Sufficient vibrators in serviceable condition shall be kept at site so that spare equipment is always available in the event of breakdowns.

Concrete shall be judged to be compacted when the mortar fills the spaces between the coarse aggregate and begins to cream up to form an even surface. Compaction shall be completed before the initial setting starts i.e. within 30 minutes of addition of water to dry mixture. During compaction, it shall be observed that needle vibrators are not applied on reinforcement which is likely to destroy the bond between concrete and reinforcement.

#### **11.0. Curing**

Immediately after compaction, concrete shall be protected from weather, including rain, running after shocks, vibration, traffic, rapid temperature changes, frost and drying out process. It shall be covered with wet sacking, hassain or other similar absorbent material approved, soon after the initial set and shall be kept continuously wet for a period of not less than 14 days from the date of placement. Masonry work over foundation concrete may be started after 48 hours of its laying but curing of concrete shall be continued for a minimum period of 14 days.

#### **12.0. Sampling and Testing of concrete**

**12.1.** Samples from fresh concrete shall be taken as per I.S. 1199-1959 and cubes shall be made, cured and tested at 7 days or 28 (days as per requirements in accordance with IS, 516-1959. A random sampling procedure shall be adopted to ensure that each concrete batch shall have a reasonable chance of being tested i.e. the sampling should be spread over the entire period of concreting and cover all mixing units., The minimum frequency of sampling of concrete of each grade shall be in accordance with following :

Quantity of concrete in the work	No. of samples	Quantity of concrete in the works	No. of samples
1-5 Cmt	1	16-30 cmt.	3
6-15 Cmt.	2	31-50 cfnt.	4
51 and above	4 + one additional for each additional 50 M. or part thereof.		

**NOTE :** At least one sample shall be taken from each shift. Ten test specimens shall be made from, each sample, five for testing at 7 days and the remaining five at 28 days. The samples of concrete shall be taken on each day of the concreting as per above-frequency. The number of specimens may be suitably increased as deemed necessary by the Engineer-in-charge when procedure of tests given above reveals a poor quality of concrete and in other special cases.

**12.2.** The average strength of the group of cubes cast for each day shall not be less than the specified cube strength of 150 Kg/Cm<sup>2</sup> at 28 (days. 20% of the cubes cast for each day may have value less than the specified strength provided the lowest value is not less than 85% of the specified strength. If the concrete made in accordance with the proportions given for a particular grade, does not yield the specified strength, such concrete shall be classified as belonging to the appropriate lower grade. Concrete made in accordance with the proportions given for a particular grade shall not, however, be placed in a higher grade on the ground that the test strength are higher than the minimum specified.

#### **13.0. Mode of measurement and payment**

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

13.2 The rate shall be including the form work

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

**E. E.**

**Item No. 07 :: Providing and laying ordinary cement concrete 1:1.5:3 (1- Cement : 1.5- Coarse sand : 3- graded stone aggregates 20 mm nominal size) and finishing smooth with, curing etc. complete including the cost of formwork but excluding the cost of reinforcement for R.C.C work in BEAMS etc. Complete.**

#### **1. 0. Materials :**

1.1. Water shall conform to M-1. Cement shall conform to M-3. Sand shall conform to M-6. The crushed Stone aggregate 20 mm. nominal size shall conform to M-12. The shuttering to be provided shall be of ordinary timber plank and shall conform to M-26. The dimensions of scantlings and battens shall conform to the design. The strength of the wood shall not be less than that assumed in the design.

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

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

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

2.2.1 All rubbish, particularly chipping shaving and saw dust shall be removed from the interior of the form before the concrete work is placed and the-form in contact with concrete shall be cleaned and thoroughly

wetted or treated. The surface shall be then coated with soap solution applied before concreting is done. Soap solution for the purpose shall be prepared by dissolving yellow soap in water to get consistency of paint. Alternatively a coat of raw linseed oil shall be applied after thoroughly cleaning the surface. Care shall be taken that the coating does not get on construction joint surface and reinforced bars.

### 2.3. Stripping time:

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

- (m) Sides of walls columns and vertical faces of beams.....24 to 48 hours.
- (n) Beam soffits, (props, left under).....7 days.
- (o) Removal of props slabs:
- (vii) Slabs spanning up to 4.5 m.....7 days.
- (viii) Spanning over 4.5 m.....14 days.
- (p) Removal of props beams and Arches:
- (v) Spanning up to 6 m.....14 days.
- (vi) Spanning over 6 m.....21 days.

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

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

### 2.5. Centering:

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

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

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

### 2.6. Scaffolding:

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

2.10.2 The scaffolding, hoisting arrangements and ladder shall allow easy approach to the work spot and afford easy inspection.

### 2.11 General:

2.11.1. The concrete mix is not required to be designed by preliminary tests. The proportion of the concrete mix shall be 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 20 mm. nominal size) by volume concrete work shall have exposed concrete surface or as specified in the item.

2.11.2. The designation ordinary M-100, M-150, M-200, M-250 specified as per I.S. correspond approximately to 1:3:6, 1:2:4, 1:1.1/2:3 and 1:1:2 nominal mix of ordinary concrete by volume respectively.

2.11.3 The ingredients required for ordinary concrete containing one bag of cement of 50 kg. by weight (0.0342 Cu M.) for different proportions of mix shall be as under:

Grade of concrete	Total quantity of dry aggregate by volume per 50 kgs. of cement to be taken as the sum of individual volume of fine and coarse aggregates, maximum	Proportion of fine aggregate to coarse aggregate	Quantity of water 50 Kgs. of cement per maximum cement
1	2	3	4
M-100 (1:3:6)	300 Liters	Generally 1:2 for aggregate	34 Liters
M-150 (1:2:4)	220 Liters	to coarse aggregate by volume	32 Liters
M-200 (1:1.1/2:3)		160 but subject to an upper limit	30 Liters
M-250 (1:1:2)	100 Liters	of 1:1.1/2 and lower limit	1:3 27 Liters

2.11.4. The water cement ratios shall not be more than specified in the above table. The cement content of the mix specified in the table shall be increased if the quantity of water in mix has to be met in order to overcome the difficulties of placements and compaction so that the water-cement ratio specified in the table is not exceeded.

2.11.5. Workability of the concrete shall be controlled by maintaining a water -cement-ratio that is found to give a concrete mix which is just sufficient wet to be placed and compacted without difficulty with the means available.

2.11.6. The maximum size of course aggregate shall be as large as possible within the limits specified but in no case greater than one forth of the minimum thickness of the member provided that the concrete can be placed without difficulty so as to surround all reinforcement thoroughly and to fill the corners of the form.

#### **2.12 Re-Use:**

2.12.1 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.

#### **2.13 Proportion of Mix:**

2.13.1. The Proportion of ' cement, sand and coarse aggregate shall be one part of cement, 3-parts of sand, 6-parts of Crushed stone aggregates and shall so measured by volume.

#### **2.14. Mixing:**

2.14.1. The concrete shall be mixed in a mechanical mixer at 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 tight 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 mixing in mechanical mixer shall be done for a period 1 to 2 minutes. The quantity of water shall be sufficient to produce a dense concrete of required workability for the purpose..

#### **2.15. Transporting & Placing the concrete**

2.15.1. The concrete shall be handled 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 commence.

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

#### **2.16. Curing**

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

#### **2.17.. Sampling and Testing of concrete**

2.17.1. Samples from fresh concrete shall be taken as per I.S. 1199-1959 and cubes shall be made, cured and tested at 7 days or 28 (days as per requirements in accordance with IS, 516-1959. A random sampling procedure shall be adopted to ensure that each concrete batch shall have a reasonable chance of being tested i.e. the sampling should be spread over the entire period of concreting and cover all mixing units., The minimum frequency of sampling of concrete of each grade shall be in accordance with following :

Quantity of concrete	No. of samples	Quantity of concrete	No. of samples
1-5 Cmt	1	16-30 cmt.	3
6-15 Cmt.	2	31-50 cmt.	4
51 and above	4 + one additional for each additional 50 M. or part thereof.		

**NOTE :** At least one sample shall be taken from each shift. Ten test specimens shall be made from, each sample, five for testing at 7 days and the remaining five at 28 days. The samples of concrete shall be taken on each day of the concreting as per above-frequency. The number of specimens may be suitably increased as deemed necessary by the Engineer-in-charge when procedure of tests given above reveals a poor quality of concrete and in other special cases.

2.17.2. The average strength of the group of cubes cast for each day shall not be less than the specified cube strength of 150 Kg/Cm<sup>2</sup> at 28 (days. 20% of the cubes cast for each day may have value less than the specified strength provided the lowest value is not less than 85% of the specified strength. If the concrete made in accordance with the proportions given for a particular grade, does not yield the specified strength, such concrete shall be classified as belonging to the appropriate lower grade. Concrete made in accordance with the proportions given for a particular grade shall not, however, be placed in a higher grade on the ground that the test strength are higher than the minimum specified.

#### **2.18. Mode of measurement and Payment:**

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

2.18.2 The rate shall be including the form work

2.18.3. The rate shall be for a unit, of one cubic metre.

**E. E.**

**Item No. 08 :: Providing and Laying ordinary cement concrete 1:1.5:3 (1- Cement : 1.5- Coarse sand : 3- graded stone aggregates 20 mm nominal size) and finishing smooth with curing etc. complete including the cost of formwork but excluding the cost of reinforcement for R.C.C work in Slabs.**

**1. 0. Materials :**

1.1. Water shall conform to M-1. Cement shall conform to M-3. Sand shall conform to M-6. The crushed Stone aggregate 20 mm. nominal size shall conform to M-12. The shuttering to be provided shall be of ordinary timber plank and shall conform to M-26. The dimensions of scantlings and battens shall conform to the design. The strength of the wood shall not be less than that assumed in the design.

## **2.0. Workmanship:**

2.1 The form work shall conform to the shape lines and dimensions as shown on the plans and be constructed as to remain sufficiently rigid during the placing and compacting of the concrete. Adequate arrangements shall be made by the contractor to safeguard 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.

## **3.0 Clearing and Treatment of forms:**

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.

## **4.0 Stripping time:**

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

(q)	Sides of walls columns and vertical faces of beams.....	24 to 48 hours.
(r)	Beam soffits, (props, left under).....	7 days.
(s)	Removal of props slabs:	
(ix)	Slabs spanning up to 4.5. m.....	7 days.
(x)	Spanning over 4.5 m.....	14 days.
(t)	Removal of props to beams and Arches:	
(vii)	Spanning up to 6 m.....	14 days.
(viii)	Spanning over 6 m.....	21 days.

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

5.1 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.

## **6.0 Centering:**

6.1.1 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.

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

6.1.3 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.

## **7.0 Scaffolding:**

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

7.1.2 The scaffolding, hoisting arrangements and ladder shall allow easy approach to the work spot and afford easy inspection.

## **8.0 General:**

8.1.1. The concrete mix is not required to be designed by preliminary tests. The proportion of the concrete mix shall be 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 20 mm. nominal size) by volume concrete work shall have exposed concrete surface or as specified in the item.

8.1.2 The designation ordinary M-100, M-150, M-200, M-250 specified as per I.S. correspond approximately to 1:3:6, 1:2:4, 1:1:1/2:3 and 1:1:2 nominal mix of ordinary concrete by volume respectively.

8.1.3 The ingredients required for ordinary concrete containing one bag of cement of 50 kg. by weight (0.0342 Cu M.) for different proportions of mix shall be as under:



Grade of concrete	Total quantity of dry aggregate by volume per 50 kgs. of cement to be taken as the sum of individual volume of fine and coarse aggregates, maximum	Proportion of fine aggregate to coarse aggregate	Quantity of water 50 Kegs. of per maximum cement
1	2	3	4
M-100 (1:3:6)	300 Liters	Generally 1:2 for line aggregate to coarse aggregate by volume 160 but subject to an upper limit	34 Liters
M-150 (1:2:4)	220 Liters		32 Liters
M-200 (1:1.1/2:3)			30 Liters
M-250 (1:1:2)	100 Liters	of 1:1.1/2 and lower limit	1:3 27 Liters

8.1.4 The water cement ratios shall not be more than specified in the above table. The cement content of the mix specified in the table shall be increased if the quantity of water in mix has to be met eased to overcome the difficulties of placements and compaction so that the water-cement ratio specified in the table is not exceeded.

8.1.5 Workability of the concrete shall be controlled by maintaining a water -cement-ratio that is found to give a concrete mix which is just sufficient wet to be placed and compacted without difficulty with the means available.

8.1.6 The maximum size of coarse aggregate shall be as large as possible within the limits specified but in no case greater than one forth of the minimum thickness of the member provided that the concrete can be placed without difficulty so as to surround all reinforcement thoroughly and to fill the corners of the form.

#### 9.0 Re-Use:

9.1 Before re-use, all from 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 Proportion of Mix:

10.1. The Proportion of ' cement, sand and coarse aggregate shall be one part of cement, 3-parts of sand, 6-parts of Crushed stone aggregates and shall so measured by volume.

#### 11.0. Mixing:

11.1. The concrete shall be mixed in a mechanical mixer at 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 tight care shall be taken to ensure that mixing is continued until tile 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 mixing in mechanical mixer shall be done for a period 1 to 2 minutes. The quantity of water shall be sufficient to produce a dense concrete of required workability for the purpose..

#### 12.0 Transporting & Placing the concrete

12.1. The concrete shall be handled from the place Of mixing to the filial position in not more than 15 minutes by the method as directed and shall be placed into its filial position, compacted and fillished within 30 minutes of mixing with water i.e. before the setting commence.

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

#### 13.0 Curing

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

#### 14.0. Sampling and Testing of concrete

14.1. Samples from fresh concrete shall be taken as per I.S. 1199-1959 and cubes shall be made, cured and tested at 7 days or 28 (lays as per requirements in accordance with LS, 516-1959. A random sampling procedure shall be adopted to ensure that each concrete batch shall have a resonable chance of being tested i.e. the sampling should be spread over the eatire period of concreting and cover all mixing units., The minimum frequency of sampling of concrete of each grade shall be in accordance with following :

Quantity of concrete	No. of samples	Quantity of concrete	No. of samples
1-5 Cmt	1	16-30 cmt.	3
6-15 Cmt.	2	31-50 cfnt.	4
51 and above	4 + one additional for each additional 50 M. or part thereof.		

