

Name Of Work :- Construction of Water Tank at Himmatpura Village of Ta.Waghodia Dist. Vadodara under Dharasabhya Shree Grant (2025-26)

GENERAL TECHNICAL SPECIFICATIONS

1.0 General :

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

- (i) length and breadth... 10 mm
 - (ii) height, depth or thickness of earthwork, sub-base, bases, surfacing, and structural members5 mm
 - (iii) areas,0.01 Sq. Metre
 - (iv) cubic contents..... 0.01 cubic metre
- in recording dimensions of work the sequence of length, width and height or depth or thickness shall be followed.

2.0 Measurement of lead for Materials :

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

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

3. Surface Regularity of Sub grade & Pavement Courses :

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

PERMITTED TOLERANCES OF SURFACE REGULARITY FOR PAVEMENT COURSES

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

Notes:-

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

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

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

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

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

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

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

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

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

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

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

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

5. **Tests on Earthwork for Embankment Construction :**

5.1 **Borrow Material :**

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

5.2 **Compaction Control :**

Control shall be exercised by taking at least one measurement of density for each 1000 square metres of compacted area, or closer as required to yield the minimum number of test results for evaluating day's work on statistical basis. The determination of density shall be in accordance with IS : 2720 (Part XXVMI). Test locations shall be chosen only through random sampling techniques. Control shall not be based on the result of any one test but on the mean value of a set of 5-10 density determinations. The number of tests in one set of measurements shall be 5 as long as it is felt that sufficient control over borrow material and the method of compactions is being exercised. If considerable variations are observed between individual density results, the minimum number of tests in one set of measurement shall be increase to 10. The acceptance of work shall be subject to the condition that the mean dry density equals or

exceeds the specified density and the standard deviation for any set of results is below 0.08 gm/cc. However for earthwork in shoulders and in top 500 mm portion of the embankment below the sub grade, at least one density measurement shall be taken for every 500 square meters of the compacted area provided further that the number of the tests in each set-of measurement shall be at least 10. In other respects, the control shall be similar to that described earlier.

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

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

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

Sr. No.	Internal Diameter of pipe in mm	Barrel thickness (in mm).		
		NP1	NP2	NP2
1	80	25	25	-
2	100	25	25	-
3	150	25	25	-
4	250	25	25	-
5	300	30	30	-
6	350	32	32	75
7	400	32	32	75
8	450	35	35	75
9	500	-	35	75
10	600	-	40	80
11	700	-	40	80
12	800	-	45	90
13	900	-	50	100
14	1000	-	55	100
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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 of aspect the provisions on these particular points, or aspects in the relevant Indian Standards shall be referred to
4. All measurements and computations, unless otherwise specified, shall be carried out nearest to the following limits:
 - (i) Length, width and depth (height) 0.01 meter
 - (ii) Areas 0.01 Sq.Mt.
 - (iii) Cubic Contents 0.01 Cu.Mt.In recording dimensions of work the sequence of length, width and height (depth) or thickness shall be followed.
5. The distance which constitutes lead shall be determined along the shortest practical route and note necessarily the route actually taken The decision of the Engineer-in-charge in this regard shall be taken as final.
6. Where no lead is specific, it shall mean "all leads"
7. Lift shall be measured from plinth level.
8. Up to "floor two level" means actual height of floor (Maxi 4 M) up to 3 Mt. above plinth level.
9. Definite particulars covered in the items of work, though not mentioned or elucidated in it specifications shall be deemed to be included therein.
10. Reference to specifications of materials as made in the detailed specification of the items of works is in the form of a designation containing them kuber of the specification of the material and prefix 'M' e.g. 'M-5',
11. Approval to the samples of various materials given by the Engineer-in-charge shall not absolve the contractor from the responsibility of replacing defective material brought on site or materials used in the work found defective at a later date. The contractor shall have no claim to any payment or compensation whatsoever on account of any such materials being rejected by the Engineer-in-charge.
12. The contract rate of the item of work shall be for the work completed in all aspects.
13. No collection of materials shall be made before it is got approved from the Engineer-in-charge.
14. Collection of approved materials shall be done at site of work in a systematic manner. Materials shall be stored in such a manner as to prevent damage, deterioration or intrusion of foreign matter and to ensure the preservation of their quality and fitness for the work.
15. Materials, if and when rejected by the Engineer-in-charge, shall be immediately removed from the site of work.

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

SPECIFICATIONS OF MATERIALS

M-1 Water

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

M-2. Lime

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

M-3. Cement

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

M-4. White Cement

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

M-5. Coloured Cement

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

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

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

M-6 Sand

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

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

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

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

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

M-7 Stone Dust :

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

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

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

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

M-8. Stone Grit

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

equivalent hard stone as approved by the Engineer-in-charge. The grit shall have no deleterious with cement.

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

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

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

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

M-9. Cinder

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

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

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

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

M-10 Lime Mortar

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

Sand shall conform to specification M-6.

10.2. Proportion of Mix:

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

10.3. Preparation of mortar:

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

10.4. Storage:

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

10.5. Use:

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

M-11. Cement Mortar

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

11.2. Proportion of Mix

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

11.3. Preparation of Mortar :

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

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

M-12. Stone Coarse Aggregate for Nominal Mix Concrete

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

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

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

TABLE

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

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

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

M-13. Black Trap or Equivalent Hard Stone Coarse

13.1. Aggregate For Design Mix Concrete : Coarse aggregate shall be of machine crushed stone of black trap or equivalent hard stone and be hard, strong, dense, durable, clean and free from skin and coating likely to prevent proper adhesion of mortar.

- 13.2.** The aggregates shall generally be cubical in shape. Unless special stones of particular quarries are mentioned, aggregates shall be machine crushed, from the best, black trap or equivalent hard stones as approved, Aggregate shall have no deleterious with cement
- 13.3.** The necessary tests indicated in I S. 383-1970 and I.S.456-1978 shall have to be carried out to ensure the acceptability of the material.
- 13.4.** If aggregate is covered with dust it shall be washed with water to make it clean.
- M-14. Brick Bats Aggregate**
- 14.1.** Brick bat aggregate shall be broken from well burnt or slightly over burnt and dense bricks. It shall be homogeneous in texture, roughly cubical in shape, clean and free from dirt of any other foreign material. The brick bats shall be of 40 mm - 50 mm. size unless otherwise specified in the item. The under burnt or over burnt brick bats shall not be allowed.
- 14.2** The brick bats shall be measured by suitable boxes or as directed.
- M-15. Bricks**
- 15.1.** The bricks shall be hand or machine molded and made from suitable soils and kiln burnt. They shall be free from cracks and flaws and nodules of free lime they shall have smooth rectangular faces with sharp corners and shall be of uniform colour.
- The bricks shall be moulded with a frog of 100 mm. x 40 mm. and 10 mm. to 20 mm. deep on one of its flat sides. The bricks shall not break when thrown on the ground from a height of 600 mm.
- 15.2.** The size of modular bricks shall be 190 mm.x 90 mm.x 90 mm.
- 15.3.** The size of the conventional bricks shall be as under :
- (9" x 4.3/8" x 2,3/4") 225 x 110 x 75 mm.
- 15.4.** Only bricks of one standard size shall be used on one work. The following tolerances shall be permitted in the conventional size adopted in a particular work.
- Length + 1/8" (3.0 mm.) Width \pm 1/16" (1.50 mm.) Height + 1/16" (1.50 mm.)
- 15.5.** The crushing strength of the bricks shall not be less than 35 Kg/Sq. Cm. The average water absorption shall not be more the 20 percent by weight Necessary tests for crushing strength and water absorption etc. shall be carried out as per I.S. 3495 (Part-I to IV) - 1976
- M-16. Stone**
- 16.1.** The stone shall be of the specified variety such as Granite/Trap Stone/ Quartzite or any other type of good hard stones. The stones shall be only from the approved quarry and shall be hard sound, durable and free from defects like cavities, cracks, sand holes, flaws injurious veins, patches of loose or soft materials etc. and weathered portions and other structural defects Or imperfections tending to affect their soundness and strength. The stone with round surface shall not be used. The percentage of water absorption shall not be more than 5% of dry weight. When tested in accordance with I.S. 1124-1974. The minimum crushing strength of stone shall be 200 Kg/.Sq. Cm. unless otherwise specified.
- 16.2.** The samples of the stone to be used shall be got approved before the work is started
- 16.3.** The Khanki facing stone shall be dressed by chisel as specified in the item for khanki facing in required shape and size. The face of the stone shall be-so dressed that the bushing on the exposed face shall not project by more than 40 mm. from the general wall surface and on face to be plastered it shall not project by more than 19 mm. nor shall it have depressions more than 10 mm. from the average wall surface.
- M-17. Laterite Stone**
- 17.1.** Laterite stone shall be obtained from the approved quarry it shall be compacted in texture sound, durable and free from soft patch. It shall have minimum crushing strength of 100 Kg/Sq. Cm. in its dry condition. It shall not

absorb water more than 20% of its own weight, when immersed for 24 hours in water. After quarrying, the stone shall be allowed to weather for some time before using in work.

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

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

17.4. Special corner stones shall be provided where so directed.

M-18. Mild Steel Bars

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

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

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

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

M-19. High Yield Strength Steel Deformed Bars

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

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

M-20. High Tensile Steel Wires

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

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

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

20.4. The high tensile wire shall be obtained from manufacturers. in coils having diameter not less 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 to 18 gauge) diameter and shall conform to I.S. 280-1972.

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

M-22. Structural Steel

- 22.1.** All structural Steel shall conform to I S. 226-1985: The steel shall be free from the defects mentioned in I.S 226-1975 and shall have a smooth finish. The material shall be free from loose mill scale, rust pits or other defects affecting the strength and durability. River bars shall conform to I.S. 1148-1973.
- 22.2.** When the steel is supplied by the Contractor test certificate of the manufacturers shall be obtained according to I.S. 226-1975 and other relevant Indian Standards.
- M-23. Galvanised Iron Sheets**
- 23.1.** The galvanised iron sheets shall be plain or corrugated sheets of gauges as specified in item The G.I. Sheets shall conform to I.S.277-1977. The sheets shall be undamaged in carnage and handling either by rubbing off of zinc coating or otherwise. They shall have clean and bright surface and shall be free from dents, bends, holes, rust or white powdery deposit.
- 23.2.** The length and width of G.I. sheets shall be as directed as per site condition.
- M-23.A : G.I. Valleys gutter, ridges**
- 23.A.1.** The G.I. ridges and hips shall be of plain galvanised sheets Class - 3 of the thickness as specified in item. These shall be 600 mm. in width and properly bent up to shape without damage to the sheets in process of bending.
- 23.A.2.** Valleys gutters and flashings shall also be of galvanised sheet of thickness as specified in item Valleys Shall be 900 mm. wide overall and flashing shall be 380 mm. wide overall They shall be bent to the required shape without damage to the sheet in the process of bending.
- M-24. Asbestos Cement Sheets**
- 24.1.** Asbestos cement sheets plain, corrugated of semi-corrugated shall conform to I.S.459-1970 The thickness of the sheets shall be as specified in the item. The sheets shall be free from all defects such as cracks, holes, deformities chipped edges or otherwise damaged.
- 24.2. Ridges & Hips :**
- 24.2.1.** Ridges and hips shall be of same thickness as that of A.C. sheets. The types, of ridges shall be suitable for the type of sheets and location.
- 24.2.2.** Other accessories to be used in roof such as flashing pieces eaves filler pieces, valley gutters, north light, and ventilator curves, barge boards etc, shall be of standard manufacture and shall be suitable for the type of sheets and location.
- M-25. Manglore Pattern Roof Tiles**
- 25.1.** The mangalore pattern tiles shall conform to I S 654-1972 for Class AA or Class A type as specified in item. Samples of the tiles to be provided shall be got approved from the Engineer-in-charge. Necessary tests shall be carried out as directed.
- M-26. Shuttering**
- 26.1.** The shuttering shall be either of wooden planking of 30 mm. minimum thickness with or without steel lining or of steel plates stiffened by steel angles The shuttering shall be supported on battens and beams and props of vertical bullies properly cross braced together so as to make the centering rigid. In places of bullies props, brick pillar of adequate section built in mud mortar may be used.
- 26.2.** The form work shall be sufficiently strong and shall have camber so that it assumes correct shape after deposition of the concrete and shall b-j able to resist forces caused by vibration of live load of men working over it and other incidental loads associated with it. The shuttering shall have smooth and even surface and its joints shall permit leakage of cement grout.
- 26.3.** If at any stage of work during or after placing concrete in the structure, the form work sags or bulges out beyond the required shape of the structure, the concrete shall be removed and work redone with fresh

concrete and adequately rigid form work The complete form work shall be got inspected by and got approved from the Engineer-in charge, before the reinforcement bars are placed in position.

- 26.4. The props shall consist to bullies having 100 mm .minimum diameter measured at mid length and 80 mm. at thin end shall be placed as per design requirement. These shall rest squarely on wooden sole plates 40 mm. thick and minimum bearing area of 0-10 sq.m laid on sufficiently hard base.
- 26.5. Double wedges shall further be provided between the sole plate and the wooden props so as to facilitate tightening and easing of shuttering without jerking the concrete
- 26.6. The timber used in shuttering shall not be so dry as to absorb water from concrete and swell or bulge nor so green or wet as to shrink after erection. The timber shall be properly sawn and planed on the sides and the surface coming in contact with concrete wooden form work with metal sheet lining or steel plates stiffened by steel angles shall be permitted
- 26.7. As far as practicable, clamps shall be used to hold the forms together and use of nails and spikes avoided.
- 26.8. The surface of timber shuttering that would come in contact with concrete shall be well wetted and coated with soap solution before the concreting is done Alternatively coat of raw linseed oil or oil of approved manufacture may be applied in place of soap solution In case of steel shuttering either soap solution or raw linseed oil shall be applied after thoroughly cleaning the surface. Under no circumstances black or burnt oil shall be permitted.
- 26.9. The shuttering for beams and slabs shall have camber of 4 mm per meter (1 in 250) or as directed by the Engineer-in-charge so as to offset the subsequent deflection For cantilevers, the camber at free end shall be 1/50 of the projected length or as directed by the Engineer-in-charge.

M- 27. Expansion Joints - Permoulded filler

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

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

- 28.1. The item provide for expansion joints in R.C.C. frame structure for internal joints, as well as exposed joints, with the use of premoulded bituminous joints filler.
- 28.2. Copper sheet shall be of 1.25 mm. width and or 1 25 mm. width and the " U " shape in the middle. Copper strip shall have holdfast of 3 mm diameter copper rod fixed to the plate soldered on strip at intervals of about 30 cm or as shown in the drawing or as directed. The width of each flange (horizontal side) of the copper plate Jo be embedded in the concrete work shall be 25 mm depth of "U" to be provided in the expansion joint, in the copper plate shall be of 25 mm.

M-29. Teak wood

- 29.1. The teak wood shall be of good quality as required for the item to be executed. When the kind of wood is not specifically mentioned, good Indian teak wood as approved shall be used.
- 29.2. Teak wood shall generally be free from large, loose dead or cluster knots, flaws, shakes, warps, twists, bends or any other defects. It shall generally be uniform in substance and of straight fibers as far as possible. It shall be free from rot decay, harmful fungi and other defects of harmful nature which will affect the strength, durability or its usefulness for the purpose for which it is required. The colour shall be uniform as for as

possible. Any effort like painting using any adhesive materials made to hide the defects shall render the pieces liable to rejection by the Engineer-in-charge.

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

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

29.5. First class teak wood

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

29.6. Second Class Teak Wood:

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

M-29. A Non-teak wood:

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

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

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

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

30.2. The face panel! of the shutters shall be formed by gluing by the hot press process on both faces of the core with either plywood or cross-bands and face veneers. The1 hopping, rebating. opening of glazing, venation etc., shall be provided if specified in the drawing.

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

30.4. The shutters shall be tested for-

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

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

(3) Glue adhesion test : The flush door shall be tested for glue adhesive test in accordance with I S 2202 (part -I) 1980. The shutters shall be considered to have passed the test, if no delamination occurs in the glue

lines in the plywood and if no single determination more than 80 mm in length and more than 3 mm in depth has occurred in the assembly glue lines between the plywood face and the style and rail. Delamination at the corner shall be measured continuously around the corner Delamination at the knots, knot hole and other permissible wood defects shall not be considered in assessing the sample.

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

In Nominal thickness ± 1.2 mm. In Nominal height ± 3 mm

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

M-31. Aluminum doors, windows, ventilators

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

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

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

M-32. Rolling Shutters

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

32.2. Guide channels shall be of mild steel deep channel section and of rolled pressed or built up (fabricated) joint less construction The thickness of sheet used shall not be less than 3.15 mm.

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

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

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

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

32.7. The Shutters shall be completed with door suspension shafts, 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 sections unless otherwise shown on drawings. The distance centre to centre of pickets shall be 12 cms .with an opening or 10 Cms
- (b) Pivoted M.S. flats shall be 20 mm x6 mm
- (c) Top and bottom guides shall be from tee of flat iron of approved size.
- (d) The fittings like stoppers fixing, locking cleats, brass handles and cast iron rollers shall be of approved design and size

M-34. Welded Steel Wire Fabric

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

M-35 Expanded Metal Sheets

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

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

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

M-37. Plywood

- 37.1.** The plywood for general purpose shall conform I.S. 303-17-1975.
Plywood is made by cementing together thin boards or strips 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 at right angles to the grain in the adjacent level.
- 37.2.** The chief advantages of plywood a single board of the same thickness is the more uniform strength of the plywood, along the length and width of the plywood and greater resistance to cracking and splitting with change in moisture content.
- 37.3.** Usually synthetic resins are used to gluing, phenolic resins are usually cured in a hot press which compresses and simultaneously heats the plies between hot plates which maintain a temperature of 90 degree C to 140 degree C and a pressure of 11 to 14 Kg/ Sq. Cm on the wood. The time of heating may be anything from 2 to 60 minutes depending upon thickness
- 37.4.** When water glue are used the wood absorbs so much water that the finished plywood must be dried carefully. When synthetic resins are used as adhesive the finished plywood must be exposed to an atmosphere of controlled humidity until the proper amount of moisture has been absorbed.
- 37.5.** According to I.S. 303-1975 the plywood for general purpose shall be of the grades namely BWR, WWR and CWR depending up to the adhesives used for bonding the veneers and it will be further classified into six

types namely AA, AB, AC, BB, BC and CC based on the quality of the two faces each face being of three kinds namely A, Band C After pressing, the finished plywood should be reconditioned to a moisture content not less than 8 percent and not more than 16 percent.

37.6. Thickness of plywood Boards

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

M-38. Glass

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

38.2. Sheet Glass

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

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

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

38.3. Plate Glass:

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

38.4. Obscured Glass:

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

38.5. Wired Glass:

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

M-39. Acrylic Sheets

39.1. Acrylic sheets shall be of thickness as specified in the item and of an specified shape and size as the case may be panels may be flat or curved It should be light in weight it shall be colourless or coloured or opaque as specified in the item. Colourless sheet shall be as transparent as the finest optical glass. Its light transmission rate shall be about 95% Transparency shall not be affected for the sheets of larger thickens, it shall be

extremely resistant to sunlight weather and low temperatures. It shall not show any significant yellowing or change in physical properties or loss of light transmission over a longer period of use. The sheet shall be impact resistant also. Sheets should be of such quality that they can be cut, bent, jointed as desired. Solution for the joints shall be used as per the requirement of manufacturer.

M-40. Particle board

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

M-41. Expanded polystyrene or framed styrofoam slabs

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

M-42. Resin bonded fiber glass.

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

42.2. For test of Mineral wool thermal insulation [Blanket] IS 3144-1965 shall be followed

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

(1) Bituminous Hessian Kraft paper suitable for use in position where moisture has to be excluded.

(2) Hessian cloth or Kraft paper for keeping out dust

(3) G.I wire netting, suitable for surfaces to be plaster over

M-43. Fixtures and fastenings

43.1. General:

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

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

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

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

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

43.2. Holdfasts:

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

43.3. Butt hinges:

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

43.3.2. Tee and strap hinges shall be manufactured from MS 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 Catch:

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

43.10. Door Stoppers:

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

43.11. Wooden Door Stop with hinges:

43.11.1. Wooden door stop of size 100 mm x 50 mm x 40 mm shall be fixed on the door frame with a hinges of 75 mm. size and at a height of 900 mm. from the floor level The wooden door stop shall be provided with 3 coats of approved oil paint

43.12. Casement Window Fastener:

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

43.13. Casement stays (Straight Red Stay):

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

43.14. Ventilator Catch:

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

43.15. Pivot:

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

M-44. Paints:

44.1. (A) Oil paints :

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

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

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

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

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

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

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

44.2. (B) Enamel paints:

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

M-45. French Polish

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

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

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

M-46. Marble chips for marble mosaic terrazzo

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

46.2. The size of various colours of marble chips ranging from the smallest up to 20 mm shall be used where the thickness of top wearing layer is 6 mm size The marble chips of approved quality and colours only as per grading as decided by the Engineer-in-charge shall be used for marble mosaic tiles or works.

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

M-47. Flooring Tiles

47.1. (A) Plain Cement tiles;

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

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

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

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

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

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

47.2. (B) Plain Coloured Tiles:

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

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

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

47.3. (C) Marble mosaic tiles:

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

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

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

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

47.3.5. The tiles shall be prepared from cement conforming to Indian Standards or coloured port land cement generally depending upon the colour of tiles to be used or as directed.

47.4. (D) Chequered Tiles :

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

47.4.2. The tiles shall be of nominal size of 250 mm. x 250 mm. or as specified. The centre to centre distance of chequer shall not be less than 25 mm. and not more than 50 mm. The overall thickness of the tile shall be 22 mm

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

47.4.4. Tiles shall conform to relevant I.S 1237-1980.

47.5. (E) Chequered Tiles For Stair Cases :

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

- (1) The length of a tile including nosing shall be 300 mm
- (2) The minimum thickness shall be 28 mm
- (3) The nosing shall have also the same wearing layer as at the top.
- (4) The nosing edge shall be rounded
- (5) The front portion of the tile for a minimum length of 75 mm. from and including the nosing shall have grooves

running parallel to nosing and at centers not exceeding 25 mm. Beyond that the tiles shall have normal chequer pattern.

M-48. Rough Kotah Stone

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

M-49. Polished Kotah Stone

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

M-50. Dholpur Stone Slab

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

M-51. Marble Slab

- 51.1.** Marble slab shall be white or of other and of best quality as approved by the Engineer-in-charge.
- 51.2.** Slabs shall be hard, close, uniform and homogeneous in texture. They shall have even crystalline grain and free from defects and cracks. The surface shall be machine polished to an even and perfect plane surface and edges machine cut true and square. The rear face shall be rough to provide key for the mortar.
- 51.3.** Marble slabs with natural veins, if selected shall have to be laid as per the pattern given by the Engineer-in-charge.
- Size of the slab shall be minimum 460 mm x 450 mm and preferably 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 marble slabs shall conform to I.S. 1130-1969

M-52. Granite Stone slab

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

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

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

M-53. P.V.C. Flooring

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

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

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

(a) Thickness + 015 mm.