**NOTE :** At least one sample shall be taken from each shift. Ten test specimens shall be made from, each sample, five for testing at 7 days and the remaining five at 28 days. The samples of concrete shall be taken on each day of the concreting as per above-frequency. The number of specimens may be suitably increased as deemed necessary by the Engineer-in-charge when procedure of tests given above reveals a poor quality of concrete and in other special cases.

14.2. The average strength of the group of cubes cast for each day shall not be less than the specified cube strength of 150 Kg/Cm<sup>2</sup> it 28 (lays. 20% of the cubes cast for each day may have valueless than the specified strength provided the lowest value is not less than 85% of the specified strength. If the c.r.i4w ma e in accordance with the proportions given for a particular grade, does not yield the specified strength, such concrete shall be classified as belonging to the appropriate lower grade. Concrete made in accordance with the

proportions given for a particular grade shall not, however, be placed in a higher grade on the ground that the test strength are higher than the minimum specified.

#### **15.0 Mode of measurement and Payment:**

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

15.2 The rate shall be including the form work

15.3. The rate shall be for a unit, of one cubic metre.

**E. E.**

**Item No. 09 :: Providing and Laying ordinary cement concrete 1:1.5:3 (1- Cement : 1.5- Coarse sand : 3- graded stone aggregates 20 mm nominal size) and finishing smooth with curing etc. complete including the cost of formwork but excluding the cost of reinforcement for R.C.C work in V & H Fins.**

#### **1. 0. Materials :**

1.1. Water shall conform to M-1. Cement shall conform to M-3. Sand shall conform to M-6. The crushed Stone aggregate 20 mm. nominal size shall conform to M-12. The shuttering to be provided shall be of ordinary timber plank and shall conform to M-26. The dimensions of scantlings and battens shall conform to the design. The strength of the wood shall not be less than that assumed in the design.

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

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

#### **3.0 Clearing and Treatment of forms:**

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.

#### **4.0 Stripping time:**

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

- |   |                 |
|---|-----------------|
| (u) Sides of walls columns and vertical faces of beams..... | 24 to 48 hours. |
| (v) Beam soffits, (props, left under).....                  | 7 days.         |
| (w) Removal of props slabs:                                 |                 |
| (xi) Slabs spanning up to 4.5. m.....                       | 7 days.         |
| (xii) Spanning over 4.5 mm.....                             | 14 days.        |
| (x) Removal of props t beams and Arches:                    |                 |
| (ix) Spanning up to 6 mm.....                               | 14 days.        |
| (x) Spanning over 6 m.....                                  | 21 days.        |

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

5.1 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.

#### **6.0 Centering:**

6.1 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.

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

6.1.2 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.

#### **7.0 Scaffolding:**

7.1.1 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.

7.1.2. The scaffolding, hoisting arrangements and ladder shall allow easy approach to the work spot and afford easy inspection.

## 8.0 General:

8.1. The concrete mix is not required to be designed by preliminary testes. The proportion of the concrete mix shall be 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 20 mm. nominal size) by volume concrete work shall have exposed concrete surface or as specified in the item.

8.2. The designation ordinary M-100, M-150m M-200, M-250 specified as per I.S. correspond approximately to 1:3:6, 1:2:4, 1:1.1/2:3 and 1:1:2 nominal mix of ordinary concrete by volume respectively.

8.3 The ingredients required for ordinary concrete containing one beg of cement of 50 kg. by weight (0.0342 Cu M.) for different proportions of mix shall be as under:

Grade of concrete	Total quantity of dry aggregate by volume per 50 kgs. of cement to be taken as the sum of individual volume of fine and coarse aggregates, maximum	Proportion of fine aggregate to coarse aggregate	Quantity of water 50 Kgs. of cement
1	2	3	4
M-100 (1:3:6)	300 Liters	Generally 1:2 for aggregate to coarse aggregate by volume 160 but subject to an upper limit	34 Liters
M-150 (1:2:4) M-200 (1:1.1/2:3)	220 Liters		32 Liters 30 Liters
M-250 (1:1:2)	100 Liters	of 1:1.1/2 and lower limit	1:3 27 Liters

8.4. The water cement ratios shall not be more than specified in the above table. The cement content of the mix specified in the table shall be increased if the quantity of water in mix has to be met eased to overcome the difficulties of placements and compaction so that the water-cement ratio specified in the table is not exceeded.

8.5. Workability of the concrete shall be controlled by maintaining a water -cement-ratio that is found to give a concrete mix which is just sufficient wet to be placed and compacted without difficulty with the means available.

8.6. The maximum size of course aggregate shall be as large as possible within the limits specified but in no case greater than one forth of the minimum thickness of the member provided that the concrete can be placed without difficulty so as to surround all reinforcement thoroughly and to fill the corners of the form.

## 9.0 Re-Use:

7.1.2 Before re-use, all from 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. Proportion of Mix:

10.1. The Proportion of ' cement, sand and coarse aggregate shall be one part of cement, 3-parts of sand, 6-parts of Crushed stone aggregates and shall so measured by volume.

## 11.0. Mixing:

11.1. The concrete shall be mixed in a mechanical mixer at 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 tight 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 mixing in mechanical mixer shall be done for a period 1 to 2 minutes. The quantity of water shall be sufficient to produce a dense concrete of required workability for the purpose..

## 12.0 Transporting & Placing the concrete

12.1. The concrete shall be handled 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 commence.

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

## 13.0 Curing

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

## 14.0. Sampling and Testing of concrete

14.1. Samples from fresh concrete shall be taken as per I.S. 1199-1959 and cubes shall be made, cured and tested at 7 days or 28 (days as per requirements in accordance with IS, 516-1959. A random sampling procedure shall be adopted to ensure that each concrete batch shall have a reasonable chance of being tested i.e. the sampling should be spread over the entire period of concreting and cover all mixing units., The minimum frequency of sampling of concrete of each grade shall be in accordance with following :

Quantity of concrete	No. of samples	Quantity of concrete	No. of samples
1-5 Cmt	1	16-30 cmt.	3
6-15 Cmt.	2	31-50 cmt.	4
51 and above	4 + one additional for each additional 50 M. or part thereof.		

**NOTE :** At least one sample shall be taken from each shift. Ten test specimens shall be made from, each sample, five for testing at 7 days and the remaining five at 28 days. The samples of concrete shall be taken on each day of the concreting as

per above-frequency. The number of specimens may be suitably increased as deemed necessary by the Engineer-in-charge when procedure of tests given above reveals a poor quality of concrete and in other special cases.

**14.2.** The average strength of the group of cubes cast for each day shall not be less than the specified cube strength of 150 Kg/Cm<sup>2</sup> at 28 days. 20% of the cubes cast for each day may have value less than the specified strength provided the lowest value is not less than 85% of the specified strength. If the concrete made in accordance with the proportions given for a particular grade, does not yield the specified strength, such concrete shall be classified as belonging to the appropriate lower grade. Concrete made in accordance with the proportions given for a particular grade shall not, however, be placed in a higher grade on the ground that the test strength are higher than the minimum specified.

#### **15.0 Mode of measurement and Payment:**

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

15.2 The rate shall be including the form work

15.3. The rate shall be for a unit, of one cubic metre.

**E. E.**

**Item No. 10 :: Providing and laying ordinary cement concrete 1:1.5:3 (1- Cement : 1.5- Coarse sand : 3-graded stone aggregates 20 mm nominal size) for R.C.C lintel including finishing smooth with curing etc. complete including the cost of formwork but excluding the cost of reinforcement.**

#### **1. 0. Materials :**

1.1. Water shall conform to M-1. Cement shall conform to M-3. Sand shall conform to M-6. The crushed Stone aggregate 20 mm. nominal size shall conform to M-12. The shuttering to be provided shall be of ordinary timber plank and shall conform to M-26. The dimensions of scantlings and battens shall conform to the design. The strength of the wood shall not be less than that assumed in the design.

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

7.2 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 safeguard 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.

#### **7.3 Clearing and Treatment of forms:**

7.3.1 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.

#### **7.4 Stripping time:**

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

- |   |                 |
|---|-----------------|
| (y) Sides of walls columns and vertical faces of beams..... | 24 to 48 hours. |
| (z) Beam soffits, (props, left under).....                  | 7 days.         |
| (aa) Removal of props slabs:                                |                 |
| (xiii) Slabs spanning up to 4.5. m.....                     | 7 days.         |
| (xiv) Spanning over 4.5 mm.....                             | 14 days.        |
| (bb) Removal of props for beams and Arches:                 |                 |
| (iii) Spanning up to 6 m.....                               | 14 days.        |
| (iv) Spanning over 6 m.....                                 | 21 days.        |

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

7.5.1 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.

#### **7.6 Centering:**

7.6.1 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.

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

7.6.3 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.

## 7.7 Scaffolding:

7.7.1 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.

7.7.2. The scaffolding, hoisting arrangements and ladder shall allow easy approach to the work spot and afford easy inspection.

## 8.0. General:

8.1. The concrete mix is not required to be designed by preliminary testes. The proportion of the concrete mix shall be 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 20 mm. nominal size) by volume concrete work shall have exposed concrete surface or as specified in the item.

8.2. The designation ordinary M-100, M-150m M-200, M-250 specified as per I.S. correspond approximately to 1:3:6, 1:2:4, 1:1:1/2:3 and 1:1:2 nominal mix of ordinary concrete by volume respectively.

8.3 The ingredients required for ordinary concrete containing one bag of cement of 50 kg. by weight (0.0342 Cu M.) for different proportions of mix shall be as under:

Grade of concrete	Total quantity of dry aggregate by volume per 50 kgs. of cement to be taken as the sum of individual volume of fine and coarse aggregates, maximum	Proportion of fine aggregate to coarse aggregate	Quantity of water 50 Kgs. of cement
1	2	3	4
M-100 (1:3:6)	300 Liters	Generally 1:2 for fine aggregate to coarse aggregate by volume	34 Liters
M-150 (1:2:4)	220 Liters	160 but subject to an upper limit	32 Liters
M-200 (1:1.1/2:3)			30 Liters
M-250 (1:1:2)	100 Liters	of 1:1.1/2 and lower limit	27 Liters

8.4. The water cement ratios shall not be more than specified in the above table. The cement content of the mix specified in the table shall be increased if the quantity of water in mix has to be met eased to overcome the difficulties of placements and compaction so that the water-cement ratio specified in the table is not exceeded.

8.5. Workability of the concrete shall be controlled by maintaining a water -cement-ratio that is found to give a concrete mix which is just sufficient wet to be placed and compacted without difficulty with the means available.

8.6. The maximum size of course aggregate shall be as large as possible within the limits specified but in no case greater than one forth of the minimum thickness of the member provided that the concrete can be placed without difficulty so as to surround all reinforcement thoroughly and to fill the corners of the form.

## 8.0 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. Proportion of Mix:

10.1. The Proportion of ' cement, sand and coarse aggregate shall be one part of cement, 3-parts of sand, 6-parts of Crushed stone aggregates and shall so measured by volume.

## 11.0. Mixing:

11.1. The concrete shall be mixed in a mechanical mixer at 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 tight 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 mixing in mechanical mixer shall be done for a period 1 to 2 minutes. The quantity of water shall be sufficient to produce a dense concrete of required workability for the purpose.

## 12.0 Transporting & Placing the concrete

12.1. The concrete shall be handled 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 commence.

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

## 13.0 Curing

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

## 14.0. Sampling and Testing of concrete

14.1. Samples from fresh concrete shall be taken as per I.S. 1199-1959 and cubes shall be made, cured and tested at 7 days or 28 (days as per requirements in accordance with IS, 516-1959. A random sampling procedure shall be adopted to ensure that each concrete batch shall have a reasonable chance of being tested



i.e. the sampling should be spread over the entire period of concreting and cover all mixing units., The minimum frequency of sampling of concrete of each grade shall be in accordance with following :

Quantity of concrete	No. of samples	Quantity of concrete	No. of samples
1-5 Cmt	1	16-30 cmt.	3
6-15 Cmt.	2	31-50 cmt.	4
51 and above	4 + one additional for each additional 50 M. or part thereof.		

**NOTE :** At least one sample shall be taken from each shift. Ten test specimens shall be made from, each sample, five for testing at 7 days and the remaining five at 28 days. The samples of concrete shall be taken on each day of the concreting as per above-frequency. The number of specimens may be suitably increased as deemed necessary by the Engineer-in-charge when procedure of tests given above reveals a poor quality of concrete and in other special cases.

**14.2.** The average strength of the group of cubes cast for each day shall not be less than the specified cube strength of 150 Kg/Cm<sup>2</sup> at 28 days. 20% of the cubes cast for each day may have value less than the specified strength provided the lowest value is not less than 85% of the specified strength. If the concrete made in accordance with the proportions given for a particular grade, does not yield the specified strength, such concrete shall be classified as belonging to the appropriate lower grade. Concrete made in accordance with the proportions given for a particular grade shall not, however, be placed in a higher grade on the ground that the test strength are higher than the minimum specified.

#### **15.0 Mode of measurement and Payment:**

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

15.2 The rate shall be including the form work

15.3. The rate shall be for a unit, of one cubic metre.

**E. E.**

**Item No. 11 :- Providing and laying ordinary cement concrete 1:1.5:3 (1- Cement : 1.5- Coarse sand : 3- graded stone aggregates 20 mm nominal size) and curing complete including cost of formwork but excluding cost of Reinforcement in Wall Caps / Coping.**

#### **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. Graded stone aggregate 20 mm. nominal size shall conform to 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. Workmanship:**

2.4. 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 safeguard against any settlement of the form-work during the course of concreting and after concreting. The form work of shuttering, centering, scaffolding, bracing etc. shall be as per design.

#### **2.3. General:**

##### **2.6.3 Clearing and Treatment of forms:**

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

##### **2.6.5 Stripping time:**

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

(cc)	Sides of walls columns and vertical faces of beams.....	24 to 48 hours.
(dd)	Beam soffits, (props, left under).....	7 days.
(ee)	Removal of props slabs:	
(xv)	Slabs spanning up to 4.5 m.....	7 days.
(xvi)	Spanning over 4.5 m.....	14 days.
(ff)	Removal of props from beams and Arches:	
(v)	Spanning up to 6 m.....	14 days.
(vi)	Spanning over 6 m.....	21 days.

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

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

## 2.8 Centering:

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

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

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

## 2.9 Scaffolding:

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

2.9.2 The scaffolding, hoisting arrangements and ladder shall allow easy approach to the work spot and afford easy inspection.

## 2.7. General:

2.7.1. The concrete mix is not required to be designed by preliminary tests. The proportion of the concrete mix shall be 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 10 mm. nominal size) by volume. Concrete work shall have exposed concrete surface or as specified in the item.

2.7.2. The designation. Ordinary M-100, M-200, M-250 specified as per I.S. Corresponding approximately to 1:3:6, 1:2:4, 1:1 1/2:3 and 1:1:2 nominal mix of ordinary concrete by volume respectively.

2.7.3. The ingredients required for ordinary concrete containing one bag of cement of 50 Kg. by weight (0.0342 Cum) for different proportions of mix shall be as under:

Grade of concrete	Total quantity of dry aggregate by volume per 50 Kgs. of cement to be taken as the sum of individual volume of fine and coarse aggregates, maximum	Proportion of fine aggregate to coarse aggregate 50 Kgs. of cement	Quantity of water per maximum.
1	2	3	4
M-100 (1:3:6)	300 Liters	Generally 1 2 for fine aggregate	34 Liters
M-150 (1:2:4)	220 Liters	to coarse aggregate by volume	32 Liters
M-200 (1:1 1/2: 3)	160 Liters	but subject to and upper limit	
30 Liters			
M-250 (1:1:2)	100 Liters	of 1 : 1 1/2 and lower limit 1 :3	27 Liters

2.7.4. The water cement ratios shall not more than those specified in the above table. The cement content of the mix specified in the table shall be increased if the quantity of water in mix has to be increased to overcome the difficulties of placement and compaction so that the water cement ratio specified in the Table is not exceeded.

2.7.5. Workability of the concrete shall be controlled by maintaining a water-cement-ratio that is bound to give a concrete mix which is just sufficiently wet to be placed and compacted without difficulty with the means available.

2.7.6. The maximum size of coarse aggregate shall be as large as possible within the limits specified but in no case greater than one fourth of the minimum thickness of the member, provided that the concrete can be placed without difficulty so as to surround all reinforcement thoroughly and to fill the corners of the form.

2.7.7. For reinforced concrete work, coarse aggregates having a nominal size of 20 mm. are generally considered satisfactory.

2.7.8. For heavily reinforced concrete members as in the case of ribs of main beams, the nominal maximum size of coarse aggregate should usually be restricted to 5 mm. less than the minimum clear distance between the main bars, or 5 mm. less than the minimum cover to the reinforcement whichever is smaller.

2.7.9. Where the reinforcement is widely spaced as in solid slabs, limitations of size of the aggregate may not be important and the nominal maximum size may sometimes be as great as or greater than the minimum cover.

2.7.10. Admixture may be used in concrete only with approval of Engineer-in-charge based upon the evidence that with the passage of time, neither the compressive strength of concrete is reduced nor are other requisite qualities of concrete and steel impaired by the use of such admixtures.

## 2.8 Re-Use:

2.8.1. 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.

(a) The bars shall be kept in position by the following methods :

(vii) In case of beam and slab construction, sufficient number of precast cover blocks in cement mortar 1:2 (1 cement : 2 coarse sand) about 4 cms. x 4 cms. section and of thickness equal to the specified cover shall be placed between the bars and shuttering as to secure and maintain the requisite cover of concrete over the reinforcement. In case of cantilevered or doubly reinforced beams or slabs, the main reinforcing bars shall be held in position by introducing chain spacers or support bars at 1.0 to 1.2 meter centers.

(viii) In case of columns and walls, the vertical bars shall be kept in position by means of timber templates with slots accurately cut in them, the templates shall be removed after concreting has been done below it. The bars may be also be suitably tied by means of annealed steel wires to the shuttering to maintain their position during concreting.

(ix) All bars projecting from pillars, columns, beams, slabs etc, to which other bars and concrete are to be attached or bonded to later on, shall be protected with a coat of thin neat cement grout, if the bars are not likely to be incorporated with succeeding mass of concrete within the following 10 days. This coat of thin neat cement shall be removed before concreting.

### **3.0. Proportion of Mix:**

**3.1.** The Proportion of ' cement, sand and coarse aggregate shall be one part of cement, 2-parts of sand, 4-parts of Crushed stone aggregates and shall so measured by volume.

### **4.0. Mixing**

**4.1.** For all work, concrete shall be mixed in a mechanical mixer which along with other accessories shall be kept in first class -working condition and so maintained throughout the construction. Measured quantity of aggregate, sand, cement required for each batch shall be poured into the drum of the mechanical mixer while it is continuously running. After about half a minute of dry mixing, measured quantity of water required for each batch of concrete mix shall be added gradually and mixing continued for another one and a half minute. Mixing shall be continued till materials are uniformly distributed and 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 the mixing be done for less than 2 minutes after all ingredients have been put into the mixer.

**4.2.** When hand mixing is permitted by the Engineer-in-charge for small jobs or for certain other reasons, it shall be done on the smooth water tight platform large enough to allow efficient turning over the ingredients of concrete before and after adding water. Mixing platform shall be so arranged that no foreign material gets mixed with concrete- nor does the mixing water flow out. Cement in required number of bags shall be placed in a uniform layer on top of the measured quantity of fine and coarse aggregate, which shall also be spread in a layer of uniform thickness on the mixing platform. Dry coarse and fine aggregate and cement shall then be mixed thoroughly by turning over to get a mixture of uniform colour. Specified quantity of water shall then be added gradually through a rose-can 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.

**4.3.** Mixers which have been out of use for more than 30 minutes shall be thoroughly cleaned before putting in a new batch. Unless otherwise agreed to by the Engineer-in-charge the first batch of concrete from the mixture shall contain only two thirds of normal quantity of coarse aggregate. Mixing plant shall be thoroughly cleaned before changing from one type of cement to another.

### **5.0 Curing**

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

### **6.0. Consistency:**

**6.1.** The degree of consistency which shall depend upon the nature of the work and methods of vibration of concrete shall be determined by regular slump tests in accordance with I.S. 1199-1959. The slump of 10 mm. to 25 mm. shall be adopted when vibrators are used and 80 mm. when vibrators are not used.

### **7.0. Inspection:**

**7.1.** Contractor shall give the Engineer-in-charge due notice before placing any concrete in the forms to permit him to inspect and accept the false work and forms as to their strength, alignment, and general fitness but such inspection shall not relieve the contractor of his responsibility for the safety of men, machinery, materials and for results obtained. Immediately before concreting, all forms shall be thoroughly cleaned.

**7.2.** Centering design and its erection shall be got approved from the Engineer-in-charge. One carpenter with helper shall invariably be kept present throughout the period of concreting. Movement of labour and other persons shall be totally prohibited for reinforcement laid in position. For access to different parts, suitable mobile platforms shall be provided so that steel reinforcement in position is not disturbed. For ensuring proper cover, mortar blocks of suitable size shall be cast and tied to the reinforcement. Timber, kapachi or metal pieces shall not be used for this purpose.

### **8.0. Transporting and laying:**

**8.1.** The method of transporting and placing concrete shall be as approved. Concrete shall be so transported and placed that no contamination, segregation or loss of its constituent material takes place.

All form work shall be cleaned and made free from standing water, (lust, 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.

**8.2.** Concreting shall proceed continuously over the area between construction joints. Fresh concrete shall not be placed against concrete which has been in position for more than 30 minutes unless a proper construction joint is formed. Concrete shall be compacted in its final position within 30 minutes of its discharge from the mixer. Except where otherwise agreed to by the Engineer-in-charge concrete shall be deposited in horizontal layers to a compacted depth of not more than 0.45 meter when internal vibrators are used and not exceeding 0.30 meter in all other cases.

**8.3.** Unless otherwise agreed to by the Engineer-in-charge, concrete shall not be dropped into place from a height exceeding 2 meters. When trunking or chutes are used they shall be kept close and used in such a way as to avoid segregation. When concreting has to be resumed on a surface which has hardened, it shall be roughened, swept clean, thoroughly wetted and covered with a 13 mm. thick layer of mortar composed of cement and sand in the same ratio as in the concrete mix itself. This 13 mm. layer of mortar shall be freshly mixed and placed immediately before placing of new concrete. Where concrete has not fully hardened, all laitance shall be removed by scrubbing the wet surface with wire or bristle, brushes, care being taken to avoid dislodgement of any particles of coarse aggregate. The surface shall then be thoroughly wetted, all free water removed and then coated with neat cement grout. The first layer of concrete to be placed on this surface shall not exceed 1.50 m, in thickness and shall be well rammed against old work, particular attention being given to corners and close spots.

**8.4.** All concrete shall be compacted to produce a dense homogeneous mass with the assistance of vibrators, unless, otherwise permitted by the, Engineer-in-charge for exceptional cases, such as concreting under water, where vibrators cannot be used. Sufficient vibrators in serviceable condition shall be kept at site so that spare equipment is always available in the event of breakdowns.

Concrete shall be judged to be compacted when the mortar fills the spaces between the coarse aggregate and begins to cream up to form an even surface. Compaction shall be completed before the initial setting starts i.e. within 30 minutes of addition of water to dry mixture. During compaction, it shall be observed that needle vibrators are not applied on reinforcement which is likely to destroy the bond between concrete and reinforcement.

#### **9.0. Curing**

Immediately after compaction, concrete shall be protected from weather, including rain, running after shocks, vibration, traffic, rapid temperature changes, frost and drying out process. It shall be covered with wet sacking, hassain or other similar absorbent material approved, soon after the initial set and shall be kept continuously wet for a period of not less than 14 days from the date of placement. Masonry work over foundation concrete may be started after 48 hours of its laying but curing of concrete shall be continued for a minimum period of 14 days.

#### **10.0. Sampling and Testing of concrete**

**10.1.** Samples from fresh concrete shall be taken as per I.S. 1199-1959 and cubes shall be made, cured and tested at 7 days or 28 (days as per requirements in accordance with IS, 516-1959. A random sampling procedure shall be adopted to ensure that each concrete batch shall have a reasonable chance of being tested i.e. the sampling should be spread over the entire period of concreting and cover all mixing units., The minimum frequency of sampling of concrete of each grade shall be in accordance with following:

Quantity of concrete in the work	No. of samples	Quantity of concrete in the works	No. of samples
1-5 Cmt	1	16-30 cmt.	3
6-15 Cmt.	2	31-50 cmt.	4
51 and above	4 + one additional for each additional 50 M. or part thereof.		

**NOTE :** At least one sample shall be taken from each shift. Ten test specimens shall be made from, each sample, five for testing at 7 days and the remaining five at 28 days. The samples of concrete shall be taken on each day of the concreting as per above-frequency. The number of specimens may be suitably increased as deemed necessary by the Engineer-in-charge when procedure of tests given above reveals a poor quality of concrete and in other special cases.

**10.2.** The average strength of the group of cubes cast for each day shall not be less than the specified cube strength of 150 Kg/Cm<sup>2</sup> at 28 (days. 20% of the cubes cast for each day may have value less than the specified strength provided the lowest value is not less than 85% of the specified strength. If the concrete made in accordance with the proportions given for a particular grade, does not yield the specified strength, such concrete shall be classified as belonging to the appropriate lower grade. Concrete made in accordance with the proportions given for a particular grade shall not, however, be placed in a higher grade on the ground that the test strength are higher than the minimum specified.

#### **4.0. Mode of measurement and payment**

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

4.2 The rate shall be including the form work

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

**E. E.**

**Item No. 12:- Providing TMT Bar FE 500D reinforcement for R.C.C. work including bending, binding and placing in position complete.**

**1.0. GENERAL**

This work shall consist of furnishing and placing TMT Fe500D Conforming to IS 1786- 2008 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 shall be T.M.T. Fe 500/500D steel 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 1786 FE-500/500D and shall be of tested quality. It shall also comply with relevant part of IS 456-1966

**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 280-1972

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

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

**5.0. PROTECTION OF REINFORCEMENT**

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

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

**6.0. Workmanship**

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

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

**7.0. BENDING OF REINFORCEMENT**

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

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

**7.3.** Bars shall be bent cold to the specified shape and dimensions or directed by the Engineer using a proper bar bender operated by hand power to obtain the correct radius of bends and shape. Bars shall not be bent or straightened in a manner that will damage parent material or the coating bars bent during transport or handling shall, be straightened before being used on work and shall not be heated to facilitate straightening.

**8.0. PLACING OF REINFORCEMENT**

**8.1.** The reinforcement cage should generally be fabricated in the yard at ground level, and then shifted and placed in position. The reinforcement shall be placed strictly, in accordance with the drawings and shall be



assembled in position, only when structure is otherwise ready for placing of concrete. Prolonged time gap, between assembling of reinforcements and casting of concrete, which may result in rust formation on the surface, shall not be permitted.

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

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

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

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

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

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

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

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

#### **9.0. Lapping**

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

#### **10.0 Welding**

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

**10.2.** While welding may be permitted for T.M.T. reinforcing bars conforming to IS: 432, welding of deformed bars conforming to IS: 1786 shall in general be prohibited. Welding may be permitted in case of bars of other than S 240 grade including special. Welding grade of S 415 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:  $CE = C + \frac{Mn}{6} + \frac{Cr}{6} + \frac{Mg}{6} + \frac{V}{6} + \frac{Ni}{6} + \frac{Cu}{6}$  is 0.4 or less.

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

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

**10.5.** Unless otherwise specified a 'U' type hook at the end of each bar shall invariably be provided to main reinforcement. The radius of the hook shall not be less than twice the diameter of the round bar and the length of the straight part of the bar beyond the end of the curve shall be at least four times of the diameter of the round bar. In case of bars which are not round and in case of deformed bars, the diameter shall be taken as the diameter of circle having an equivalent effective area. The hooks shall be suitably encased to prevent any spitting 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 coatof 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 bejoined by coupling which shall have a cross section sufficient to transmit the full stresses of bars The end of the bars that are joined by coupling shall be upset for sufficient length so that the effective cross section at the base of threads is not less than the normal cross section of the bar. Threads shall be 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 arc 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.	Dia. of Steel	wt./m. of Steel	Sr. No.	Dia. of Steel	wt./m. of Steel
1	8 mm	0.39 kg/rmt.	5	20 mm	2.47 kg/rmt.
2	10 mm	0.62 kg/rmt.	6	25 mm	3.85 kg/rmt.
3	12 mm	0.89 kg/rmt.	7	32 mm	6.31 kg/rmt.
4	16 mm	1.58 kg/rmt.	8	40 mm	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 tones on the basis of IS: 1732. Wastage, overlaps, couplings, welded joints, spacer bars, chairs, stays, hangers and annealed steel wire or other methods for binding and placing shall not be measured and cost of these items shall be deemed to be included in the rates of 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.