(b) Length or Width

(1) 300 mm. Square tiles ± 0.20 mm. (3) 900 mm Square tiles ± 0.60 mm.

(2) 600 mm. Square tiles ± 0.40 mm. (4) Sheets and roll ± 0.10 percent.

53.4. Adhesive:

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

M-54. Facing Tiles

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

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

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

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

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

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

Max. 2.5 mm
Max. 3.0 mm

- 54.5.** The average compressive strength obtained as a sample of five tiles when tested in accordance with the procedure laid as per I S 1077-1976 shall be not less than 175 Kg/Sq Cm. The average compressive strength of any individual bricks shall be not less than 160 Kg / Sq.Cm.
- 54.6.** The average water absorption for five bricks tiles shall not exceed 12 percent of average weight of brick before testing. The absorption for each individual bricks shall not exceed 25 percent.
- 54.7.** The brick tiles when tested in accordance with I.S. 1077-1976, the rate of efflorescence shall not be more than "Slightly effloresced"

M-55. White glazed tiles

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

M-56. Galvanised iron pipes and fittings

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

M-57. Bib cock and stop cock

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

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

M-58. Gun metal wheel valve

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

M-59. White glazed porcelain wash basin

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

- 59.2.** White glazed pedestal of the quality and colour as that the basin shall be provided where specified in the item. It shall be completely recessed at the back for reception of supply and wash pipe. It shall be capable of supporting the basin rigidly and adequately and shall be so designed as to make the height from the floor the floor to top of the rim of basin 750 mm. to 800 mm. as directed.
- M-60. European type water closet/with low flushing**
- 60.1.** The European type water closet shall be white glazed porcelain first quality and shall be of wash down type conforming to I.S. 2556-1973 and I.S. 771-1979.
- 60.2.** 'S' trap shall be provided as required with water seal not than 50 mm. The solid plastic seat and cover shall be of best Indian make conforming to I.S 2548-1980. They shall be made of moulded synthetic materials which shall be tough and hard with high resistance to solvents and shall be free from blisters and surface defects and shall have chromium plated brass hinges and rubber buffer of suitable size.
- M-61. Orrissa type water closet**
- 61.1.** The Specification of Orrissa type white glazed water closet of first quality shall conform to I.S. 2256 (Part-III) - 1981 and relevant specification of Indian type water closet except that pan will be with the integral squatting pan of size 580 mm x 400 mm with raised footrest.
- M-62. Indian type water closet**
- 62.1.** The Indian type white glazed water closet of first quality shall be of size as specified in the item and conforming to I.S. 771-1979 and I.S. 2556 – (Part-II) 1981. Each pan shall have integral flushing. It shall also have an inlet at back an or front for connecting flush pipes as directed. The inside of the bottom of the pan shall have sufficient slope from the front towards the outlet and surface shall be uniform and smooth. Pan shall be provided with 100 mm. diameter 'P' or 'S' trap with approximately 50 mm. Water seal and 50 mm. diameter vent horn.
- M-62. A. Foot Rests**
- 62.A.1.** A pair of whit glazed earthen ware rectangular foot to minimum size 250 mm. x 130 mm. x 20 mm shall be provided with the water closet.
- M-63. Glazed Earthen Ware Sink**
- 63.1.** The glazed earthen-ware sink shall be of specified size, colour and quality. They sink shall conform, to I.S. 771 Part – II – 1979. The brackets for sinks shall conform to I.S 775-1970.
- 63.2.** The pipes shall conform to I.S. 1239-part-I 1973 and I.S. 404-1962 for steel and lead pipes respectively. 32 mm. brass waste coupling of standard pattern with brass chain and rubble plug shall be provided with sink.
- M-64. Glazed earthen-ware Lipped type flat back urinal/corner type urinal**
- 64.1.** The lipped type urinal shall be fiat back or corner type as specified in the item and shall conform to I.S 771-1979. It shall be of best Indian make and size as specified and approved by the Engineer-in-charge. The flat back of corner type urinal must be of 1st quality free from any defects, cracks etc.
- M-65. Low level Enamel flushing tank**
- 65.1.** The low level enamel flushing tank shall be of 15 liters capacity. It shall conform of I S 774-1971. The flushing cistern shall be of best quality and free from any defects. The flushing tank shall have outlet 32 mm. diameter. The outlet shall be connected with W.C. pan by lead pipe or P.V.C. pipe as specified. The flushing tank shall be provided with inlet and outlet for fixing G.I. inlet pipes and over-flow pipes. The flushing cistern shall be provided with chromium plated handle for flushing The flushing tank shall be provided with bracket of cast iron so that it can be fixed on wall at specified height. The brackets shall conform to I.S. 775-1970.
- M-66. Cast iron flushing cistern.**

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

M-68. Cast iron pipes and fittings.

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

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

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

68.4. Tolerances :

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

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

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

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

M-69. Nahni Trap

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

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

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

M-70. Gully Trap

- 70.1.** Gully trap shall conform to I.S. 651-1980. It shall be some, free from defects such as fire-cracks or hair cracks. The glaze of the traps shall be free from crazing. They shall give a sharp clear note when struck with light hammer. There shall be no broken blisters.
- 70.2.** The size of the gully trap shall be as specified in the item.
- 70.3.** Each gully trap shall have one C.I. grating of square size corresponding to the dimensions, of inlet of gully trap. It will also have a water tight C.I. cover with frame inside dimensions 300 mm. x 300 mm. the cover with frame inside dimensions 300 mm. x 300 mm. the cover and weighing not less than 4.53 Kg. and the frame not less than 2.72 Kg. The grating cover and frame shall be of sound and good casting and shall have truly square machined seating faces.

M 71. Glazed Stone Ware pipe And Fittings

- 71.1.** The pipes and fittings shall be of best quality as approved, by the Engineer-in-charge. The pipe shall be of best quality manufactured from stone- ware of fire clay, salt glazed thoroughly burnt through the whole thickness, of a close, even texture, free from air blows, fire blisters, cracks and other imperfections, which affect the serviceability. The inner and outer surfaces shall be smooth and perfectly glazed. The pipe shall be capable to withstand pressures or 1.5 M lead without showing sign of leakage. The thickness of the wall shall not be less than 1/12th of the internal dia. The depth of socket shall not be less than 38 mm. The socket shall be sufficiently large to allow a joint of 6 mm. around the pipe.
- 71.2.** The pipes shall generally conform to relevant I S 651-1980.

M-72. Wall Peg Rail

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

M-73. G.I. Water Spot

- 73.1.** The G.I. pipes of 40 mm dia shall be of medium quality and specials shall be of 'R' brand or equivalent brand of best approved quality
- 73.2.** The pipe shall have length as required for the thickness of wall in which it is fixed and at outside end tee bend cut at half the length shall be provided and at other end coupling shall be provided to have better fixing. The water spout shall be provided as per detailed drawing or as directed.

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

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

M-75. Crydon Ball valve

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

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

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

M-77. Selected Earth

- 77.1.** The selected earth shall be that obtained from excavated material or shall have to be brought from outside as indicated in the items. If item does not indicate anything the selected earth shall have to be brought from outside.
- 77.2.** The selected earth shall be good yellow soil and shall be got approved from the Engineer-in-charge. In no case black cotton soil or similar expansive and shrinkable soil shall be used. It shall be clean and free from all rubbish and perishable materials, stones or brick bats. The clods shall be broken to a size of 50 mm or less. Contractor shall make his own arrangement at his own cost for land for borrowing selected earth. The stacking of material shall be done as directed by the Engineer-in-charge in such a way not to interfere with any construction all activities and in proper stacks.
- 77.3.** When excavated material is to be used only selected stuff got approved from the Engineer-in-charge shall be used. It shall be stacked separately and shall, comply with all the requirements of selected earth mentioned above.

M-78. Barbed Wire

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

Item No. 1 :- Designing structurally (and aesthetically) complying provisions of relevant Indian standards and constructing ROC Elevated service Reservoir of the following capacity and height . using latest Soil Investigation Report of proposed site , Seismic zone, Wind speed Zone including (1) Container shape any suitable type(or as specified), (2) Staging consisting of column brace trestle / shaft / combination column- brace trestle and shaft as appropriate(or as specified) and (3) Appropriate foundation system. This includes excavation in all types of soil strata including hard rock). casting 100 mm thick P.C.C. levelling course in M-10 , Refilling the pit with proper soil and disposing of the surplus stuff at all required lead. (4) This will also include cement plaster in CM 1:2 with approved water proofing compound to inside face of container. (5) All types of labour & material charges of lowering , laying, erecting / hoisting & joining of pipe assembly of Inlet, Outlet, overflow, washout and bye pass arrangement as per hydraulic design are including. (6) Providing and fixing of any accessories(specified), like MS/ GI Ladder CI Manhole frame and covers, water level indicator, lightning conductor. GI Pipe railing around walk way, at roof level, at gallery and around landing of inside shaft, Adequate cowl type ventilators or lantern type ventilator with stainless steel jali, (7) Scope of work includes constructing RCC spiral staircase with adequate tie beams, staircase footing B.B. Masonry chambers for valves. ventilating shaft and ventilators as well as door in shaft. (8) including providing and applying three coats of cement paint/snowcem (as specified) to the whole structure, (9) It also includes satisfactory water tightness test as per relevant I.S. Code and painting name of scheme & capacity on the tank as per direction of engineer in charge. (SBC + Testing Necessary) (25000 Lit. Capacity)

The structural design of ESR shall be in accordance with provisions of relevant Indian Standards.

List of Indian Standards for design of ESR:

1. IS 3370 (Part I & II) – 2009 or latest revision
 - 1.1) IS 3370 (Part III & IV) – 1965 or latest revision
2. IS 456 – 2000 or latest revision
3. IS 11682 – 1985 or latest revision
4. IS 1893 (Part I to V) – 2002 or latest revision
5. IS 13920 – 1993 or latest revision
6. IS 875 (Part I to III) – 1987 or latest revision
7. IS 11089 – 1987 or latest revision

General Specifications:

1. Minimum concrete grade for RCC shall be M30. Concrete mix shall be designed and batched by weight.
2. HYSD (Fe 415) or higher grade reinforcing steel conforming to IS 1786/1139 or CRS/TMT bars shall be used.
3. In case of column-brace trestle staging with more than 6 columns, internal horizontal bracing is mandatory. One bracing shall be at foundation level in case of individual footings.
4. Minimum size/thickness of components shall be as per design criteria or standard practice.
5. Minimum dimensions specified in tender data/specifications shall be strictly followed.
6. Safe Bearing Capacity (SBC) shall be taken from soil investigation report or tender data. If poor soil or groundwater is encountered, SBC shall be reassessed and design revised accordingly.
7. Maximum spacing between horizontal bracings shall be 5 m (storey height).
8. BB masonry cabin with MS door shall be constructed when spiral staircase is outside staging.