**11.4.** 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.

**11.5.** The rate shall be for a unit of **One Kilogram**.

**E. E.**

**Item No. 13: White Stone Bela masonry block in course in foundation and plinth with stone of approved quality in Cement Mortar 1:5 (1-Cement :5- coarse sand) including packing the joints etc. complete.**

**1.0 Materials:**

The stone or Bela shall be white hard sand stone or block. The stone shall be sound hard rough and durable. It shall be free from skin. The thickness of Bela or block shall not be less than 15 cms. or as directed. The mortar used shall consist. One part of Cement putty and 5 parts of fine sand. Cement mortar shall conform to M-11. Water shall conform to M-1. Sand Shall be Conform to M-6.

**2.0 Workmanship**

**2.1 Dressing of stone:**

2.1.1 Stone shall be chiselled on all the sides so that all six sides shall be in a rectangular shape and all the stones shall be so dressed that the bushing of the exposed face shall not project nor depressions for the general wall surfaces. The size of Bela or block shall be as per thickness of the wall to be constructed or as directed.

**3.0 Laying:**

All the stone shall be sufficiently wetted before laying to prevent absorption of water from mortar. All connected Walls in a structure shall normally be raised up uniformly and regularly. The vertical joint shall not be allowed and also it shall not be more than 12 mm. in thickness.

3.1 Proper bonding shall be made by laying Bela or block side by side each other with cement mortar on bed as well as in between two Bela or block vertically.

**4.0 Bond stones:**

Bond stones or through stones running right across the thickness of the wall shall be provided in walls up to 450 mm. thick. In thicker walls two Bela or blocks or laying each other by at least 150 mm. each other shall be provided across the thickness of the wall to bond stone. Such bond stone shall be at least one for every 1.0 sq. mt. area of the wall surface.

**5.0 Joints:**

All the joints shall be completely filled up with mortar and their thickness shall not exceed by 12 mm. When plastering or pointing is not required to be done, the joints shall be struck flush and finished, simultaneously while laying the stone. Otherwise the joints shall be raked to a minimum depth of 20 mm. during process of laying while mortar is still green.

**6.0 Scaffolding:**

Single or double scaffolding shall be used. It shall be strong and sound. The holes left in masonry for supporting shall be made good before plastering.

**7.0 Curing:**

Green work shall be cured for a period of 7 days continuously.

**8.0. Mode of measurements & payment:**

8.1 The work shall be measured on the basis of finished dimensions. No deduction shall be made nor extra payment shall be made for the following:

- (a) Ends of joint, beams, posts, girders, rafters, purlins, corbels etc., each up to 500 sq.cms. in section
- (b) Opening each up to 0.10 Sq.m.
- (c) Small plates and bed plates, bearing of chhajjas and like up to 10 cms. depth (bearing or floor and roof shall be deducted from masonry), (d) Drain holes and recesses for cement concrete blocks to embedded hold fasts of one cubic meter.

**E. E.**

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**No. 14 :: Uncoursed Rubble Masonry with hard stone of approved quality in foundations and plinth in Cement Mortar 1:6 (1-cement : 6-coarse sand including levelling up etc. complete**

**1.0. Materials:**

The cement mortar shall conform to M-11. Stone shall conform to M-16.

**2.0. Workmanship**

**2.1. Dressing of stones:**

Stone used for uncoursed rubble masonry work shall be hammer dressed on the sides, and beds in which such a way as to close with the adjacent stone in the masonry work as strongly as possible. The face stones shall be dressed in such a manner as to give a specified pattern such as polygonal facing etc. The face of the stones shall be so dressed that bushing on the exposed face shall not project by more than 40 mm. from the general wall surface and on the face to be plastered, it shall not project by more than 19 mm., nor shall have depressions more than 10 mm. from the average wall surface.

**2.2. Laying:**

All the stone shall be sufficiently wetted before laying to prevent absorption of water from mortar. The wall shall be built true to plumb (or true to required batter when so specified). All connected walls in a structure shall be raised up informally and regularly. However if for any specific reason, one part of masonry is required to be left behind the wall shall be racked back at an angle not steeper than 45. Vertical tooled joints in masonry shall not

be allowed. The work shall be carried out regularly and masonry of any day wall not be raised by more than 1 meter in height.

**2.3.** The stone shall be laid in an uncoarsed fashion, or random facing etc. However the masonry is required to be brought to level at various stages viz. plinth level window sill level, roof level and any other level specifically shown in the drawings. This may be done first by adjusting the laying of stone to one level and then by providing leveling coarse of cement concrete 1:6:12 (1 cement: sand : 12 graded stone aggregate 20 mm. nominal size) or as otherwise specified.

**2.4.** Proper bonding shall be achieved by closely filling in adjacent stones as well as by using bond stones or through stones as described herein below. Face stones shall extend back sufficiently, and bond well with the masonry. The stone shall be carefully set so as to break joints and avoid formation of vertical joints. The depth of stone from the face of wall inwards shall not be less than weight or breadth at the face. The hearing or interior filling of the wall shall consist of rubble stones which may be of any shape. Neither the face stone nor the hearing stone shall be so small to pass through circular ring of 150 mm. internal diameter in any direction nor shall any of them shall have minimum thickness 100 mm.

**2.5.** All stone shall be carefully laid, hammered down by a wooden mallet into position and solidly embedded in mortar, chips and spawns of stone may be used wherever necessary to avoid thick mortar beds or joints at the same time ensuring that no hollow space is left anywhere in the masonry. The chips used shall not be more than 20% by volume of masonry. The hearing shall be laid nearly level with face stones except that at about one meter intervals vertical bond stone or plumes projecting about 150 to 200 mm. shall be firmly embedded to from vertical bounding in masonry.

**2.6. Bond stone:**

Bond stones or through stones running right across the thickness of the wall shall be provided in wall up to 600 mm. thick. In thicker walls two stones overlapping each other by at least 150 mm. shall be provided across the thickness of the wall to form bond stones. There shall be at least one bond stone for every 0.5 sq. mt of wall surface. The bond stone shall be marked by a distinguishing letter during construction for subsequent verification and shall be laid staggered in subsequent layers.

**2.7. Quoins:**

The quoins or corners stones shall be selected stone neatly dressed with hammer and/or chisel to form the required corner angle and laid header and stretcher alternatively, The bed top surface of quoins shall be chiseled dressed to give horizontal joints. The quoins shall have a uniform chisel draft of at least 25 mm. width at four edges of each exposed face, all the edges of the same face being in one plane. No quoins stone shall be smaller than 0.025 cum. in volume.

**2.8. Jamb Stones:**

The jamb stone shall be made with stone specified for quoins, that the stone provided on the jambs shall have their length equal to thickness of wall up to 600 mm. and a line of headers shall be provided for walls thicker than 600 mm. as specified for bond.

**2.9. Joints:**

All the joints shall be completely filled with mortar and width shall not exceed 25 mm. when plastering of pointing is not required to be done, the joints shall be struck flush and finished simultaneously while laying the stone. Otherwise the joints shall be raked to a minimum depth of 20 mm. by a racking tools, during progress of laying while the mortar is still green.

**2.10. Scaffolding:**

Single or double scaffolding shall be used. The scaffolding shall be strong and sound. The holes left in masonry for supporting scaffolding shall be filled and made good before plastering.

**2.11. Curing:**

Green work shall be protected from rains by covering the same. Masonry shall be kept constantly moist on all the faces for a period of at least 7 days. The top of masonry shall be flooded at close of the day.

**3.0. Mode of measurements and payment**

**3.1.** All work shall be measured on the basis of finished dimensions and measured net except where otherwise specified. Only specified dimensions shall be allowed. Anything extra shall be ignored. The masonry work in foundation and plinth shall be measured under this item. No deduction shall be made, not extra payment made for the following:

- (a) Ends of joints, beams, spots, girders, rafters, purlins, trusses, corbels, etc. each up to 500 sq. cm. in section.
- (b) Opening each up to 0.1 sq.m.
- (c) Wall plates and bed plates, bearing of chhaja and like up to 10 cm. depth (bearing of floor and roof slabs shall be deducted from masonry).
- (d) Drain holes and recesses for cement concrete blocks to embed hold fasts for doors windows.
- (e) Building in the masonry iron fixtures pipes up to 300 mm. dia. hole fasts of doors and windows.
- (f) Forming theses in masonry up to section of 350 sq.cm.

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

**E. E.**

**m No. 15 :: Filling available excavated earth (excluding rock) in trenches, Plinth, sides of foundations etc. in layers not exceeding 20cm. in depth, consolidating each deposited layer by ramming and watering.**

**1.0 Workmanship**

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

1.2 As soon as the work in foundation has been completed and measured the site of foundation shall be cleared of all debris, brick bats: mortar dropping etc., and filled with earth in layers not exceeding 20 cms. Each layer shall be adequately watered, rammed and consolidated before the succeeding layer is laid. The earth shall be rammed with iron rammers where feasible and with the but ends of crow-bars, where rammer cannot be used.

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

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

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

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

**2.0 Mode of Measurements & Payment:**

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

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

**E. E.**

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**Item No. 16 :: Filling in plinth with sand under floor including watering ramming consolidating and dressing etc complete.**

**1.0. Materials**

1.1. Sand shall conform to M 6

**2.0. Workmanship:**

2.1. The Sand to be used for filling shall be free from salts, organic or other foreign matter.

2.2. As soon as the work under the floor has been completed and measured the site shall be cleared of all debris, brick bats: mortar dropping etc., and filled with sand in layers not exceeding 20 cms. Each layer shall be adequately watered, rammed and consolidated before the succeeding layer is laid. The sand 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 filled with sand 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.

**3.0. Mode of Measurements & Payment**

3.1. The relevant specifications of item No. 4.12 shall be followed.

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

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

**E. E.**

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**Item No. 17 :: White Stone Bela masonry block in course in superstructure with stone of approved quality in Cement Mortar 1:5 (1-Cement :5- course sand) including packing the joints etc. complete.**

**1.0 Materials:**

1.1 The stone or Bela shall be white hard sand stone or block. The stone shall be sound hard rough and durable. It shall be free from skin. The thickness of Bela or block shall not be less than 15 cms. or as directed. The mortar used shall consist. One part of Cement putty and 5 parts of fine sand. Cement mortar shall conform to M-11. Water shall conform to M-1. Sand Shall be Conform to M-6

**2.0 Workmanship**

2.1 Dressing of stone:

2.2 Stone shall be chiselled on all the sides so that all six sides shall be in a rectangular shape and all the stones shall be so dressed that the bushing of the exposed face shall not project nor depressions for the general wall surfaces. The size of Bela or block shall be as per thickness of the wall to be constructed or as directed.

**3.0 Laying:**

3.1 All the stone shall be sufficiently wetted before laying to prevent absorption of water from mortar. All connected Walls in a structure shall normally be raised up uniformly and regularly. The vertical joint shall not be allowed and also it shall not be more than 12 mm. in thickness.

3.2 Proper bonding shall be made by laying Bela or block side by side each other with cement mortar on bed as well as in between two Bela or block vertically.



#### **4.0 Bond stones:**

4.1 Bond stones or through stones running right across the thickness of the wall shall be provided in walls up to 450 mm. thick. In thicker walls two Bela or blocks or laying each other by at least 150 mm. each other shall be provided across the thickness of the wall to bond stone. Such bond stone shall be at least one for every 1.0 sq. mt. area of the wall surface.

#### **5.0 Joints:**

5.1 All the joints shall be completely filled up with mortar and their thickness shall not exceed by 12 mm. When plastering or pointing is not required to be done, the joints shall be struck flush and finished, simultaneously while laying the stone. Otherwise the joints shall be raked to a minimum depth of 20 mm. during process of laying while mortar is still green.

#### **6.0 Scaffolding:**

6.1 Single or double scaffolding shall be used. It shall be strong and sound. The holes left in masonry for supportings shall be made good before plastering.

#### **7.0 Curing:**

7.1 Green work shall be cured for a period of 7 days continuously.

#### **8.0 Mode of measurements & payment:**

8.1 The work shall be measured on the basis of finished dimensions. No deduction shall be made nor extra payment shall be made for the following:

8.2 Ends of joint, beams, posts, girders, rafters, purlins, corbels etc., each up to 500 sq.cms. in section

8.3 Opening each up to 0.10 Sq.m.

8.4 Small plates and bed plates, bearing of chhajjas and like up to 10 cms. depth (bearing or floor and roof shall be deducted from masonry), (d) Drain holes and recesses for cement concrete blocks to embedded hold fasts of one cubic meter.

**E. E.**

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### **m No. 18 :: White Stone Bela masonry work in partition walls up to 15 cm thickness in cement Mortar 1:4 ( 1- Cement : 4- coarse sand)**

#### **1.0 Materials:**

1.1 The stone or Bela shall be white hard sand stone or block. The stone shall be sound hard rough and durable. It shall be free from skin. The thickness of Bela or block shall not be less than 15 cms. or as directed. the proportion of mortar shall be in C.M. 1:4 (1 cement : 4 coarse sand.)

#### **2.0 Workmanship**

2.1 Dressing of stone: Stone shall be chiselled on all the sides so that all six sides shall be in a rectangular shape and all the stones shall be so dressed that the bushing of the exposed face shall not project nor depressions for the general wall surfaces. The size of Bela or block shall be as per thickness of the wall to be constructed or as directed.

#### **3.0 Laying:**

3.1 All the stone shall be sufficiently wetted before laying to prevent absorption of water from mortar. All connected Walls in a structure shall normally be raised up uniformly and regularly. The vertical joint shall not be allowed and also it shall not be more than 12 mm. in thickness.

3.2 Proper bonding shall be made by laying Bela or block side by side each other with lime mortar on bed as well as in between two Bela or block vertically.

#### **4.0 Bond stones:**

4.1 Bond stones or through stones running right across the thickness of the wall shall be provided in walls up to 450 mm. thick. In thicker walls two Bela or blocks or laying each other by at least 150 mm. each other shall be provided across the thickness of the wall to bond stone. Such bond stone shall be at least one for every 1.0 sq. mt. area of the wall surface.

#### **5.0 Joints:**

5.1 All the joints shall be completely filled up with mortar and their thickness shall not exceed by 12 mm. When plastering or pointing is not required to be done, the joints shall be struck flush and finished, simultaneously while laying the stone. Otherwise the joints shall be raked to a minimum depth of 20 mm. during process of laying while mortar is still green.

#### **6.0 Scaffolding:**

6.1 Single or double scaffolding shall be used. It shall be strong and sound. The holes left in masonry for supportings shall be made good before plastering.

#### **7.0 Curing:**

7.1 Green work shall be cured for a period of 7 days continuously.

#### **8.0 Mode of measurements & payment**

8.1 The work shall be measured on the basis of finished dimensions. No deduction shall be made nor extra payment shall be made for the following:

8.2 Ends of joint, beams, posts, girders, rafters, purlins, corbels etc., each up to 500 sq.cms. in section. (b) Opening each up to 0.10 Sq.m. (c) Small plates and bed plates, bearing of chhajjas and like up to 10 cms. depth (bearing or floor and roof shall be deducted from masonry). (d) Drain holes and recesses for cement concrete blocks to embedded hold fasts of one cubic meter.

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

**E. E.**

**Item No. 19 :: Providing 15mm thick cement plaster in single coat on Rough (similar ) sides of single or half brick wall for interior plastering up to floor two level finished even and smooth in(I) Cement mortar 1:3 (1 cement : 3 sand)Finishing with floatin coat of cement slurry**

**1.0. Materials:**

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

**2.0. Workmanship:**

2.1. Scaffolding : Wooden ballies, bamboos, planks, treaties 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 roughened by wire brushing if it is not hard and by racking if it is hard. In case of concrete surface, if a chemical retarder has been applied to the form work, the surface shall be roughened by wire brushing and all the resulting dust and loose particles cleaned off and care shall be taken that none of the retarders is left on the surface. Trimming of projections on brick/concrete surface where necessary shall be carried out to get an even surface.

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

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

2.2.4. For external plaster, the plastering operation shall be started from top floor and carried downwards. For internal plaster, the plastering operations may be started wherever the building frame and cladding work arc ready and the temporary supporting ceiling resting on the wall of the floor have been removed. Ceiling plaster shall be completed before starting plaster to walls.

2.2.5. This work is for ceiling soffits of stairs, upto two floor level instead of plaster on walls.

2.2.6. The smooth concrete surface shall be suitably roughened to provide necessary bond before plastering.'

**2.3. Applications of plaster :**

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

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

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

2.3.3. In suspending the work at the end of the day, the plaster shall be left out clean to the line both horizontally and vertically. When recommending the plaster, the edges of the old work shall be scraped clean and wetted with cement putty before plaster is applied to the adjacent 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 arid nearer than 15 cm. to any corners or arrises. Horizontal joints in plaster work shall not also occur on parapet tops and copings as these invaiably 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 rill 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 handing mattings or gunny bags on the outside of the plaster and keeping them wet.

**3.0 Applying floating coat of neat cement slurry.**

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

3.2. In any continuous face of wall the finishing treatment should be carried out continuously and day to day break made to coincide with architectural breaks in order to avoid unsightly junctions.

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

**4.0. Mode of measurements & payment:**

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

4.2. All plastering shall be measured in square metres unless, otherwise specified. Length, breadth or height shall be measured correct to a centimetre.

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

4.4. This item includes plastering upto floor two level.

4.5. 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.

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

4.7. For jambs, soffits, sills etc. for openings not exceeding 0.5 sq. mt. each in area for ends of joists, 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 manner:

(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 opening for finish to plaster around ends of joints, beams posts etc.

(b) Deduction for openings exceeding 0.5 sq. mt. but not exceeding 3 sq. mt. each shall be made as follows and no addition shall be made for reveals, jambs, soffits, sills etc. of these openings.

(i) When both faces of all wall are plastered with same plaster, deduction shall be made for one face only.

(ii) When two faces of wall are plastered with different types of plasters or if one, faces is plastered and the other pointed, deductions shall be made from the plaster or pointing on the side of frame for door, window etc. on which width 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 area of plaster and/or pointing as the case maybe.

4.8. For openings having door frames equal to projecting beyond the thickness of wall, full deduction for opening shall be made from each plastered face of the wall. 4.9. In case of openings of area above 3 sq. mt. each, deduction shall be made for opening but jambs, soffits and sills shall be measured.

4.10 The rate also includes finishing the plaster work with a plotting coat of neat cement slurry in proportion of 1:1 (1.5mm thick about)

**4.11. The rate shall be for a unit of one sq. metre.**

**E.E.**

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**Item No. 20 :: Providing 20mm thick sand faced cement 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. Materials**

**1.0.** Water shall conform to M-1. Cement mortar shall conform to M-11.

**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. The relevant specifications of item No. 17.58(I) shall be followed except that the thickness of back coat shall be 12 mm. average. 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.

**2.2.** 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.

**2.3. 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.

**3.0.** Mode of measurement & payment

**3.1.** The relevant specifications of item No. 17.58 shall be followed except that the sand face plaster on outside up to 10 m. above ground level shall be measured under this item.

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

**17.116(A)** Pointing on brick work with cement mortar 1:3 ( 1 cement : 3 coarse sand) flush pointing.

**1.0. Materials**

**1.1.** Water shall conform to M-1. Cement mortar shall conform to M-11.

**2.0.** Workmanship

**2.1.** The flush pointing work shall be carried out with cement mortar of proportion 1:3(1 part of cement and 3part of coarse sand) by volume.

**2.2.** Preparation of surface.

**2.2.1.** The joints shall be raked to such a depth that the average of new mortar measured from either the sunksurface to finished pointing or from the -edge of the brick shall be average 10 mm.

**2.3.** Application of Mortar and Finishing :

**2.3.1.** The mortar shall, be pressed in to the raked out joints with a pointing trowel according to the types of pointing specified in item. The mortar shall not spread over the corner edges or surface of the masonry. The pointing shall then be finished with the pointed tools.

**2.4.** Curing :

**2.4.1.** The pointing shall be kept wet for 7 days. During this period, it shall be suitably protected from all damages.

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

**3.1.** No deductions shall be made end of joints, beams and 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.

**3.2.** Deductions for openings exceeding 0.5 sq. mt. but not exceeding 3 sq. mt. each shall be paid as follows and no addition shall be made for reveals, jambs, soffits, sills etc. of these openings : (i) When both faces of walls are pointed with same type of pointing, deduction shall be made for one face only, (ii) When two faces of walls are pointed with different type of pointing or if one face is plastered and the other is pointed, deduction shall be made in the plaster or pointing on the side of frame for door, windows etc. on which the width of reveals is less than that on the other side but no deduction shall be made from plaster or pointing on the other side.

(iii) When only one face is treated and the other face is not treated, full deduction shall be made, if the width of the reveals on the treated side is less than on the untreated side, but if the width of the reveal is more then no deduction shall be made nor any addition shall be made for reveals/jambs, soffits, sills etc.

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

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

**E. E.**

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**Item No. 21 :: P & L 24" x 24" vitrified 8 mm thick tile flooring over 20mm (average) base of cement mortar 1:6 ( 1 cement: 6 coarse sand) on new surface or fixing on existing flooring by adhesive material including dismantling of existing flooring and jointed with color cement slurry including finished with flush pointing & cleaning the surface etc. complete for light shade**

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

**1.1.** Water shall conform M-1. Cement Mortar shall conform to M-11. Vitrified tiles shall be of I.S. standard

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

**2.1.** The size of each Vitrified tiles shall be 24" x 24" and 8 to 10mm thickness. The sides thus dressed shall have a full contact if a straight edge is laid along. All angles and edges of the slabs shall be true square and free from chippings and giving a plane surface. The thickness of the base where the tiles to laid shall not less than 20 mm. at any place of the slab.

**2.2** Before laying of the vitrified tiles the existing flooring if any shall be dismantled manually. During this period proper care should be taken to see that the adjoining structure or work or man power may not met with any type of accident. After dismantling the same, the ground shall be levelled to proper line, level and grade.

**2.2.** Bedding for the vitrified tiles shall be cement mortar 1:3 (1 cement; 3 coarse sand) of average thickness 20mm. as given in the description of the item. Sub grade shall be cleaned, wetted and mopped. Mortar of the specified mix and thickness shall be then be spread on an area sufficient to receive one tiles. The tiles 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 pedded in level with and close to the adjoining slab. The joint shall be as fine as possible. The slabs fixed in the floor adjoining the wall shall enter not less than 1.0 mm. under the plaster, skirting or dado. The junction between the wall floor shall be finished neatly. The finished surface shall be level 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 Fixing of tiles ::**

The vitrified tiles of appropriate size and 8mm thick shall be fixed on the flooring with the flooring adhesive materials of approved quality and it shall be laid as recommended by the Manufacturer.

**2.5.** The holes required for Nahni traps, pipes any other fittings shall be made without any extra cost.

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

**3.1.** The rate shall include the cost of all materials and labour involved in all the operations described above. The vitrified tiles shall be measured in square metre correct to two places of decimal, length and breadth shall be measured correct to a centimetre and between the finished face of skirting dado or wall plaster and no deduction shall be made nor extra paid for any opening in floor of areas upto 0.1 sq. mt.

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

**E. E.**

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**Item No. 22 :: Providing and laying white glazed tiles 6 mm thick in skirting, risers of steps and dado on 10 mm thick cement plaster 1:3 ( 1 cement : 3 coarse sand) and jointed with white cement slurry.**

#### **1.0 Materials**

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

#### **2.0 Workmanship**

**2.1.1** Preparation of Surface:

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

**2.2 Laying ;**

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

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

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

**3.0 Mode of measurements and payment**

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

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

**E. E.**

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**Item No. 23: Providing and fixing machine cut Both side mirror polished Kotah stone 25mm thick for Cupboard including making groove in walls and finished the same in CM 1:2 (1-cement:2-sand) etc. complete.**

**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 Polished Kota stone shall conform to M-49,

**2.0. WORKMANSHIP**

2.1. Each slab shall be cut to the required size and shape and fine chisel dressed at all the edges. The sides 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 shelves shall be true square or rectangle and free from chippings and giving a plane surface. The thickness shall be 25mm as specified in the item.

2.2. The single piece Kota stone shelves shall be placed after making groove to the wall and fixing the same in line and level and finishing the same with C M 1:2 and also finishing with neat cement. The finished surface shall be true to levels and slopes as directed

**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 Kota stone shall be measured in square meters correct to two places decimal, length and breadth shall be measured correct to a centimetre and between the finished face.

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

**E. E**

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**Item No. 24 :: Providing and laying 50mm thick cement concrete flooring 1:2:4 (1-cement : 2-coarse sand : 4-graded stone aggregate 20mm nominal size) laid in one layer finished with a floating coat of neat cement.**

**Materials**

Water shall conform to M-1. Cement shall conform to M-3. Sand shall conform to M-6. Stone aggregate 20 mm. nominal size shall conform to M-12. Cement concrete of 1:2:4 proportion measured by volume shall conform to relevant specifications of ordinary grade 1:2:4 concrete.

**2.0. Workmanship**

2.1. The cement concrete flooring of 40 mm thick (Average) is to be laid as per the site condition. The concrete shall be mixed in a mechanical mixer at the work. Hand mixing may however be allowed for smaller quantities of work and in case of failure of machineries or as permitted by the Engineer-in-charge. It shall be carried out on a water tight platform and care shall be taken to ensure that mixing is continued until the mass is uniform in colour and consistency. However 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 or specified thickness shall be laid in accordance with approved pattern or as directed. Finishing operation shall depending 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. meter.

**E. E.**

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**Item No. 25: Providing and laying broken China mosaic flooring for terrace using 12 mm to 20 mm broken pieces of glazed tiles to be laid over cement mortar 1:3 to plain or slope and to be tempered to bring mortar crème out up to surface using white cement including rounding off junctions and extending them up to 15 cm along the wall clearing with water and oxalic acid etc. as directed.**

**1.0 MATERIAL:-**

Water shall be conform to M-1. Cement mortar shall conform to M-3. China mosaic tiles pieces in random size shall conform to M-55 sand shall be conform M-6. And water proofing material of approved quality.

**2.0. WORKMANSHIP:-**

**2.1 General**

1 The grooves are made at height of 150mm on parapet from finished roof surface all along vertical parapet.

2 The Roof Surface 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.

3 The China Mosaic tiles shall be laid on cement mortar bedding 20mm thick in C.M. 1:3. The mortar shall have sufficient plasticity for laying and there shall be no hard lumps that would interfere with the evenness of bedding. The base shall than the spread in thickness not less than 20mm at any place and average 20mm 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 grey cement grout of honey like consistency shall be over the mortar bedding as directed. Uneven size 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 bedding and in level with the adjoining tiles. Then shall be no hollows in bed or joints. The joints between the tiles shall be as thin as possible in as per pattern and work shall be carried out in true in line and level direction of Engineer-in-Charge.

2.2.2 The joints shall be filled with grey cement grout with wire brush or trowel to a depth of 5mm and loose material removed. White cement shall be used for pointing the joints. After fixing the tiles finally in an even plane the flooring be kept wet and allowed to nature undisturbed for 7 Days.

**2.3 Cleaning:-**

The surplus cement grout that may have come out the joints shall be cleaned off before its 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.

After finishing the whole terrace shall flooded with water for a period of two weeks.

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

3.1 The work done shall be measured in Sq.mt. for visible area of work done. The length and width of the following shall be measured between the faces of skirting or dados or plastered face of wall as the case may be. The paving under dado or skirting shall not be measured. No deduction shall be paid nor extra paid for any opening in the floor of area to 0.1 Sq.mt. nothing extra shall be paid for laying the floors at different levels in the same rooms.

The rate shall be for a unit for a one Sq.mt. for Plan area only.