9. MS ladder shall be provided if roof height from ground level is up to 10 m. For ESR above 10 m, RCC spiral staircase or suitable RCC staircase shall be provided.
10. For staging height above 15 m, spiral staircase shall be provided inside staging with effective tie beams in more than one direction.
11. Water level indicator (float type/electronic as specified) shall be provided.
12. Rate shall include providing and fixing pipes, specials, and valves for inlet, outlet, washout, overflow, and bypass arrangement, including RC supports and laying up to 5 m from outermost column.
13. Only CI pipes and specials shall be used.
14. Rate shall include cost of dewatering during execution with necessary arrangements.
15. Structure shall be designed for uplift due to groundwater table; no extra payment shall be made.
16. Proper curing shall be carried out as per specifications.
17. Contractor shall engage a qualified (minimum graduate) consulting engineer for design, who shall visit the site at least 3 times.
18. 75% payment for container items (concrete, reinforcement, plaster) shall be released only after satisfactory water tightness test as per tender conditions. Until then, work shall be treated as incomplete.

Above conditions/general specifications Sr. No. 1 to 17 are part of the contract.

Staging height: up to 12 m from Ground Level (G.L.)
Safe Bearing Capacity (SBC): 10 T/sq.m

All work shall be done as directed by Engineer-in-charge

Measurement & Rate

- Unit: Nos.
- Rate includes: Design, All materials and labour, Machinery and equipment, Testing, All taxes, leads, lifts, and contingencies

3. Detailed Specifications and Workmanship

3.1 Container Construction

3.1.1 Shape and Type

- **Container Shape:** The container shall be of a suitable shape, typically **circular or spherical**, as per the hydraulic requirements and as specified by the designer.
- **Material:** **RCC (Reinforced Cement Concrete)** with **Grade M30** concrete mix.
- **Waterproofing:** The internal face of the container shall be plastered with **CM 1:2** mix, and an approved waterproofing compound shall be added to ensure complete water retention and protection.

Workmanship:

- All mixing of materials should be done using **weigh batching**, ensuring a precise mix ratio as per the approved mix design.
- Plastering should be done evenly, ensuring no cracks or weak spots. The waterproofing compound must be mixed in the correct proportions as specified by the manufacturer.

3.1.2 Thickness of Wall & Slab

- **Wall Thickness:** A minimum of **200 mm** or as per structural design.
- **Base Slab Thickness:** A minimum of **250 mm** or as per structural design.

- **Dome Thickness:** A minimum of **100 mm** or as per structural design.

Workmanship:

- Formwork should be properly placed and secured, ensuring the required thickness and shape are maintained.
- Curing must be done continuously for **at least 7 days** for each RCC component to ensure adequate hydration of the concrete.

3.2 Staging

3.2.1 Type of Staging

- **Type of Staging:** Column-brace trestle, shaft, or a combination of both as per the structural design. The staging shall be designed for a height of up to **12 meters** from Ground Level (G.L.).
- **Columns:** A minimum of **6 columns** shall be provided as per the design specifications.
- **Column Size:** Typically **300 mm × 300 mm** (but may vary based on design).

Workmanship:

- The formwork for columns should be **clean, dry, and properly oiled** to avoid adhesion with concrete.
- Columns must be properly aligned and plumbed during casting to ensure verticality.
- Proper **vibration** of concrete should be done to remove air pockets and ensure a solid column structure.
- After curing, columns must be checked for alignment and surface finish.

3.2.2 Bracing

- **Bracing System:** Internal horizontal bracing is mandatory for a staging system with more than **6 columns**. One bracing shall be installed at the foundation level in case of individual footings.
- **Spacing Between Bracings:** Bracings should be placed with a maximum spacing of **5 meters** (storey height).

Workmanship:

- Ensure the bracing is **properly aligned** and securely welded or bolted according to the design specifications.
- All joints and connections must be checked for stability before pouring concrete.

3.2.3 Tie Beams and Footings

- **Tie Beams:** Adequate tie beams should be provided as per design to connect the columns and maintain stability.
- **Footing Size:** Footings shall be designed as per the structural requirements, typically **1.2 m × 1.2 m**.

Workmanship:

- The base of the footings should be levelled accurately, and formwork should be carefully placed.
- Reinforcement bars must be positioned correctly and tied securely to prevent displacement during concrete pouring.
- Concrete pouring should be done in layers, ensuring proper compaction.

3.3 Foundation

3.3.1 Excavation

- Excavation shall be carried out in all types of soil strata, including hard rock.
- **Excavation Depth:** As per the structural design requirements.
- **Excavation Width:** Sufficient to accommodate the foundation system as per the design.

Workmanship:

- Excavation should be done in a systematic manner, avoiding over-excavation.
- **Dewatering** should be carried out as necessary during excavation if groundwater is encountered.
- The bottom of the excavation should be **levelled and cleaned** of all debris, loose soil, and water before starting foundation work.

3.3.2 Concrete Levelling Course

- A **100 mm thick PCC (M-10)** levelling course shall be cast over the excavation base to provide a smooth surface for the foundation.

Workmanship:

- The PCC should be mixed uniformly and poured evenly to maintain the required thickness across the entire foundation base.
- It should be levelled properly, and the surface should be cured for a minimum of **3 days**.

3.3.3 Backfilling and Refilling

- The foundation pit shall be backfilled with suitable soil.
- The surplus material shall be disposed of within a **lead of 50 meters**.

Workmanship:

- The refilled soil must be compacted in layers to ensure stability and prevent settlement.
- The soil should be tested for compaction before proceeding with further construction.

3.4 Pipe Works and Hydraulic Components

3.4.1 Pipe Assembly

- **Pipes:** Inlet, outlet, overflow, washout, and bypass pipes must be installed as per the hydraulic design.
- **Material:** CI pipes and specials shall be used for all connections.
- **Laying Length:** Pipes should be laid up to **5 meters from the outermost column**.

Workmanship:

- Ensure pipes are **properly aligned**, with no bends or deformities.
- Pipe joints must be **sealed and tested** to prevent leakage, and adequate supports must be provided to prevent sagging.
- Proper fittings and valves must be installed as per the design specifications.

3.5 Accessories

3.5.1 MS/GI Ladder

- **Material:** MS/GI ladder shall be installed for roof access if the height from G.L. is up to **10 m**.
- **Material Specification:** MS (Mild Steel) or GI (Galvanized Iron) depending on the specification.

Workmanship:

- The ladder should be securely anchored to the tank and staging, ensuring it is **safe and stable**.
- The rungs should be **evenly spaced** and firmly fixed.

3.5.2 CI Manhole Frame and Covers

- CI manhole frame and covers shall be provided for maintenance access.

Workmanship:

- The manhole frames and covers must be **precisely fitted** to avoid misalignment.
- Ensure that the covers are easily operable and provide **secure sealing** to prevent unauthorized access.

3.5.3 Water Level Indicator

- Water level indicator (either **float type or electronic**) shall be installed in an accessible location.

Workmanship:

- Install the water level indicator according to the manufacturer's instructions, ensuring easy access for maintenance and monitoring.

3.5.4 Lightning Conductor

- A **lightning conductor** shall be installed and grounded as per safety standards.

Workmanship:

- Ensure proper **connection to the ground** for effective lightning protection.
- The conductor should be installed at the highest point of the tank and securely fixed.

3.6 Staircase

3.6.1 Spiral Staircase

- **Material:** RCC (Reinforced Cement Concrete) spiral staircase with adequate tie beams and staircase footing.
- **Height:** For staging heights **above 10 m**, an RCC spiral staircase shall be constructed.

Workmanship:

- The staircase should be cast in **smooth, uniform layers** to ensure proper finishing.
- The riser and tread of each step should be uniform to ensure **comfortable access**.

3.7 Finishing

3.7.1 Cement Paint

- Three coats of **cement paint (Snowcem or as specified by Engineer incharge)** shall be applied to the exterior of the container and staging.

Workmanship:

- Each coat of paint should be applied evenly and allowed to dry **completely** before the next coat is applied.
- Proper surface preparation must be done to remove dust, dirt, and moisture before applying paint.

3.8 Testing and Commissioning

3.8.1 Water Tightness Test

- A **water tightness test** shall be performed on the tank as per IS 3370.

Workmanship:

- The test should involve filling the tank with water and checking for any signs of leakage.
- Ensure that the test is conducted over a **minimum period of 24 hours**.

Item No. :- Excavation for foundation upto 5.0 depth including sorting out and stacking of useful materials and disposing of the excavated stuff upto 50 Meter lead. (A) All Type of Soil

➤ **All sorts of soil**

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

1.0. General

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

2.0. Clearing the site

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

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

3.0. Setting out

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

4.0. Excavation

The excavation in foundation shall be carried out in true line and level and shall have the width and depth as shown in the drawings or as directed. The contractor shall do the necessary shoring and shutting or providing necessary slopes to a safe angle, at his own cost. The payment for such precautionary measures shall be paid separately it not specified. The bottom of the excavated area shall be leveled both longitudinally and transversely as directed by removing and watering as required no. earth filling will be allowed for brining it to level, if by mistake or any excavation is made deeper or wider than, that shown on the plan or directed. The extra depth or width shall be made up with concrete of same proportion as specified for the foundation concrete at the cost of the contractor. The excavation upto 5.00 mt. depth shall be measured under this item.

5.0. Disposal of the excavated stuff

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

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

6.0. Mode of measurements & payment

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

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

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

Item No :-

Brick work using common burnt Clay building bricks having crushing strength not less than 35 kg / sq.cm in foundation and plinth in Cement mortar 1:6 (1 Cement : 6 fine sand) (b) Conventional

1.0. Materials

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

2.0. Workmanship

2.1. Proportion:

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

2.2. Wetting of bricks:

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

2.3. Laying:

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

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

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

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

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

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

2.4. Joints:

2.4.1. Bricks shall be so laid that all joints are quite flush with mortar. Thickness of joints shall not exposed 12 mm. The face joints shall be raked out as directed by raking tools daily during

the progress of work, when the mortar is still green so as to provide key for plaster or pointing to done.

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

2.5. Curing:

- 2.5.1.** Green work shall be protected from rain suitably. Masonry work shall be kept moist on all the faces for a period of seven days. The top of masonry work shall be kept well wetted at the close of the day.

2.6. Preparation of foundation bed:

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

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

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

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

3.0. Mode of measurements & payment

- 3.1.** The masonry work of G.F. & First floor shall be measured and paid under this item rate includes cost of all materials & labour.
- 3.2.** Brick work in parapet shall be included in the corresponding masonry item of floor immediately below the floor above which the parapet is built.
- 3.3.** No deduction shall be made from quantity of brick work nor any extra payment made for embedding in masonry of marking holes in respect of following item.

- (1) Ends of joints, beams, posts, girders, rafters, purlins trusses corbel, steps, etc. where cross sectional area does not exceed 500 sq.cm.
- (2) Opening not exceed in 1000 sq.cm.
- (3) Wall plate sand bed plates bearing of slab, chhajjas, and like whose thickness does not exceed 10 cms. and the bearing does not extend the full thickness of wall.
- (4) Drainage holes and recesses for cement concrete blocks to embed hold fasts for doors, window etc.
- (5) Iron fixtures, pipes up to 300 mm. dia. hold fasts of doors, and window built into masonry and pipes etc. for concealed wiring.
- (6) Forming charges of section not exceeding 350 sq.cm. in masonry.
- (7) Apparatuses for fire places shall not be deducted nor shall extra labour required to make splaying of jumps, throating and making trenches over the aperture be paid for separately.