**E. E.**

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**Item No. 26 :: Providing cement vata (10cm x 10cm 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 Sunk Portion and terraces as directed. The vata shall be finished in quarter round shape. The work shall be earned out in the nest workman like manner. The inter portion of 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.

**E. E.**

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**Item No. 27 :: Constructing a cooking platform 60cm width and 70cm height resting on B.B. masonry wall 23cm thick in C.M. 1:6 with (i) fixing of precast R.C.C. (1:2:4) 8cm thick slab with marble mosaic chips set in C.M.(1:6) 6mm thick (terrazzo) with plastering on exposed faces of wall in C.M. (1:4) etc. complete.**

**1.0. Materials**

Water shall conform to M-1. Cement shall conform to M-3. Sand shall conform to M-6. Burnt brick shall conform to M-15. Marble Mosaic chips shall conform to M-46. Stone aggregate 20 mm. nominal size shall conform to M-12. M.S. Bars shall conform to M-18.

**2.0. Workmanship**

2.1. The cooking platform of size as directed shall be constructed in 60 cms. width and 70 cms. height. The brick masonry wall, in C.M. 1 :6 shall be constructed in 23 cms. thickness up to full depth. The relevant specifications of item 6.13 (B) shall be followed for masonry work.

2.2. The R.C.C. slab of 8 cms. thickness and of adequate design and size shall be precast and the same shall be put up on the B.B. masonry work.

2.3. The top and exposed sides of the R.C.C. slab shall be finished with marble mosaic terrazzo 8 mm. thick with required colour pigment. The work of terrazzo shall be carried out as per the Engineer in charge.

2.4. The whole masonry work shall be finished with cement mortar in C.M.1:4. The relevant specification of item 15 shall be followed.

**3.0. Mode of measurements and payments**

3.1. The work of cooking platform shall be measured for finished work.

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

3.3. The rate shall be for a unit of One running meter.

**E. E.**

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**Item No. 28 :: Providing and fixing in positing M.S.Angle 40mm x 40mm x 6mm frame for doors of 25 x 25 x 5 mm angle for shutter frame and 16 gauge M.S.Sheet welded to shutter frame and 6mm square bar for grill as per the approved drawing and design and including 3 coats of oil paint including a primer coat of red oxide paint and all necessary fitting, fixture locking arrangements etc complete.**

**MATERIAL:**

Structural steel shall confirm to M-22.

M S Sheet shall confirm to M-23.

M. S. Bars and flats shall confirm to M-18 & M-22.

Ready mixed primer shall confirm to IS 102-1962.

Synthetic enamel paint shall confirm to IS 1932-1964.

Fixtures and fastenings shall confirm to M-43.

**WORKMANSHIP:**

The frame of angle section 40 X 40 X 6mm shall be made as per required size of door to accommodate the door made of M S angle section 25 X 25 X 5 mm with required bracings and covered with 16 Gauge M S sheet welded to the frame with 3.00 nos. or more hinges welded to the frame no undulation during fixing of sheet is allowed. The shutter shall be fixed in a manner for easy operation during closing and opening position. Required iron oxidised fixtures and fastenings like aldrop, door stopper and required locking arrangement system as directed by engineer in charge shall be welded for easy operation of the shutter.

If any damage to the existing structure found during the fixing of door frame and shutter shall be rectified by the agency free of cost.

**PAINTING:**

The door shall be painted with one coat of red lead primer and two coats of synthetic enamel paint as per general technical specification of painting work to give an even shade to the door.

**MODE OF MEASUREMENT AND PAYMENT:**

The work includes cost of all material, labours, tools & plants and machineries, formwork, and painting etc. required to complete the operation. No any extra shall be paid for any work included in this item.

The measurement shall be carried out for out to out of framework nearest to 1.0 Cm. and payment shall be made in Sqmt. Basis for completed item.

**E. E.**

**Item No. 29 :: Providing and fixing in positing M.S.Angle 35mm x 35mm x 6mm frame for windows and ventilators of 25 x 25 x 5 mm angle for shutter frame and 16 gauge M.S.Sheet welded to shutter frame and 6mm square bar for grill as per the approved drawing and design and including 3 coats of oil paint including a primer coat of red oxide paint and all necessary fitting, fixture locking arrangements etc complete.**

**MATERIAL:-**

Structural steel shall confirm to M-22.

M S Sheet shall confirm to M-23.

M. S. Bars and flats shall confirm to M-18 & M-22.

Ready mixed primer shall confirm to IS 102-1962.

Synthetic enamel paint shall confirm to IS 1932-1964.

Fixtures and fastenings shall confirm to M-43.

**WORKMANSHIP:**

The frame of angle section 35 X 35 X 6mm shall be made as per required size of window to accommodate the door made of M S angle section 25 X 25 X 5 mm with required bracings and covered with 16 Gauge M S sheet welded to the frame with 3.00 nos. or more hinges welded to the frame no undulation during fixing of sheet is allowed. The shutter shall be fixed in a manner for easy operation during closing and opening position. Required iron oxidised fixtures and fastenings like stopper, hook and eye and required locking arrangement system as directed by engineer in charge shall be welded for easy operation of the shutter.

If any damage to the existing structure found during the fixing of door frame and shutter shall be rectified by the agency free of cost.

**PAINTING:**

The door shall be painted with one coat of red lead primer and two coats of synthetic enamel paint as per general technical specification of painting work to give and even shade to the door.

**MODE OF MEASUREMENT AND PAYMENT:**

The work includes cost of all material, labours, tools & plants and machineries, formwork, and painting etc. required to complete the operation. No any extra shall be paid for any work included in this item.

The measurement shall be carried out for out to out of framework nearest to 1.0 Cm. and payment shall be made in Sqmt. Basis for completed item.

**E. E.**

**Item No. 30 :: Providing and fixing EZ-7 section door / window frame including welding and fixtures fastenings including 3-coats of approved enamel oil paint etc.with sheet glass selected quality glass 5mm thick bedded in putty and fixed with wooden beadings of first class teakwood and necessary cuttings etc Complete**

**MATERIAL:-**

Structural steel shall confirm to M-22.

M S Sheet shall confirm to M-23.

M. S. Bars and flats shall confirm to M-18 & M-22.

Ready mixed primer shall confirm to IS 102-1962.

Synthetic enamel paint shall confirm to IS 1932-1964.

Fixtures and fastenings shall confirm to M-43.

**WORKMANSHIP.**

The frame of E Z-7 angle section as per specified size shall be made as per required size of window to accommodate the window shutter made M. S. Section with required bracings and panels shall be provided with 5 mm thick ordinary sheet glass beaded with iron putty welded to the frame with 2.00 nos. or more hinges welded to the frame no undulation during fixing of shutter is allowed. The shutter shall be fixed in a manner for easy operation during closing and opening position. Required iron oxidised fixtures and fastenings like stopper, hock and eye and required locking arrangement system as directed by engineer in charge shall be welded for easy operation of the shutter.

If any damage to the existing structure found during the fixing of window frame and shutter shall be rectified by the agency free of cost.

**PAINTING:**

The window shall be painted with one coat of red lead primer and two coats of synthetic enamel paint as per general technical specification of painting work to give and even shade to the door.

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

The work includes cost of all material, labours, tools & plants and machineries, formwork, and painting etc. required to complete the operation. No any extra shall be paid for any work included in this item.

The measurement shall be carried out for out to out of framework nearest to 1.0 Cm. and payment shall be made in Sqmt. Basis for completed item.

**E. E.**

**Item No. 31 :: Providing and fixing M.S. Plain Grill of required pattern to wooden frames of windows etc. with M.S. flats at required spacing and frame around, square or round bars with round headed bolts and nuts or by screws incl. one coat of priming coat & two coat of oil paint etc. complete.**

### **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 drawings or as directed for fixing to wooden frames of windows etc.

**2.2.** The grill shall be fabricated to the designs and patterns shown in the drawings and the weight shall be as directed, and the joints shall be rivetted 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 of screws viz. bolt nut/screw per 30 cm. of the length of outer strip subject to a minimum of 2 Nos. on each side of the frame or as indicated in the drawings or as directed.

**2.3.** The bolts and nut-, or screws shall be counter sunk and shall be fixed with the top of their heads flush with the face of frame strips.

### **2.5.1 Application of Priming coat ::**

#### **2.5.0 Materials**

**2.5.1.1.** The synthetic emulsion priming paint, brushing red lead shall conform to relevant I.S. specifications

**2.5.1.2.** The thinner (linseed oil) shall conform to I.S. 75-1973. If for any reason, thinning is necessary in case of ready mix paint, the brand of thinner recommended by manufacturer shall be used.

#### **2.5.2.0. Workmanship**

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

#### **2.5.2.2. Application of primer:**

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

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

**2.5.2.3.** No hair marks from the brush or clogging at paint puddles in the corner or panels angles of mouldings etc. shall be left on the work.

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

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

### **2.6 Application of Two coats of Oil paint ::**

#### **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 manufacturers or approved dealer and brought to the site in maker's drums, kegs, etc. with seal unbroken.

**2.1.2.** All materials not in actual use shall be kept properly protected, lids of containers shall be kept closed and surface (if 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, thinning is necessary, the brand of thinner recommended by the manufacture 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 parts of 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 any 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 except the last coat shall be lightly rubbed down with sand -paper of fine pumice stone and cleaned of dust before the next coat is applied. No hair marks, from the brush or clogging of paint puddles in the corners of panels, angles of Moulding 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 & payment:**

**3.1** No payment shall be made for weight of screws, bolts, nuts etc. Only weight of grill shall be paid.

**3.2.** The rate shall be for unit of one Kg.

**E. E.**

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**Item No. 32 :: Providing and fixing water closet squatting pan ( Indian type W.C. Pan ) 580 m.m. size including providing and fixing 100 m.m size "P" or "S" trap for water closet squatting pan including jointing the trap with pan and soil pipe in c.m. 1:3 ( 1 cement : 3 coarse sand ) including providing and fixing inc.C.m. 1:3 ( 1 cement : 3 coarse sand ) and pair of white vitreous china 250 mm x 130 mm x 30 mm foot rest for long pattern with C.I. inlet connection for flush pipe with W.C. pan and chromium plated brass half turn flush cock of approved quality 25mm dia. etc complete.**

**1.0. Materials**

**1.1.** Water closet squatting pan ( Indian type W.C. Pan) shall conform to M-62. Cement mortar shall conform to M- 11

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

**1.3.** The pair of white vitreous china foot-rests shall conform to M-62 Cement mortar shall conform to M-11.

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

**1.5.** Chromium plated brass half turn flush cock shall conform to M-67.

**2.0. Workmanship:**

**2.0.** The pan shall be sunk into the floor and embedded in a cushion of average 15 cm. cement concrete 1:5:10 (1 cement : 10 graded stone aggregate or brick aggregate 40 mm. nominal size) or and its bed concrete, the floor should be left 115 mm.-below the top level of the pan so as to allow for flooring and its bed concrete. The floor should be suitably stopped so that the waste water is drained into the pan.

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

**2.2.** After laying the floor, the floor shall be suitably sloped so that the waste water is drained into the pan A pair of foot-rests of size 250 mm. x 130 mm. x 30 mm. of white vitreous china shall be set in cement mortar 1:3 (1 cement ; 3 coarse sand). The foot-rests shall be fixed at a distance of 175 mm. from the inner edge of the back side of the pan and shall be fixed at convenient angle.

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

**3.0. Mode of measurements and payment**

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

**3.2.** The rate shall be for Complete Item.

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

**E. E.**

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**Item No. 33 :: " Providing and fixing flat back wash basin of 550 x 400mm size including C.I. or M.S. brackets fixing in wall C.P. brass work of 32mm dia,,. fisher union of 32mm, pillar cock of 15mm dia, PVC waste pipe, PVC connection, brass stopcock of 15mm dia etc. complete.**

**1] Materials ::**

The white earth ware Wash Basin (550mm x 400 size) with standard height in white or the color as directed by the Engineer-in-charge shall be approved quality having size 550mm x 400mm of Ist quality like Hindustan, Cera, Parry ware or equivalent make approved by the Engineer-in-charge and it shall conform to M-59. The C.P. brass waste trap and unions shall be of 32mm dia and of best quality. The gun metal check or non return full Way wheel valve of specified dia. shall conform to I.S. 778- 1964. non return valve shall be of best quality. The brass screw down stop cock of specified dia. shall conform to I.S. : 781-1977. The pillar cock shall conform to I.S. 1795-1961 and shall be tested quality.

**2.0. Workmanship :**

The wash basin shall be fixed on the walls as directed. It shall be supported on a pair of M.S. or C.I. brackets fixed in C.M. 1:3 (1-cement, 3-sand). The brackets shall conform to I.S. 775. The wall plaster on flit, rear shall be cut to rest the top of the wash basin. After fixing the wash basin plaster shall be made good and surface shall be to match the existing shade The brackets shall be painted with ready-mixed paint.

2.1 The C.I. brass trap and union shall be connected to 32mm dia waste pipe which shall be suitably bent towards the wall and which shall discharge into an open drain leading trap or directed into gully trap on the ground floor and shall be connected to a waste pipe through 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 into vertically.

2.2 The height of the front edge of the wash basin from the floor level shall be 80 cms.

2.3 The necessary inlet, outlet connections and fittings such as Pillar cocks dress waste trap, waste pipe, stop cock, Pillar cock, rubber plug etc. shall be fixed as directed.

2.4 The gun metal check or non return valve shall be fully cleared, of all foreign matter fixing. The fixing of valve shall be done by means of bolts nuts and 3 mm. rubber insertions with flanges of spigot and socketed tail pieces, drilled to the same specification as in case of socket and spigot and with flanges in case of flanged pipes jointing shall be done leak proof.

2.5 The stop cock shall be fixed in position by means of Jam nut and stocket. The stop cock shall be fixed near the inlet of the water metre or as directed. The joints shall be done with while' zinc and spun yarn. The joint shall be tested for leak proofing. The pillar cock of the approved quality shall also be fixed with the basin as directed

**3.0. Mode of measurements & payment**

3.1. The rate includes cost of all laboures, materials, tools and plant etc. required for satisfactory completion of this Item.

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

**E.E.**

**Item No. 34 :: Providing and fixing cast iron spigot and socket soil waste and ventilating pipes of the 75mm dia nominal size.**

**1.0. Materials**

1.1. The specified dia. C.I. Spigot and socket soil or waste pipe shall conform M-68.

**2.0. Workmanship**

2.1. The fixing of C.f. spigot and sockets soil, waste and ventilating pipe shall be carried out as per relevant specifications of item 15.93 (B) except the C.I. spigot and socket shall be fixed. 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

2.2. All soil pipes shall be earned up above the roof and shall have a wire ball on guarded or a cowl.

2.3. The ventilating pipe or shaft shall be carried out to a height of at least one meter above the outer covering of the roof of the building or in the case of windows in a gable wall or a dormer windows, it shall t carried up to a ridge of the roof or at least tow meters above the top of the windows. In case of flat roof to which access for use is provided, it shall be carried out up to a height of at least on meter above the parapet or two meters measured vertically from the top of any windows or opening which any exist up to a horizontal distance of five meters from the vent pipe into such building and in no case shall be carried out to a height less then three meters.

2.4. Where ventilating pipes are carried in pipe shafts, the shaft shall be of a minimum size of one meter. If lhe shells are also used to give fight and air to rooms, the ventilating pipes must be carried out to a horizontal distance at root level not loss than five meter from the site of the shaft.

2.5. The 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.

**2.6.** The connection between the main pipe and branch pipes shall be made by using branches and bends with access doors for cleaning

**2.7.** The waste from lavatories, kitchens basins, sinks, baths and other floor traps shall be separately connected to respective stacks of upper floor. The waste stack of lavatories shall be connected directly to main hole while the waste stack of other shall be separately discharged over gulley trap.

**3.0. Mode of measurements and payment**

**3.1.** The length of pipe shall be measured including all fittings along its length in running meters correct to a centimeter. No allowance shall be made for the portion of pipe length entered in the sockets of the adjacent pipe of fittings.

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

**3.3.** The rate shall be for a unit of One running meter.

**E.E.**

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**Item No. 35 :: Providing and fixing S.W. gully trap 150mm x 100mm size - P type with C.I. Grating brick masonry chamber and water tight C.I. cover with frame of 300mm x 300mm size (inside) with standard weight Square mouth trapes.**

**1.0 Materials :** (1) Water shall conform to M-1. (2) Cement mortar of proportion 1:5 shall conform to M-11. (3) Burnt brick shall conform to M-15. (4) The S.W. Galley trap of 150 mm. x 100 mm. size shall confirm to .M-70.

**2.0 Workmanship**

**2.1** Excavation for gulley trap shall be done true to dimensions and levels as indicated on plans or as directed.

**3.0 Fixing:**

**3.1** The gully trap shall be fixed over cement concrete 1:5:10 (1 cement : 5 sand : 10 graded Cr. stone 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 UPVC SWR pipe.

**4.0 Brick masonry chamber:**

**4.1** After fixing and testing gulley and branch drain, a brick masonry 300 x 330 mm. inside with bricks in CM 1:5 (1 cement : 5 sand) shall be built with a 100 mm. brick work round OH; gulley trap from the top of bed concrete up to ground level. The space between the chamber walls and the trap shall be filled with cement concrete 1:5:10. The upper portion of the chamber i.e. above the top level of the trap shall be plastered inside with cement mortar 1:3 (1 cement: 3 sand) finished with floating coat of neat cement. The corners and bottom of the chamber shall be rounded of so as to slope towards the grating.

**4.2** PVC 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.

**5.0 Mode of measurements & payment**

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

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

**E. E.**

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**Item No. 36 :: Providing & fixing cast iron ( Spun ) 100 MM Dia Nahni trap of the following nominal diametre of self cleaning design with C.I.screwed down or hinged grating including cost of cutting & making good the walls & floors 100mm inlet & 50mm outlet.**

**1.0. Materials**

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

**2.0. Workmanship**

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

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

**3.0. Mode of measurements and payment**

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

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

**E. E.**

**Item No. 37 :: providing and fixing G.I. rain water spout of 50mm dia & 30 cm.length.**

- 1.0. Materials :** G.I.M.S. type of 50 mm. dia. shall conform to M-56.
- 2.0. Workmanship**
  - 2.1.** The G.I. pipe of 30 cms. fixed as rain water pipe as directed. The pipe shall be fixed about 1/4 dia. below the floor level so as to make approach of water easy. The inlet of pipe shall be rounded off for easy entry of rain water pipe. The pipe shall be fixed in C.M. 1:3.
- 3.0. Mode of measurements & payment**
  - 3.1.** The rate includes of all labour and materials required for satisfactory completion of this item.
  - 3.2.** The rate shall be for a unit of One number.

**E. E.**

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**Item No. 38 :: Providing and fixing to wall ceiling and floor galvanized mild steel tubes (Medium grade) 25mm dia nominal bore tube, fitting and clamps including making good the wall, ceiling and floor.**

- 1.0. Materials**
  - 1.1.** Galvanised mild steel tubes of specified dia nominal bore shall conform to I.S. 1239-1968.
  - 1.2.** The galvanised fittings, clamps, etc. required for specified dia. bore pipes shall be of best quality and makes as approved by the 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 watertight 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. Burr 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.
    - 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 of tube fittings to wall ceiling & floors.**
    - 2.2.1.** In case of fixing of tubes and fittings to the 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 inducts 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 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 e, item shall, unless otherwise stated be held to include where necessary, conveyance, and delivery, handling, unloading, storing fabrication, hoisting, all labour for finishing to required shape and size, setting, fitting in position straight, cutting and waste return of packing etc.

3.2. The length shall be measured on running meter basis of finished work. The length shall be taken along the centre line of the pipe and fittings. The pipes fixed to wall, ceiling, floors etc shall be measured and paid under this item.

3.3. All the work shall be measured in decimal system as fixed in its place, subject to tolerance given below unless otherwise stated.

(i) Dimension shall be measured to the nearest 0.01 meter. (ii) Area shall be worked out to the nearest 0.01 sq. meter.

3.4. All measurements of cutting shall unless otherwise stated be held to include the consequent waste

3.5. In case of fitting of unequal bore, the targets bore shall be measured for the test.

3.6. Testing of pipe lines fittings, and joints include for providing all plant appliances necessary for obtaining access to the work to be tested and carrying out the tests

3.7. The rate includes galvanised steel tubing 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.

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

**E. E.**

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### **Item No. 39 :: Providing and fixing to wall ceiling and floor galvanized mild steel tubes (Medium grade) 15mm dia nominal bore tube, fitting and clamps including making good the wall, ceiling and floor.**

#### **1.3. Materials**

1.4. Galvanised mild steel tubes of specified dia nominal bore shall conform to I.S. 1239-1968.

1.5. The galvanised fittings, clamps, etc. required for specified dia. bore pipes shall be of best quality and makes as approved by the Engineer-in-charge.

2.4. Workmanship

#### **2.5. Cutting, Laying & Jointing**

2.5.1. When the tubes are to be cut or rethreaded, the ends shall be carefully filed out so that no obstruction to bore is offered. The ends of the tubes shall then be threaded conforming to the requirements of I.S. 554-1955 with pipe dies and taps carefully in such a manner that it will not result in slackness of joints when the two pieces are screwed together.

2.5.2. 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 watertight joint. The screw threads for tube and fitting shall be protected from edge until they are fitted.

2.5.3. 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. Burr 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.

2.5.4. 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.

#### **2.6. Fixing of tube fittings to wall ceiling & floors.**

2.6.1. In case of fixing of tubes and fittings to the 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 inducts 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.

**2.6.2.** 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 cement : 3 coarse sand), and properly finished to match the adjacent surface.

**2.7. Testing of joints :**

**2.7.1.** After laying and jointing, the pipes and fillings shall be inspected under working conditions of pressure and flow. Any joints found like shall be redone, and all leaking pipes removed and replaced without extra cost.

**2.7.2.** 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.

**3.8. Mode of measurements and payment**

**3.9.** The description of e, 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.

**3.10.** 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.

**3.11.** 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.

**3.12.** All measurements of cutting shall unless otherwise stated by held to include the consequent waste

**3.13.** In case of fitting of unequal bore, the targets bore shall be measured for the test.

**3.14.** Testing of pipe lines fittings, and joints include for providing all plant appliances necessary for obtaining access to the work to be tested and carrying out the tests

**3.15.** The rate includes galvanised steel tubing 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.

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

**E. E.**

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**Item No. 40 :: Providing and laying (two level or slopes) and jointing with stiff mixture of cement mortar in proportion 1:1 salt glazed stoneware pipes 100mm dia nominal internal diameters including testing of pipes and joints etc. complete.**

**1.0. Materials**

(i) Water shall conform to M-1(2) Cement mortar of proportion 1:1 shall conform to M-11. (3) 100 mm. dia. glazed stoneware pipe shall conform to M-71.

**2.0. Workmanship**

**2.1.** The width and depth of the trenches for different diameters of the, tubes shall be as under, For 15 to 80 mm. dia tube width of trenches shall be 30 cms. and depth of trenches 60 cms,

**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 an 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 gaskin 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. Mode of measurements and payment**

**3.1.** Pounding or buttering of the fit trenches bed to the lower part of the pipe and "Grips" dug to take socket, collars etc. are included in the rate of laying the pipes.

**3.2.** The measurements shall be net without any allowance for cutting, and waste. The length of bends, junctions, and other connections shall be included in the total length of the drain pipes. Nothing extra shall be paid for the same. The rate includes necessary excavation refilling trenches etc. complete,

**3.3.** The rate shall be for a unit of One running meter.

**E. E.**

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**Item No. 41 :: Providing and laying (two level or slopes) and jointing with stiff mixture of cement mortar in proportion 1:1 salt glazed stoneware pipes 150mm dia nominal internal diameters including testing of pipes and joints etc. complete.**

**1.0. Materials**

(i) Water shall conform to M-1(2) Cement mortar of proportion 1:1 shall conform to M-11. (3) 100 mm. dia. glazed stoneware pipe shall conform to M-71.

**2.5. Workmanship**

**2.6.** The width and depth of the trenches for different diameters of the tubes shall be as under, For 15 to 80 mm. dia tube width of trenches shall be 30 cms. and depth of trenches 60 cms,

**2.7. Laying:**

**2.7.1.** 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.

**2.8. Jointing:**

**2.8.1.** 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.

**2.8.2.** 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.

**2.8.3.** The mortar shall be mixed as necessary for immediate use.

**2.8.4.** 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.

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

**2.9. Testing of Joints:**

**2.9.1.** 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.

**2.9.2.** 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.

**3.4. Mode of measurements and payment**

**3.5.** Pounding or buttering of the fit trenches bed to the lower part of the pipe and "Grips" dug to take socket, collars etc. are included in the rate of laying the pipes.

**3.6.** The measurements shall be net without any allowance for cutting, and waste. The length of bends, junctions, and other connections shall be included in the total length of the drain pipes. Nothing extra shall be paid for the same. The rate includes necessary excavation refilling trenches etc. complete,

**3.7.** The rate shall be for a unit of One running meter.

**E. E.**

**Item No. 42 :: Providing & Fixing 25mm dia Gun metal check or non return fullway wheel valve.**

**1.0. Materials :** The gun metal check or not return full way wheel valve of 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.**

**E. E.**

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**Item No. 43 :: Providing and fixing 15mm dia gun metal check or non return full way wheel valve.**

**1.0. Materials :** The gun metal check or not return full way wheel valve of specified dia. shall conform to I.S. : 778-1964. The non-return valve shall be of tested quality.

**2.2. Workmanship**

**2.3.** 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.

**3.3. Mode of measurements and payment**

**3.4.** The rate includes all labours, **materials, tools and plant etc. required for** satisfactory completion of this item.

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

**E. E.**

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**Item No. 44:- Providing and fixing Brass chromium plated screws down bib taps of 15mm dia**

**1.0 Materials :** 15 mm. dia. brass screw down with bright polished finished shall conform to I.S. 781-1977. The bib cock shall be best Indian make and quality.

**2.0 Workmanship**

**2.1** The screw down bib cock 15 mm. as specified above shall be fixed as directed. The threaded portion shall be smeared with white or red lead and around with a few turns of fine-spun yarn round the screwed end of the pipe. The bib cock shall be then screwed and fixed to water tight position.

**3.0 Mode of measurements & payment**

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

**E. E.**

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**Item No. 45:- Constructing brick masonry for underground C.I. Inspection chamber and bends with bricks having crushing strength no less than 35Kg. / cm<sup>2</sup> in C.M. 1:5 C.I. cover with frame (light duty) 445mm x 610mm internal dimensions total weight of cover with frame to be not less than 38Kg. (wt or cover 23Kg 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 for inside dimensions 445mm x 610mm x 450mm deep for single pipe line.**

**1.0 Materials :** Water shall conform to M-1. Cement shall conform to M-6. Coarse sand shall conform to M-5. Brick shall conform to M-15. Stone aggregate shall conform to M-12. Grit shall conform to M-8. Cement mortar of specified proportion shall conform to M-11. Brick bat shall conform to M-14 TMT bar shall conform to M-18. C.C. cover with frame shall be good quality.

**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** The wall of the chamber shall be constructed in brick work C.M. 1:5 and 23 Cms.

**2.5** The walls and the bed concrete of chamber shall be plastered inside with 15 mm. thick cement plaster 1 : 3 (1 cement : 3 coarse sand) finished smooth.

**2.6** The C.C. cover slab shall be constructed as per direction of engineer in charge.

### 3.0 Mode of measurements & payments

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 One number.

E. E.

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**Item No. 46:- Distempering with dry distemper of approved brand and manufacture (Three coats) and of required shade on wall surface to give an even shade, over and including a priming coat of whiting after thoroughly brooming the surface free from mortar dropping and other foreign matter.**

#### 1.0. Materials

1.1. The dry distemper and primer shall be of approved brand and manufacture. The dry distemper shall be of required colour and shade and the same shall conform to I.S. 427-1965. Whiting shall conform to I.S. 63-1964.

#### 2.0. Workmanship

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 (Joolas) may be used for distempering. Where ladders are used- pieces of old gunny bags shall be tied at top and bottom to prevent scratches to the walls and floors. \For distempering to ceiling, proper stage scaffolding shall be erected where necessary.