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

Item No. :- Providing and laying cement concrete 1:3:6 (1- Cement : 3- Coarse sand : 6- graded stone aggregates 20 mm nominal size) and curing complete (A) Foundation and Plinth

MATERIALS

1.0 WATER

1.1 Water shall not be salty brackish and shall be clean reasonably clear and free objectionable quantities of silt and traces of oil injurious alkalis salts organic matter and other deleterious material which will either weaken the mortar of concrete or cause efflorescence or attack the steel in R C C container for transport storage and huddling of water shall be clean, Water shall conform to the standard specified in I S 455 -1978

1.2 If required by the Engineer in charge it shall be tested by comparison with distilled water compression shall be made by means of standard cement tests for soundness time of setting and mortar strength as specified in I S 269-1976 Any indication of unsoundness change in time of setting by 30 minutes or more or decrease of more than 10 percent strength of mortar prepared with distilled water sample when compared with the result obtained with mortar prepared with distilled water shall be sufficient cause for rejection of water under test.

1.3 Water for curing mortar concrete or masonry should not be too acidic or too alkaline

1.4 It shall be free of elements which significantly affect the hydration reaction or otherwise interface with the hardening of mortar or concrete during curing or those which produce objectionable stains or other unsightly deposits on concrete or mortar surfaces

1.5 Hard and bitter water shall not be used for curing

1.6 Potable water will generally found suitable for curing mortar or concrete

2.0 CEMENT

2.1 Cement shall be ordinary Portland slag cement as per IS 1624 -1974 or Portland slag cement as per IS 455-1976

2.2 Cement shall be stored above the ground level in perfectly dry and water tight sheds. Wherever bulk storage containers are used, their capacity should be sufficient to cater to the requirements at site and should be cleaned at least once every 3 to 4 months. The aggregate shall be stored in such a way as to prevent admixture of foreign materials. Different size of fine or coarse aggregate shall be stored in separate stock-piles sufficiently away from the each other to prevent intermixing the materials.

3.0 SAND

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

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

I. S. Sieve Designation	% by wt. passing
4.75 mm	100
2.36mm	90 to 100
1.18 mm	70 to 100
600 MC	30 to 100

300 MC	85 to 70
150 MC	00 to 50

3.2 Fine Sand: The fineness module shall not exceed 1.0 the sieve analysis of fine sand be as under:

IS. Sieve Designation	% by wt. passing
4.75 mm	100
2.3 6mm	. 100
1.18 mm	75 to 100
600 MC	40 to 85
300 MC	05 to 50
150 MC	00 to 10

4.0 STONE COARSE AGGREGATE FOR NOMINAL MIX CONCRETE:

4.1 Coarse aggregate shall be machine crushed stone of black trap and hard, strong, dense, durable, clean and free from disintegrated pieces, organic and other deleterious matter.

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

IS Sieve designation	% passing for single sized aggregate of nominal size		
80mm			
63 mm	100	-	-
40mm	85-100	100	0
20mm	0-20	85-100.	100
16mm	-	-	85-100

IS Sieve designation	% passing for single sized aggregate of nominal size		
12.5 mm			
10mm	0.5	0.20	0.30
4.75 mm	-	0.5	0.5
2.35 mm	-	-	-

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

4.3 The grading test shall be taken in the beginning and at the change of source of material as indicated in I.S. 383-1970 and I.S. 456-1978. Aggregate shall be stored separately and handled in such a manner so as to prevent the intermixing diff aggregate if the aggregate are covered with dust, they shall be washed with water to make them clean.

4.4 All materials shall be stored as to prevent their deterioration of their quality and fitness for the work. Any material which has deteriorated or has been damaged or is otherwise considered defective by the Engineer-in-charge shall not be used in the work. The aggregate shall be stored in such a way as to prevent admixture of foreign materials. Different size of fine or coarse aggregate shall be stored in separate stock-piles sufficiently away from the each other to prevent intermixing the materials.

5.0 WORKMANSHIP

General

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

5.2 The ordinary concrete mix shall generally be specified by volume. For cement which normally comes in bags and is used by weight, volume shall be worked out taking 50 kg of cement as 0.035 cubic meter in volume. While measuring aggregate by volume, shaking, ramming or hammering shall not be done. Proportioning of sand shall be as per its dry volume. In case it is dump, allowance for "bulking" shall be made as per IS: 2386 (Part-III).

6.0 PROPORTION OF MIX

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

Note: The proportions of the aggregates shall be adjusted from higher limit to lower limit progressively as the grading of the fine aggregates becomes finer and the maximum size of coarse aggregate becomes larger

Example:- For an average grading of the fine aggregate (that is Zone II of S:383-1963) the proportions shall be 1: 1 1/2, 1:2 ,and 1:3 for maximum size of aggregates 10mm, 20mm and 40mm.respectively (after carrying out sieve analysis).

6.2 For any other item of construction not covered by items! (I) to (v) as specified on the drawing Or as directed by the Engineer in-charge in case It is not specified on drawing. For heavily reinforced concrete members as in the case of ribs of main beams nominal maximum size of aggregate shall usually be restricted to SqM. less than the minimum lateral clear distance between the main bars or. Less than the minimum cover to the reinforcement, whichever is the smaller only black trap type of coarse aggregate should be used. Fine aggregate shall be clean, hard, coarse sand. Shall be free dust and such other substances. The sand be got approved by the Engineer-in-charge. All materials shall be stored as to prevent their deterioration or intrusion of their quality and fineness for the work. Any material which has deteriorated or has been damaged or is otherwise considered defective by the Engineer-in-charge shall not be used in the work.

7.0 MIXING:

FOR MASS CONCRETE WORK. :

7.1 Dry coarse and fine aggregate and cement shall then be mixed thoroughly by turning over to get a mixture of uniform colour.

7.2 Enough water shall then be added gradually and the mass turned over till a mix of required consistency is obtained. In case of hand mixing quantity of cement shall be increased by 10 per cent above that specified. The quantity of water shall be just sufficient to produce a dense concrete of required workability for the purpose

7.3 The concrete shall be mixed in a mechanical mixer. At the site of work Hand mixing may however be allowed for smaller quantity of work if approved by the Engineer-in-charge. When hand mixing is permitted by the Engineer-in-charge in case of break-down of machineries and in the interest of the work. 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 be the Engineer in-charge, the first batch of concrete from the mixer 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. .

7.4 The method of transporting and placing concrete shall be approved by the Engineer-in charge. Concrete shall be so transported and placed so that no contamination, segregations or loss of its constituent material takes place. All form work and reinforcement contained in it shall be cleaned

and made free from standing water, dust, snow or ice immediately before placing of concrete. No concrete shall be placed in any part of the structure until the approval of the Engineer-in-charge has been obtained.

7.5 Mixing shall be done on a smooth watertight platform large enough to allow efficient turning over the ingredients of concrete before and after adding water, Mixing platform shall be so arranged so that no foreign material shall get mixed with concrete nor does the mixing water flow out.

7.6 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,

7.7 Unless otherwise agreed to by the Engineer-in-charge, concrete shall not be dropped into place from a height exceeding 2 meters. When chutes are used they shall be kept clean 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, kept 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 the coated with neat cement grout. The first layer of concrete to be placed on this surface shall not exceed 150 mm. in thickness, and shall be well rammed against old work particular attention being given to corners and Close spots.

7.8 If concreting is not started within 24 hours of the approval being given, it shall have to be obtained again from the Engineer-in-charge. Concreting being given, it 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 unless carried in properly design agitators, operating continuously, when this time shall be within 2 hours of the addition of cement to the mix and within 30 minutes of its discharge from the agitator. Except where otherwise agreed to be the Engineer-in-charge, concrete shall be deposited in horizontal layers to a compacted depth of not more than 0.4-metre when internal vibrators are used and not exceeding 0.30 meter in all other cases

8.0 FORM WORK IF REQUIRED:

8.1 Formwork shall include all temporary or permanent forms required for forming the concrete, together with all temporary construction required for their support.

Formwork shall however be divided into following two distinct categories.

- (1)** Shuttering i.e. formwork required for forming the concrete.
- (2)** Scaffolding i.e. formwork required for supporting shuttering.

8.2 Forms for shuttering shall be constructed only in metal suitably lined. Forms for scaffolding shall be constructed of metal or timber. Both shuttering and scaffolding shall be of substantial rigid construction and shuttering shall be true to shape and dimensions shown on the drawings. All bolts and rivets shall be counter-sunk and well ground to provide a smooth, plane surface.

8.3 Forms shall be mortar-tight and shall be made sufficiently rigid by the use of ties and bracings to prevent any displacement or sagging between supports. They shall be strong enough to withstand all pressure, ramming and vibration, without deflection from the prescribed lines

occurring during and after placing the concrete. Screw jacks or hard wood wedges where required shall be provided to make up any settlement in the formwork either before or during the placing of concrete. Suitable camber shall be provided in horizontal members of structure, especially in long spans to counteract the effects of any fixed as to provide for such Forms shall be so constructed as to be removable in sections in the desired sequence, without damaging the surface of concrete or disturbing other sections. Unless otherwise specified or directed, chambers or fillets of sizes 25mm x 25mm shall be provided at all angles of formwork to avoid sharp comers.

8.4 The inside surface of shuttering shall, except in the case of permanent formwork or where otherwise agreed to by the Engineer-in-charge, be coated with an approved material to prevent adhesion of concrete to the formwork. Release agents shall be applied strictly in accordance with the manufacture's instructions and shall not be allowed to come into contact with any reinforcement or pre-stressing tendons and anchorages. Different release agents shall not be used in formwork for concrete which will be visible in the finished works.

8.5 Special measures shall be taken to ensure that the formwork does not hinder the shrinkage of concrete because without these cracking could occur before the Formwork is removed. Wherever applicable arrangements must be made to ensure that the formwork does not restrain the shortening and hogging of the beams or slabs during tensioning of the tendons. The formwork should take due account of the calculated amount of positive or negative camber so as to ensure the correct final shape of the structures having regard to the deformation of a false work, scaffolding or propping and the deformation due to various causes affecting prestressed structures. Where there are re-entrant angles in the concrete sections the formwork should be removed at those sections as soon as possible after the concrete has set in order to avoid cracking due to shrinkage of concrete. Formwork shall be tight enough to prevent any appreciable loss of cement during vibrations suitable tolerances should be provided in the form work, immediately before concreting all forms shall be thoroughly cleaned. 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 formwork as to their strength alignment and general fitness, but such inspection shall not relieve the contractor of his responsibility for safety of men, machinery, materials and for results obtained.

8.6 The Engineer-in-charge shall be informed in advance by the contractor of his intention to strike any formwork. While fixing the time for removal of formwork, due consideration shall be given to local conditions, character of the structure, the weather and other conditions that influence the setting of concrete and of the materials used in the mix. Where field operations are controlled by strength tests of concrete, the removal of the load-supporting or suffix forms may commence when concrete has attained strength equal to at least twice the stress to which the concrete will be subjected at the time of striking props including the effect of any further addition of loads. When field operations are not controlled by strength tests of concrete the vertical forms of beams, columns and walls may be removed after 2 days. The props of slabs and beams may be removed after 14 and 21 days respectively. All formwork shall be removed without causing any damage to the concrete. Centering shall be gradually and uniformly lowered in such a manner as to permit the concrete to take stresses due to its own weight uniformly and gradually. Where internal metal ties are permitted, they or their removable parts shall be extracted without causing any damage to the concrete and remaining holes filled with cement mortar. No permanently embedded metal part shall have less than 25mm cover to the finished concrete surface. Where it is intended to reuse the formwork, it shall be cleaned and made good to the satisfaction of the Engineer -in-charge.

8.7 Immediately after the removal of forms, all exposed bars or bolts passing through the cement concrete member and used for shuttering or any other purpose shall be cut inside the cement concrete member to a depth of at least 25 mm. below the surface of the concrete and the resulting holes shall be filled by cement mortar. All fins caused by form joints, all cavities produced by the removal of form ties and all other holes and depressions, honeycomb spots, broken edges or corners

and other defects, shall be thoroughly cleaned & saturated with water and carefully pointed and rendered true with mortar of cement and fine aggregate mixed in the proportions used in the grade of concrete that is being finished and of as dry as consistency as is possible to use, Considerable pressure shall be applied in filling and pointing to ensure thorough. Filling in all Surfaces which have been pointed shall be kept moist for a period of four hours. If rock honeycombs, in the opinion of the Engineer-in-charge are of such an character as to affect the strength of the structure materially or to endanger: the life of the steel reinforcement, he may declare the concrete defective and require the removal and replacement of the portions of the structure affected. In the case of reinforced concrete work workability shall be such that the concrete and properly grips all reinforcement. The degree of consistency which shall depend upon the nature of work and methods of vibration of concrete shall be determined by regular slump, tests. Following slump shall be adopted for different types of works.

8.8 Works strength tests shall be made in accordance with IS: 516. Each test shall be conducted on ten specimens, five of which shall be tested at seven days and the remaining five at 28 days. The slump of concrete shall be taken on each day of concreting and cubes shall be made at the rate of one for every 5 cubic meter of concrete or a part thereof. However, if concreting done in a day is less than 15 cubic meter, the minimum number of cubes can be reduced to 6 with the specific permission of the Engineer-in-charge. Similar works tests shall be carried out whenever the quality and grading of materials is charted irrespective of the quantity of concrete poured. The number of specimens may be suitably increased as deemed necessary by the Engineer-in-charge when procedure of tests given above reveal a poor quality of concrete and in other special cases.

8.9 The average strength of the group of cubes cast for each day shall not be less than the specified works cube-strength. 20 per cent of the cubes cast for each day may have values less than the specified strength, provided the lowest value is not less than 85 per cent of the specified strength.

8.10 R.C.C. work shall have exposed concrete surface. Centering design and its erection shall approved by the Engineer in charge. One carpenter with helper will invariably be kept present throughout the period of concreting. Movement of labour and other persons shall be totally prohibited over reinforcement laid in position. For access to different parts, suitable mobile platforms shall provided so that steel reinforcement in positions not disturbed. For ensuring proper cover, mortar blocks of suitable size shall be cast and tied to the reinforcement. Timber kapchi or metal pieces shall not be used for this purpose. Concreting of important structural members shall always be done in the presence and inductee supervision of departmental person not below the rank of Assistant Engineer/ Additional Assistant Engineer, Work Assistant or as instructed by the Engineer in charge. After removal of form work checks that concrete produced is of good quality. Plastering shall not be allowed to the exposed faces of concrete.

9.0 Segregation.

9.1 When concreting has to be resumed on a surface which has hardened, it shall be roughened, swept, clean, thoroughly wetted and covered with a 13 mm. thick layer of mortar shall be freshly mixed and placed immediately before placing of new concrete. Where concrete has not fully hardened, segregation 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, with neat cement grout. The first layer of concrete to be placed on the old surface shall not exceed 150mm in thickness, and shall be well rammed against old work particular attention being given to corners and close spots.

10.0 Transporting & Placing the Concrete:

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

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

10.3 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 can not be used. sufficient vibrators in serviceable condition shall be kept at site so that spare equipment is always available in the event of break downs.

11.0 Curing :

11.1 Immediately after compaction, concrete shall be protected against harmful effects of weather, including rain, running water, shocks, vibration, traffic, rapid temperature charges, frost and driving out process shall be covered with wet jute bags or the similar absorbent material approved by the Engineer-in-charge soon after the initial set, and shall be kept continuously wet for a period of not less than 14 days from the date of placement. Masonry work over- the foundation concrete may be started after 48 hours of its laying but the curing of concrete shall be continued for a minimum period of 14 days.

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

12.0 Mode of Measurement & Payment :

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

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

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

12.4 The unit rate concrete shall include the cost of all materials, tools and plant required for mixing, placing in position, compacting, finishing as per direction of the Engineer-in-charge, curing and all other incidental expenses for producing concrete of specified strength to complete the structure or its components as shown on the drawings and according to these specifications. They shall also include the cost of making, fixing and removing of all centering and forms required for the work.

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

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

Item No :- Providing and laying Controlled cement concrete M.300 work with curing etc. complete including the cost of formwork but excluding the cost of reinforcement for R.C.C. work in for Foundation footing base of columns, Columns, Beams, Slab.

1.0. Materials

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

2.0. General

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

Grade of Concrete Compressive strength of 15 cms. cubes in kg/cmt. at 28 days, conducted in accordance with I.S. 516-1959.

	Preliminary test Min.	Work Test Min.
M 150	200	150
M 200	260	200
M 250	320	250
M 300	380	300
M 350	440	350
M 400	500	400

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

3.0. Workmanship

- 3.1. The proportions for ingredients chosen shall be such that concrete has adequate workability for conditions prevailing on the work question and can be property compacted with means available except where it can be shown to the satisfaction of the Engineer-in-charge, that supply of properly graded aggregate of uniform quality can be maintained till the completion of work, grading of aggregate shall be controlled by obtaining the coarse aggregates in different sizes and bending them in the right proportions as required. Aggregates of different sizes shall be stocked in separate stock piles. The required quantity of material shall be stock piled several hours, preferably a day before use. The grading of coarse and fine aggregate shall be checked as frequently as possible, the frequency for a given job being determined by Engineer-in-charge to ensure that the suppliers are maintaining the uniform grading as approved for samples used in the preliminary tests.
- 3.2. In proportioning concrete, the quantity of both cement and aggregate shall be determined by weight. Where the weight of cement is determined by accepting the maker's weight per bag, a reasonable number of bags shall be weighted separately to check the net weight. Where cement is weighted form bulk stocks at site and not by bags, it shall be weighed separately from the aggregate. Water,

shall either be measured by volume in calibrated tanks or weighed. All measuring equipment shall be maintained in clean and serviceable condition. Their accuracy shall be periodically checked.

- 3.3.** It is most important to keep the specified water cement ratio constant and at its correct value. To this end, moisture content in both fine and coarse aggregates shall be determined by the Engineer-in-charge according to the weather conditions. The amount of mixing water shall then be adjusted to compensate for variations in the moisture content. For the determination of moisture content in the aggregates I.S. 2386 (Part-III) shall be referred to. Suitable adjustments shall also be made in the weights of aggregates due to variation in their moisture content. Minimum quantity of cement to be used in controlled concrete shall not be less than 220 kg/m³ in plain concrete and not less than 250 kg/m³ in reinforced concrete.

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

4.0. Clearing and Treatment of forms:

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

5.0 Stripping time:

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

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

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

(c) Removal of props slabs:

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

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

(d) Removal of props t beams and Arches:

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

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

6.0 Procedure when removing the form work :

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

7.0 Centering:

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

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

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

8.0 Scaffolding:

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

- 8.2.** The scaffolding, hoisting arrangements and ladder shall allow easy approach to the work spot and afford easy inspection.
- 8.3.** The rate is applicable to all condition of working and height up to 4 mts. The rate shall include the cost of materials and labour for various operations involved such as :
- (a) Splayed edges, notching, allowance for overlaps and passing at angles, battens centering, shuttering propping, bolting, wedging easing, striking and removal.
 - (b) Filleting to form stop chamfered edges or splayed external angles not exceeding 20 mm: width to beams, columns and the like.
 - (c) Temporary openings in the forms for pouring concrete, if required removing rubbish etc.
 - (d) Dressing with oil to prevent adhesion of concrete with shuttering and.
 - (e) Raking or circular cutting.
- 9.0 Re-Use:**
- 9.1.** Before re-use, all form shall be inspected by Engineer-in-charge and their suitability ascertained. The forms shall be scarred, cleaned and joints are gone over, repaired where required. Inside surface shall be retreated to prevent adhesion of concrete.
- 10.0. Mode of measurement & payment**
- 10.1.** The consolidated cubical contents of concrete work as specified in item shall be measured. No deduction shall be made for
- (a) Ends of dissimilar materials such as joints, beams, posts, girders, falters, purling trusses, corbels and steps etc. up to 500 Sq, Cm. in section.
- 10.2.** Form work shall be measured as the area in square meters to shuttering in contract with concrete except in the case of inclined member and portion of curved profile and upper side in which case on area of underside shall be measured for payment.
- 10.3.** Form work to secondary beams shall be measured up to the sides of main beams but no deduction shall be made from the form work of the main beam at the inter section point. No deduction shall be made from the form work of a column at inter section of beams.
- 10.4.** The rate includes cost of all materials labour, tools and plant required for mixing, placing in position, vibrating and compacting, finishing, as directed, curing and all other incidental expenses for producing concrete of specified strength. The rate includes the cost of form work.
- 10.5.** The rate shall be for a unit of **one cubic meter**.

Item No. :- Filling in foundation and plinth with murrum or selected soil in layers of 20cm. thickness including watering, ramming and consolidating etc. completed.

1.0 MATERIALS

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

2.0 WORKMANSHIP

- 2.1 The murrum to be used for filling shall be free from salts, organic or other foreign matter all clods of murrum shall be broken.
- 2.2 As soon as the work in foundation has been completed and measured the site of foundation shall be cleared of all debris brick bats mortar dropping etc. and filled with murrum in layers not exceeding 20 cms. Each layer shall be adequately watered, rammed and consolidated before the succeeding layer is laid. The murrum shall be rammed with iron rammers where feasible and with the but ends of crow bars. Where rammer cannot be used.
- 2.3 The plinth shall be similarly tilled with murrum in layers not exceeding 20 cms adequately watered and consolidated by ramming with iron or wooden rammers. When filling reaches finished level the surface shall be flooded with water for at least 24 hours and allowed to dry and then rammed and consolidated.
- 2.4 The finished level of filling shall be kept to shape intended to be given to floor.
- 2.5 In case of large heavy duty flooring like factory flooring, the consolidation may be done by power rollers, where so specified. The extent of consolidation required shall also be as specified.

3.0. MODE OF MEASUREMENTS & PAYMENT

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

Item No :-

Providing and fixing M.S grills of required pattern with M.S.flats at required spacing on frame all-round square or round bars with rounded headed bolts and nuts or by screws incl. Priming coat and Two coats of oil paintings etc.comp. (a) Plain grill

1.0. Materials

The structural steel shall conform to M-22.

The ready mixed primer, brushing red shall conform to I.S. 102-1962.

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.

The enamel paint shall conform to I.S. 133-1975.

2.0. Workmanship

2.1. The M.S. Grill shall be prepared as per the drawing 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 reverted or welded as shown in the plan or as directed. The grill so formed shall be fixed into the frames of the windows etc. before they are erected in position. The outside strip frame of the grill shall be housed to its full thickness into the recess cut into the frame of the windows etc. The grill shall be fixed to the frame with number of bolts and nuts or screws viz. bolt nut/screw per 30 cm. of the length of outer strip subject to minimum of 2 Nos. on each side of the frame or as indicated in the drawing or as directed.

2.3. The bolts and nuts or screws shall be counter sunk and shall be fixed with the top of their heads flush with the face of the frame strips.

3.0 PRIMER COAT

3.1. 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.

3.1.1 In painting doors and windows, the putty, round the glass panes also be painted but care shall be taken to see that no paint, stain etc. are left on the glass. Top of shutters and surfaces in similar hidden locations shall not be left out in painting.