#### 2.2. Preparation of Surface.

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

2.2.2. All unnecessary nails shall be removed. Pitting in plaster shall be made good with plaster of Paris mixed with dry distemper of the colour to be used. The surface shall then be rubbed down again with a fine grades and paper and made smooth. The surface affected by moulds, moss, fang, algae lichens, efflorescence etc. shall be treated in accordance with I.S. 2395 (Part-I) 1966 before applying distemper. Any unevenness shall be made good by applying putty made of plaster of Paris mixed with water on entire surface including filling up the undulations and then sand papering the same after it is dry.

#### 2.3. Priming coat :

2.3.1. A priming coat of whiting shall be applied as per item No. 18.11 over the prepared surface in case of new work on undecorated surface. No coat of white washing with lime shall be used as a priming coat for distemper.

#### 2.3.2. Application of plaster 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.

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. Distemper is not recommended to be applied within six months of the completion of wall plaster.

2.4. **Proportion of Distemper :** The distemper shall be diluted with water or any other prescribed thinner in a manner recommended by the manufacturers only. Sufficient quantity of distemper required for one day's work shall be prepared.

#### 2.5. Application of Distemper coat :

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

2.5.2. Sufficient quantity of distemper shall be mixed to finish on room at a time. The application of a coat in each room shall be finished in one operation and no work shall be started in any room which cannot be completed, on the same day.

2.5.3. 15 cm. double bristle distemper brush shall be used. After the day's work, brushes shall be thoroughly washed in hot water with soap solution and hang down to dry. Old brushes which are dirty and caked with distemper shall not be used on the work.

2.6. **Protective Measures :** The surfaces of doors, windows, floors, articles of furniture etc. and such other parts of the building as are not to be distempered shall be a plashed form being splashed upon. Such surfaces shall be cleaned of distemper a plashes if any.

#### 3.0. Mode of measurements and payment

3.1. Priming coat of distemper primer, scraping of surface spoiled by smoke soot, removal of oil and grease spots, treatment for infraction of effloresces, mould moss, fungi, algae and lichens and patch repairs to plaster

shall be included in this item for which nothing extra shall be paid.

**3.2.** AH the work shall be measured net in the decimal system as in places subject to the following limits unless otherwise stated hereinafter:

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

(b) Area in individual items shall be worked out to the nearest 0.01 sq. m. All work shall be measured in sq. meter. No deductions shall be made for ends of joints, beams, posts, etc. of these openings nor for finish around the ends of joints, beams, posts etc.

**3.3.** Deductions of openings exceeding 0.5 sq.m. but not exceeding 3 sq. m. each shall be made as follows and no addition shall be made for reveal, jambs, soffits etc. of these openings:

(a) When both the faces of walls are provided with the same finish deductions shall be made for one face only.

(b) When each face of wall is provided with different finish, deduction shall be made for that of frame for door, windows etc. on which width of reveal is less than that of the other side but no deductions shall be made on the other side. Where the width of reveals on the both the faces of wall are equal, deduction of 50% of area of opening on each face shall be made from area of finish.

(c) When only one face of wall is treated and the other face is not treated, full deductions shall be made if the width of the reveal on treated side is less than that on untreated side but if the width of the reveals is equal or more than that of untreated side neither deductions nor additions to be made for reveals, jambs, sills and soffits shall be measured

**3.4.** In case of openings of area exceeding 3 sq.m. each, deduction shall be made for openings, but jambs, sills and soffits shall be measured.

**3.5.** No deductions shall be made for attachments such as casing, conduits, pipes, electric wiring and the like.

**3.6.** Item includes removing nails, making good holes, cracks, patches with materials similar in composition to the distemper.

**3.7.** The rate includes cost of all materials, labour, scaffolding, protective measures etc. involved in all the operations described above This shall also include conveyance, delivery, bundling, unloading storing etc.

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

**E. E.**

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**Item No. 47:- Finishing wall with water proofing cement paint on wall surface (Three coats) to give an approved brand and manufactures and of required shape even shade after thoroughly brushing the surface to remove all dirt and remains of loose powdered material.**

**1.0. Materials**

**1.1.** The water shall conform to M-1. Cement water proofing paint shall conform to I.S. 5410-1969.

**2.0. Workmanship**

**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.

**2.1. Preparation of surface :**

The relevant specifications of item No. 18.11 shall be followed except that the word white wash colour wash shall be substituted with water proofing cement paint. The surface shall be thoroughly wetted with clean water before cement water proofing paint is applied.

**2.2. Preparation of paint:** Portland cement paint shall be prepared by adding paint powder to water and stirring to obtain a thick paste, which shall then be diluted to a brush able consistency. Generally, equal volumes of paint powder and water make a satisfactory paint. In all cases, The manufacture's instructions shall be followed. The paint shall be mixed in such quantities as can be used up within an hour of mixing as otherwise the mixture will set and thickness, affecting flowing and finish. The lids of cement paint drums shall be kept tightly when not in use.

**2.3. Application of Paint:**

**2.3.1.** No painting shall be done when the paint is likely to be exposed to a temperature of below 7° c within 48 hours after application.

**2.3.2.** When weather conditions are such as to cause be carried out in the shadow as far as possible. This helps the proper hardening of the paint film by keeping the surface moist for a longer period.

**2.3.3.** To maintain the uniform mixture and to prevent segregation, the paint shall be stirred frequently in the bucket.

**2.3.4.** For undecorated surfaces, the surface shall be treated with minimum two coats of water proof cement paint. Not less than 24 hours shall be allowed between two coats. Next coat shall not be started until the preceding coat has become sufficiently hard to resist marking by the brush being used. In hot dry weather, the preceding coat shall be slightly moistened before applying the subsequent coat.

**2.3.5.** The finished surface shall be even and uniform in shade, without patches, brush marks, paint drops etc.

**2.3.6.** The cement paint shall be applied with a brush with relatively short stiff hog or fiber bristles. The paint

shall be brushed in uniform thickness and shall be free from excessively heavy brush marks. The lamps shall be brushed out.

**2.3.7.** Water proof cement paint shall not be applied on surface already treated with white wash, colour wash, distemper dry or oil bound varnishes, paint etc. It shall not be applied on gypsum, wood and metal surfaces.

**2.4. Curing :** Painted surfaces shall be sprinkled with water two or three times a day. This shall be done between coats and for at least two days following the final coat. The curing shall be started as soon as the paint has hardened so as not to be damaged by the sprinkling of water say about 12 hours after the application.

**3.0. Mode of measurements and payment**

**3.0.** 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.

**3.1.** 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.

**3.2.** No deductions for openings exceeding 0.5 sq. mt. but not exceeding 3 sq. mt. each shall be made as follows and no addition will be made for reveals, jambs, soffits etc. of these openings :

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

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

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

**3.5** 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) Naintial pattern roof (Plain sheeting sheets) 10%
- (e) Naintial pattern roof (with corrugated sheets) 25%

**3.6** 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.

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

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

**E. E.**

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**Item No. 48:- Painting two coats on new steel and other metal surface with enamel paint, brushing, interior to give an even shade including applying priming coat with ready mix primer over new steel and other metal surfaces after and including preparing the surface by thoroughly cleaning oil, grease, dirt and other foreign matter and secured with brushes, fine steel, wool scrapers and sand paper.**

**1.0. Materials**

- 1.1.** The enamel paint shall conform to M-44 B.
- 1.2.** The ready mixed primer, brushing red shall conform to I.S. 102-1962.
- 1.3.** The thinner (linseed oil) shall conform to I.S. 75-1973. If for any reason, thinning is necessary in case of ready mix paint the brand of thinner recommended by manufacture shall be used.

**2.0. Workmanship**

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

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

**2.3.** 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.

**2.4.** If for any reasons, thinning is necessary, the brand of thinner recommended by the manufacturer shall be used.

**2.5.** 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 of the work shall be carried out in wet, damp or otherwise unfavourable weather and all the surfaces shall be thoroughly dry before painting work is started.

**2.6. Application of primer :**

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

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

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

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

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

**3 Application of paint:**

**3.0.** 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.

**3.1.** 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.

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

**3.3.** 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 & 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.** The rate shall be for a unit of One sq. meter.

**E. E.**

**Item No. 49:- Providing and fixing precast rubber Dye / steel Dye inter locking concrete block 60 mm thick with grade of concrete M300 Pneumatic compressed / vibrated mechanically and as per approved design confirming to IS 15658:2006 including 35 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.**

**1.0. Material:-**

- 1.1 The rubber moulded paver block shall be approved and best quality and thickness as specified in description of item.
- 1.2 The sand shall conform to M-6.

**2.0. Workmanship:-**

- 2.1 The work shall be carried out as per IS 1443-1972.
- 2.2 Before the sand bedding the ground shall be in proper line and level as directed.
- 2.3 The sand bedding shall be laying as per proper line and level.
- 2.4 After laying sand bedding should be proper watering and ramming as per instructed by Engineer-in-charge.
- 2.5 The sand bedding layer shall be not less than 30mm and Average thickness of bedding shall be 75mm.
- 2.6 The pre-cast blocks are fixed on bedding as per proper line and level.
- 2.7 The joint shall be of uniform thickness and in straight line as per pattern.
- 2.8 The colour and design of Precast block shall be as per directed by Engineer-in-Charge.
- 2.9 In places where full block cannot be fixed the block shall be cut of the size and smooth and at edges to give straight and line joints.
- 2.10 If any block is disturbed or damage it shall be refitted or replaced properly jointed.
- 2.11 The joints or edges where there is no possibility provide to fix the paver block it should be finished or locked with cement concrete of same strength.

**3.0. Mode of Measurements & payments.**

- 3.1 Precast Inter locking paved flooring shall be measured in Sqmt. for visible area of work done.
- 3.2 The rate shall include the cost of all materials, labour involved in all the operations as described above.
- 3.3 The rate shall be for a Unit of one Sqmt.

**E.E.**

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**Item No. 50:- Providing and laying brick on edge flooring laid dry grouted with C.M. 1:6 including finishing the joints curing etc. complete.**

**1.0. Materials**

Water shall conform to M-1. Cement mortar shall conform to M-11. Burnt bricks shall conform to M-15.

**2.0. Workmanship**

**2.1.** The flooring shall be laid on concrete sub grade where so provided. The slope in the floor shall be provided in the sub-grade. Where sub-grade is not provided, the earth below shall be properly sloped, watered, rammed and consolidated. Before laying the flooring it shall be moisture. Plinth masonry off-eta shall be depressed so as to allow the sub grade concrete to rest on it.

**2.2. Laying :**

The brick shall be laid in plain, diagonal herring bond, or other pattern as directed. The bricks shall be dry laid properly and set home by gently tapping. On completion of the portion of flooring the vertical joints shall be grouted with C.M. 1:6 and all joints shall be finished flush. The joints shall be as fine as possible and not exceeding 5 mm. These points shall be filled with cement mortar 1:6.

**2.3. Curing :**

The brick paving shall be cured for 7 days.

**3.0. Mode of measurements and payment**

- 3.1 The length and breadth shall be measured correct to a centimeter between skirting dedo or wall plaster. No deductions shall be made nor extra paid for any opening up to 0.1 sq.mt. in area in the floor Nothing extra shall be paid for laying the floors at different levels in the same room or courtyard.
- 3.2 The rate shall be for unit of one sq. meter.

**E.E.**

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**Item No.51:- Providing erecting and fixing double coated ISI water tank of required capacity each with all necessary fittings and connection etc. complete on terrace.**

**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 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

- 1.3. Ball valve:** Ball valve shall be of approved make and of best quality  
**1.4. Connections:** Connections shall be of approved make and of best quality

**2.0 WORKMAN SHIP:**

**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 & PAYMENT :**

**3.1.** The unit rate PVC tank 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 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.

**3.2.** The PVC water tank 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 per Litre basis of the finished work.

E.E.

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**Item No. 52:- Providing soak pit of 5.00 cum volume including excavation and filling brick bats with dry masonrywork at top for 45 c.m. height including covering the top with stone including providing vatas in c.m 1:3 with finishing curing etc. complete as directed.**

**1.0 Materials :**

**1.1** Water shall conform to M-1. Cement mortar conform to M-11. Burnt Bricks shall conform to M-15. Rough stone slab 40 x 50 mm. thick shall conform to M-48. Brick bat shall conform to M-14.

**2.0 Workmanship:**

**2.1** The excavation for soak pit shall be carried out as per instruction of Engineer in charge (A) except that the size of soak pit such that the clear volume 'shall' remain 5 cum. The diameter and depth shall be as directed.

**2.2** The periphery of the soak pit shall be provided with dry masonry wall with burnt bricks in 23 cms. thick. The masonry wall shall be done with best workman like manner in true line and plumb.

**2.3** The soak pit shall be filled in with brick bats of burnt brick 40 mm. nominal size in 45 cms. height. The work of filling brick-bats shall be done in such a way that no dry masonry shall be damaged during filling of brick bats.

**2.4** The top of the soak pit shall be covered with rough Kota stone slab 40 to 50 mm. thickness. The length of the stone shall be in single piece in length.

**2.5** The cement mortar 1:3 shall be used to fill up the joints and preparing vata as directed.

**2.6** The cement work shall be cured for 4 days.

**3.0 Mode of measurements and payment**

**3.1** The rate includes costs of all labour and material required for satisfactory completion of this item as described above.

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

E. E.

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**Item No. 53:- Providing and fixing 20cm x 15cm x 2.5cm thick year plate of Marble stone set in CM 1:4 including finishing and engraving letters etc complete.**

Providing and Fixing 20cm. X 15cm. X 2.5cm. thick No. and yearplate of marble and of standard lettering with leads or paint including finishing etc. complete.

Marble plate shall be white and of approved quality and shall be 25mm thick and of standard size as directed by the Engineer-in-Charge of the work.

Lettering shall be done by U-shape engraving and shall be filled with black paint of approved quality. Lettering shall be done as directed by the Engineer-in-Charge. The marble plate shall be fixed in neat cement at a place as directed by the Engineer-in-Charge. Cement shall conform to relevant I.S. specification.

Measurement shall be per number of marble plate fixed.

Unit rate includes cost of all material, labour etc. For complete work.

**Signature of the Contractor**

Deputy Executive Engineer  
R & B Panchayat Sub-Division  
Dwarka

Executive Engineer  
R & B Panchayat Division Devbhoomi Dwarka  
Khambhaliya