3.2. Application of primer :

3.2.1. 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 wall constitute one coat.

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

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

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

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

4.0. Mode of measurements & payment

4.1. No payment shall be made for weight of screws, bolts nuts etc. only weight of grill shall be paid.

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

Item No. :-

Providing TMT Fe 500D Bar reinforcement for R.C.C. work including bending, binding and placing in position complete upto floor two level

1.0. GENERAL

This work shall consist of furnishing and placing **TMT Fe-500 D 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 **TMT Fe-500 D** steel bars. They may be uncoated or coated 'with epoxy or with approved protective coatings.

2.2. TMT bars reinforcement for RCC work shall conform to IS 1786 FE-415 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, oil 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 bend g schedule shall be furnished by the Contractor and got approved by the Engineer before start of work.

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

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

8.0. PLACING OF REINFORCEMENT

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

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

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

In case of beam an 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 TMT 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:

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

is 0.4 or less.

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

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

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

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

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

10.7. As far possible bars of full length shall be used In case this is not possible, overlapping of bars shall be done as directed by the Engineer in charge When practicable overlapping bars shall not touch each other,

but be kept apart by 25 mm Where no feasible overlapping bars shall be bound with annealed wires not less than 1 mm thick twisted tight The overlaps shall be staggered for different bars and located at points along the span where neither sheer not bending moments is maximum.

10.8. Whenever indicated on drawing or desired the Engineer in charge bars shall be jointed by coupling which shall have a cross section sufficient to transmit the full stresses of bars The end of the bars that are 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.

10.8. When permitted or specified on the drawings joints of reinforcement bars shall butt-welded so as to transmit their full stresses Welded joints shall preferably be located at points when steel will not be subject to more than 75 percent of the maximum permissible stresses and welds so staggered that at any one section not more than 20 percent of the rods are welded Only electric are welding using a process which excludes air form the molten metal and conforms to any or other special provisions for the work shall be accepted Suitable means shall be provided for holding bars securely in position during welding It shall be ensured that no voids are left in welding and when welding is done in two or three stages previous surface shall be cleaned properly Ends of bars shall be cleaned of all loose scale rust stages paint and other foreign matter before welding Only competent welders shall be employed on the work. The M.S. electrodes used for welding shall conform IS 814 Welded pieces of reinforcement shall be tested. Specimen shall be taken form the actual site and their number shall frequency to test shall be as directed by the Engineer in charge

11.0 MODE OF MEASUREMENTS & PAYMENT

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

Sr. No.	Diameter of steel	weight of steel per running meter	Sr. No.	Diameter of steel	weight of steel per running meter
1.	6 mm.	0.22 Kg./Rmt.	8.	20 mm	2.47 Kg./Rmt.
2.	8 mm	0.39 Kg./Rmt.	9.	22 mm	2.98 Kg./Rmt.
3.	10 mm	0.62 Kg./Rmt.	10.	25 mm	3.85 Kg./Rmt.
4.	12 mm	0.89 Kg./Rmt.	11.	28 mm	4.83 Kg./Rmt.
5.	14 mm	1.21 Kg./Rmt.	12.	32 mm	6.31 Kg./Rmt.
6.	16 mm	1.58 Kg./Rmt.	13.	36 mm	7.99 Kg./Rmt.
7.	18 mm	2.00 Kg./Rmt.	14.	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 excluding overlaps, No steel shall be given for lap but work may be carried out as per detailed drawings. Where welding or coupling is resorted to, in place lap joints, such joints shall be measured for payment as equivalent length of overlap as per design requirement. From the length so measured, the weight of reinforcement shall be calculated in tones on the same basis of as per table given above even though steel is supplied to the contractor by the department on actual weight. Length shall include hooks at the ends. Wastage and annealed steel wire for binding shall not be measured and the cost of these items shall be deemed to be included in the rate for reinforcement.

11.3. The rate for reinforcement includes cost of steel binding wires, but excluding Lap Length its carting with all leads and lifts, cutting, bending, placing in position, binding and fixing in position as shown on the drawings and as directed. It shall also include all devices for keeping reinforcement in approved position, cost of joining as per approved method and all wastage and spacer bars.

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

ITEM NO.

Providing 15mm thick cement plaster in Two coat for interior plastering and finished even and smooth in finishing with a floating coat of neat cement slurry (ii) Cement mortar 1:2 (1-cement :2-sand etc. complete with water proofing compound.

General

This work shall consist of Providing **Providing 15 mm thick cement plaster in Two coat** of the shape and dimensions shown on the drawings and conforming to these Specifications or as approved by the Engineer in charge.

Material

1.0 CEMENT

1.1. Cement to be used in the works shall be any of the following types with the prior approval of the Engineer:

- a)** Ordinary Portland Cement, 33 Grade, conforming to *IS:269*.
- b)** Rapid Hardening Portland Cement, conforming to *IS:8041*.
- c)** Ordinary Portland Cement, 43 Grade, conforming to *IS:8112*.
- d)** Ordinary Portland Cement, 53 Grade, conforming to *IS:12269*.
- e)** Soleplate Resistant Portland Cement, conforming to *IS:12330*.

1.2. Cement conforming to *IS:269* shall be used only after ensuring that the minimum required design strength can be achieved without exceeding the maximum permissible cement content of 540 kg/cum. of concrete.

1.3. Cement conforming to *IS:8112* and *IS:12269* may be used provided the minimum cement content mentioned elsewhere from durability considerations is not reduced. From strength considerations, these cements shall be used with a certain caution as high early strengths of cement in the 1 to 28-day range can be achieved by finer grinding and higher constituent ratio of C_3S/C_2S , where C_3S is Tri-calcium Silicate and C_2S is Dicalcium Silicate. In such cements, the further growth of strength beyond say 4 weeks may be much lower than that traditionally expected. Therefore, further strength tests shall be carried out for 56 and 90 days to fine tune the mix design from strength considerations.

1.4. Cement conforming to *IS: 12330* shall be used when sodium soleplate and magnesium soleplate are present in large enough concentration to be aggressive to concrete. The recommended threshold values as per *IS:456* are soleplate concentration in excess of 0.2 per cent in soil substrata or 300 ppm (0.03 percent) in ground water. Tests to confirm actual values of soleplate concentration are essential when the structure is located near the sea coast, chemical factories, agricultural land using chemical fertilizers and sites where there are effluent discharges or where soluble soleplate bearing ground water level is high. Cement conforming to *IS:12330* shall be carefully selected from strength considerations to ensure that the minimum required design strength can be achieved without exceeding the maximum permissible cement content of 540 kg/cum. of concrete.

1.5. Cement conforming to *IS 8041* shall be used only for pre cast concrete products after specific approval of the Engineer in charge.

1.6. Total chloride content in cement shall in no case exceed 0.05 percent by mass of cement also total sulfur content calculated as sulfuric anhydride (SO_3) shall in no case exceed 2.5 per cent and 3.0 percent when tri-calcium aluminate per cent by mass in up to 5 or greater than 5 respectively.

1.7. Storage

Cement shall be transported, handled and stored on the site in such a manner as to avoid deterioration or contamination, Cement shall be stored above ground level in perfectly dry and water tight sheds and shall be stacked not more than eight bags high. Wherever bulk storage containers are used their capacity should be sufficient to cover the requirement at site and should be cleaned at least once every 3 to 4 months

1.8. Each consignment shall be stored separately so that it may be readily identified and inspected and cement shall be used in the sequence in which it is delivered in any way, during storage shall not be used in the works and shall be removed from the site by the contractor without charge to the employer

The contractor shall prepare and maintain proper records on site in respect of delivery handling storage and use of cement and these records shall be available for inspection by the engineer in charge at all times

1.9. The contractor shall make a monthly return to the engineer in charge on the date corresponding to the interim certificate date showing the quantities of cement received and issued during the month in stock at the end of the month.

2.0 SAND

2.1 Sand shall be natural sand, clean well graded, hard strong durable and gritty particular free from immure amounts of dust, clay, kankar modules

2.2. For masonry works sand shall conform to the requirements of IS: 2116

2.3. For plain and reinforced cement concrete (PCC and RCC) or pre stressed concrete (PSC) works fine aggregates shall consist of clean, hard strong and durable pieces of crushed stone, crushed gravel or suitable combination of natural sand crushed stone or gravel, They shall not contain dust lumps soft or flaky materials mica or other deleterious materials in such quantities as to reduce the strength and durability of concrete, or to attack the embedded steel. Motorized sand washing machines should be used to remove impurities from sand. Fine aggregate having positive alkali-silica reaction shall not be used. All fine aggregates shall conform to IS L 383 and tests for conformity shall be carried out as per IS : 2386 (Part I to VIII) The contractor shall submit to the Engineer in charge the entire information indicated in Appendix A of IS : 383. The fineness modulus of fine aggregate shall neither be less than 2.00 nor greater than 3.5.

2.4. Sand fine aggregates for structural concrete shall conform to the following grading requirements as shown in the table below

2.5 Fine Sand: The fineness module shall not exceed 1.0 the sieve analysis of fine sand be as under:

IS. Sieve Designation % by wt. passing			
	Zone I	Zone II	Zone III
10 mm	100	100	100
4.75 mm	90-100	90-100	90-100
2.3 6mm	60-95	75-100	85-100
1.18 mm	30-70	55-90	75-100
600 MC	15-34	35-59	60-79
300 MC	5-20	8-30	12-40
150 MC	0-10	0-10	0-10

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

I. S. Sieve Designation	% by wt. passing
4.75 mm	100
2.36mm	90 to 100

1.18 mm	70 to 100
600 MC	30 to 100
300 MC	85 to 70
150 MC	00 to 50

3.0. WATER

3.1 Water shall not be salty brackish and shall be clean reasonably clear and free objectionable quantities of silt and traces of oil injurious alkalis salts organic matter and other deleterious material which will either weaken the mortar of concrete or cause efflorescence or attack the steel in R C C container for transport storage and huddling of water shall be clean, Water shall confirm to the standard specified in I S 455 -1978

3.2. If required by the Engineer in charge it shall be tested by comparison with distilled water compression shall be made by means of standard cement tests for soundness time of setting and mortar strength as specified in I S 269-1976 Any indication of unsoundness charge in time of setting by 30 minutes or more or decrease of more than 10 percent strength of mortar prepared with distilled water sample when compared with the result obtained with mortar prepared with distilled water shall be sufficient cause for rejection of water under test.

3.3 Water for curing mortar concrete or masonry should not be too acidic or too alkaline

3.4 It shall be free of elements which significantly affect the hydration reaction or otherwise interface with the hardening of mortar or concrete during curing or those which produce objectionable stains or other unsightly deposits on concrete or mortar surfaces

3.5 Hard and bitter water and sea water shall not be permitted for curing

3.6 Potable water will generally found suitable for curing mortar or concrete

3.7. Storage Water shall be stored in containers/ tanks covered at top and cleaned at regular intervals in order to prevent intrusion by foreign matter or growth of organic matter Water from shallow muddy or marshy surface shall not be permitted The intake pipe shall be enclosed to exclude silt, mud grass and other solid materials and there shall be a minimum depth of 0.60 m on water below the intake at all times

3.8. As a guide following concentrations represent the maximum permissible values

(a) to neutralize 200 ml sample of water using phenolphthalein as indicator, it should not require more than 2 ml of 0.1 normal NaOH

(b) To neutralize 200 ml of water using methyl orange as an indicator, it should not required more than 10 ml of 0.1 normal HCl

(c) the permissible limits for solids shall be as follows when tested in accordance with IS 3025

	Permissible limits (Max)
Organic	200 mg/lit
Inorganic	3000 mg/lit
Sulphates (SO ₄)	500 mg/lit
Chlorides (Cl)	500 mg/lit
Suspended matter	2000 mg/lit

In case of structures of length 30 m and below, the permissible limit of chlorides may be increased up to 1000 mg/lit

All samples of water (including potable water shall be tested and suitable measures taken where necessary to ensure conformity of the water to the requirements stated herein.

(d) The pH value shall not be less than 6

4.0 WORKMANSHIP

4.1 Sand shall be screened and shall be free from all impurities like dust and loose particles pieces of stone or kankar or gravel, and all type of organic materials

4.2. Cement and sand shall be mixed in proportions of 1:2 (1 cement ; 2 coarse sand) Cement and sand shall be proportioned by volume after making due allowance for bulking. The required quantity of water shall then be added and the mortar mixed to produce workable consistency before mixing platform shall be thoroughly cleaned before changing from one type of cement to another.

4.3. The mixing shall be done intimately, The operation shall be carried out on clean water tight platform, and cement sand shall be first mixed dry in the required proportion to obtain uniform colour and then the mortar shall be mixed for at least two minutes after addition of water. In case of cement mortar, that has suffered because of evaporation of water the same shall be re-tempered by adding water as frequently as needed to restore the requisite consistency but its re-tempering shall be permitted only within thirty minute from the time of addition to water at the time of initial mixing.

4.4. For a surface which is to be subsequently plastered the joints shall be squarely racked out to a depth of 15mm. With the mortar is till green. The racked joints shall be well brushed to remove dust and loose particles and the surface shall be throughway washed with water, and wetted

4.5. Cement and sand shall be mixed in proportion as specified in the item, Cement and sand shall be proportioned by volume after making due allowance for bulking. The required quantity of water shall then be added and the mortar mixed to produce workable consistency.

4.6. The mixing shall be done intimately. by hand infixing,. The operation shall be carried out on a clean watertight platform, and cement and sand shall be first mixed dry in the required proportion to obtain mortar that has stiffened because of evaporation of water, the same shall be re-tempered by adding water as frequently as needed to restore the requisite consistent but this re-tempering shall be permitted only within thirty minutes from the time of addition of initial mixing.

4.7. Plastering shall be started from top and worked down. All long holes shall be properly filled in advance of the plastering as the scaffolding is being taken down.

Wooden screeds 75mm. wide and of the thickness of the plaster shall be fixed vertically 2.5-meters to 4 meters apart to act as gauges and guides in applying the plaster. The mortar shall be laid on the wall between the screeds using the plaster float and pressing the mortar to the racked joints are properly filled.

4.8. The plaster shall then be finished off with a wooden straight edge reaching across the screeds. The straight edge shall be worked on)e screeds with a small upward and side way motion 50mm or 75mm at a time. Finally, the surface shall be finished off with a plaster's wooden float. Metal floats shall not be used.

4.9. When recommencing plastering beyond the work suspended earlier the edge of the old plaster shall be scrapped, cleaned and wetted before plaster is applied to the adjacent areas. No

portion of the surface shall be left out initially or be patched by later on. The plaster shall be finished to a true and plumb thickness of plaster shall not be less than the thickness specified in the item with tolerance of 3mm th which appear in the surface and all portions, which sound hollow as directed by the Engineer- in charge

4.10. Curing shall be started as soon as the mortar used for finished has hardened sufficiently no to be damaged when watered. It shall be kept wet for a period of at least 7 days. During this period, it shall be suitably protected from all damages;

4.11. Stage scaffolding shall be provided for the work. This shall be independent of the structure.

4.12. Green work shall be protected from rain by suitable covering. Plaster work is cement of composite mortar shall be kept constantly moist on all faces for a minimum period of seven days. The top of the masonry work shall be left flooded with water at the close of the day.

4.13. During hot weather, all finished or partly finished work shall be covered or wetted in such manner as will prevent rapid drying of the brick work.

4.14. The scaffolding shall be sound and strong to withstand all loads to come upon it. The holes which provide resting space for horizontal members shall not be left in masonry under one meter in width or immediately near the skew backs or arches. The holes left in the masonry work for supporting the unfolding shall be filled and made good.

5.0 PROPORTION OF MIX

5.1. The proportion of cement and sand shall be one part of cement. 2 (Two) parts of sand and shall be measured by volume.

6.0 MODE OF MEASUREMENT & PAYMENT :

6.1. The unit rate Plaster shall include the cost of all materials, tools and plant required for mixing, applying & placing in position, compacting, finishing as per direction of the Engineer-in-charge, curing and all other incidental expenses for producing plaster work of specified thickness to complete the structure or its components as shown on the drawings and according to these specifications. They shall also include the cost of making, fixing and removing of all scaffolding and forms required for the work.

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

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

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

ITEM NO.

Finishing wall with cement paint (Snowcem or as specified) on outer surface (Three coats) to give an required shape even shade after thoroughly brushing the surface to remove all dirt, and remains of loose powdered materials.etc complete

This work shall consist of **Finishing wall with water proofing Cement paint** of approved brand and manufacture and of approved shade, of the shape and dimensions shown on the drawings and confirming to these specifications or as approved by the Engineer in Charge.

1.0 MATERIALS

1.1 The water shall conform to M-1. Cement water proofing paint shall conform to I.S. 5410-1969.

Paint

The Acrylic emulsion paint shall be of approved brand and manufacturer and of approved shade as directed by the Engineer-in-Charge.

2.0 WORKMANSHIP

2.1 Scaffolding :

The relevant specifications of Item No.18.11 shall be followed.

2.2 Preparation of Surface :

The relevant specifications of item 18.11 shall be followed except that the word white wash colour wash shall be substituted with Epoxi paint of approved brand and manufacturer and of approved shade. The surface shall be thoroughly wetted with clean water before Epoxi paint is applied.

2.3 Preparation of Paint :

Portland Acrylic emulsion paint shall be prepared as per instruction of manufacturer water as recommended by the manufacturer and stirring to obtain a thick paste, which shall then be diluted to a brushable consistency. Generally, equal volumes of paint powder and water make a satisfactory paint. In all cases, the manufactures instructions shall be followed. The paint shall be mixed in such quantities as can 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. Epoxi paint shall be equivalent to Asian paint quality.

2.4 Application of Paint :

2.4.1 No painting shall be done when the paint is likely to be exposed to at temperature below 70 C within 48 hours after application.

2.4.2 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 24 hours or a longer period as instructed by the Engineer-in-Chare.

2.4.3 To maintain the uniform mixture and to prevent segregation, the paint shall be stirred frequently in the bucket.

2.4.4 For undecorated surfaces, the surface shall be treated with minimum two coats of Epoxi paint. Not less than 24 hours shall be allowed between two coats. Next coat shall not be started until the proceeding coat has become sufficiently hard to resist marking by the brush being used. In hot dry weather, the proceeding coat shall be slightly moistened before applying the subsequent coat.

2.4.5 The finished surface shall be even and uniform in shade, without patches, brush mark, paint drops etc.

2.4.6 The paint shall be applied with a brush with relatively short stiff hog or fibre bristles. The paint shall be brushed in uniform thickness and shall be free from excessively heavy brush marks. The lamps shall be well brushed out.

2.4.7 Epoxi 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.

2.2 Curing :

Painted surface 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. 2.6 Protection measures shall be taken as per item.

3.0 MODE OF MEASUREMENT & PAYMENT :

3.1 The unit rate painting shall include the cost of all materials, tools and plant required for mixing, applying and placing in position, compacting, finishing as per direction of the Engineer-in-charge, curing and all other incidental expenses for producing plaster work of specified thickness to complete the structure or its components as shown on the drawings and according to these specifications. They shall also include the cost of making, fixing and removing of all scaffolding and forms required for the work.

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

3.2 The chipping work shall be measured for its **length** and **height**, or **breath** limiting dimensions to those specified on plan or as directed. The rate shall be for a unit of one squire meter.

The payment will be made on square meter basis of the finished work

ITEM NO.

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

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

1.0. Materials

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

2.0. Workmanship

2.1. Cutting, Laying & Jointing

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

2.2. Fixing concealed to wall, ceiling & floors.

2.2.1. In case of fixing **concealed cement point to** walls or ceilings, these shall run on the surface of the wall, or ceiling (not in chase) unless otherwise specified. The fixing shall be done by means of standard pattern, holder clamps keeping the pipes about 15 mm. clear of the wall. When it is found necessary to pattern, holder clamps keeping the pipes about 15 mm. clear of the wall. When it is found necessary to conceal the pipes and when specified so, chasing may be adopted or pipe fixed 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 (1 cement : 3 coarse sand), and properly finished to match the adjacent surface.

2.3. Testing of joints :

2.3.1. After laying and jointing, the pipes and fillings shall be inspected under working conditions of pressure and flow. Any joints found liken shall be redone, and ail leaking pipes removed and replaced without extra cost.

2.3.2. The pipes and fittings after they are laid shall be tested to hydraulic pressure of 6 Kg./Sq cm. The pipe shall be slowly and carefully charged with water allowing all air to escape and avoiding all shocks and water hammer. The draw off takes and stop cock shall then be closed and specified hydraulic pressure shall be applied gradually. The pressure gauge must be accurate. The pipes and fittings shall be tested in sections as the work laying proceeds, keeping, the joints exposed for inspection during the testing.

3.0. Mode of measurements and payment

3.1. The description of the item shall, unless otherwise stated be held to include where necessary conveyance and delivery, handling, unloading, storing fabrication, hoisting, all labour for finishing to required shape and size, setting, fitting in position straight, cutting and waste return of packing etc.

3.2. The length shall be measured on **running meter** basis of finished work. The length shall be taken along the centre line of the pipe and fittings. The pipes fixed to wall, ceiling. floors etc shall be measured and paid under this item.

- 3.3.** All the work shall be measured in decimal system as fixed in its place, subject to tolerance given below unless otherwise stated.
- (i) Dimension shall be measured to the nearest 0.01 meter.
 - (ii) Area shall be worked out to the nearest 0.01 sq. meter.
- 3.4.** All measurements of cutting shall unless otherwise stated be held to include the consequent waste.
- 3.5.** In case of fitting of unequal bore, the target bore shall be measured for the test.
- 3.6.** Testing of pipe line fittings, and joints include for providing all plant appliances necessary for obtaining access to the work to be tested and carrying out the tests.
- 3.7.** The rate includes [U.P.V.C. pipes having thermal stability for hot and cold water supply](#) with screwed socket joints to be fitted with all fittings (such as bends, sockets, elbows, tees, crosses, short pieces, clamps and plugs, unions etc.) and fixing complete with clamping wall hooks, wooden plug etc. and also curing, screwing and waste and for making forged (or hand made) bends on piping as required. Connector shall be inserted where required or directed. The rate also includes cutting through walls, floors etc. and their making good and painting exposed threads with anti-corrosive paint as above and testing where tubes are to be fixed to wall, ceiling and flooring, the rates shall not include painting of pipes, providing sleeves and sand filling under floor for which separate payment shall be made.
- 3.8.** The rate shall be for a unit of one running meter.

ITEM NO.

Providing and fixing Gun metal check or non-return fullway wheel valve. All Dia

1.0. Materials : The gun metal check or not return full way wheel valve or specified dial, shall conform to I.S.: 778-1964. The non-return valve shall be 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 flaps 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.

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



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