

***GENERAL TECHNICAL  
SPECIFICATIONS  
FOR  
BUILDING WORKS  
BOOK***

# ***GENERAL TECHNICAL SPECIFICATIONS***

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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 its 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 under the specification of the material and prefix 'M' e.g. 'M-5',
11. Approval to the samples of various materials given by the Engineer-in-charge shall not absolve the contractor from the responsibility of replacing defective material brought on site or materials used in the work found defective at a later date. The contractor shall have no claim to any payment or compensation whatsoever on account of any such materials being rejected by the Engineer-in-charge.
12. The contract rate of the item of work shall be for the work completed in all aspects.
13. No collection of materials shall be made before it is got approved from the Engineer-in-charge.
14. Collection of approved materials shall be done at site of work in a systematic manner. Materials shall be stored in such a manner as to prevent damage, deterioration or intrusion of foreign matter and to ensure the preservation of their quality and fitness for the work
15. Materials, if and when rejected by the Engineer-in-charge, shall be immediately removed from the site of work.
16. No materials shall be stored prior to, during and after execution of a structure in such a way as to cause or lead to damage or overloading of the various components of the structure.
17. All works shall be carried out in a workmanlike manner as per the best techniques for the particular item.
18. All tools, templates, machinery and equipment for correct execution of the work as well as for checking lines, levels, alignment of the works during execution shall be kept in sufficient numbers and in good working condition on the site of the work.
19. The mode, procedure and manner of execution shall be such that it does not cause damage or over-loading of the various components of the structure during execution or after completion of the structure.
20. Special modes of construction not adopted in general Engineering practice if proposed to be adopted by the Contractor, shall be considered only if the contractor provides satisfactory evidence that such special mode

Of construction is safe, sound and helps in speedy construction and Completion of work to the required strength and quality. Acceptance of the same by the Engineer-in-Charge shall not, however absolve the contractor of the responsibility of any adverse effects and consequences of adopting the same in the course of execution of completion of the work.

21. All installations pertaining to water supply and fixtures there of as well as drainage lines and sanitary fittings shall be deemed to be completed only after giving satisfactory tests by the contractor.
22. The contractor shall be responsible for observing the rules and regulations imposed under the "Minor Minerals Act", and such of the laws and rules prescribed by Government from 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

## GENERAL

### STANDARD TECHNICAL SPECIFICATIONS

Sr. No. of the item in the Schedule 'B' of tender	Sr. No. of applicable Specification	Sr. No. of the item in the Schedule 'B' of tender	Sr. No. of applicable Specification	Sr. No. of the item in the Schedule 'B' of tender	Sr. No. of applicable specification
1		25		49	
2		26		50	
3		27		51	
4		28		52	
5		29		53	
6		30		54	
7		31		55	
8		32		56	
9		33		57	
10		34		58	
11		35		59	
12		36		60	
13		37		61	
14		38		62	
15		39		63	
16		40		64	
17		41		65	
18		42		66	
19		43		67	
20		44		68	
21		45		69	
22		46		70	
23		47		71	
24		48		72	

Sr. No. of the item in the Schedule 'B' of tender	Sr. No. of applicable Specification	Sr. No. of the item in the Schedule 'B' of tender	Sr. No. of applicable Specification	Sr. No. of the item in the Schedule 'B' of tender	Sr. No. of applicable specification
73		99		125	
74		100		126	
75		101		127	
76		102		128	
77		103		129	
78		104		130	
79		105		131	
80		106		132	
81		107		133	
82		108		134	
83		109		135	
84		110		136	
85		111		137	
86		112		138	
87		113		139	
88		114		140	
89		115		141	
90		116		142	
91		117		143	
92		118		144	
93		119		145	
94		120		146	
95		121		147	
96		122		148	
97		123		149	
98		124		150	



## 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 sand shall be as under.

I.S. Designation	Sieve passing sieve	Percentage by weight Designation	I.S. Sieve Percentage by weight passing Sieve
4.75 mm	100	600 micron	30 - 100
2.36 mm	90 to 100	300 micron	50 - 70
1.18 mm	70 to 100	150 micron	0 - 50

**6.3. Fine Sand :**

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

I.S. Designation	Percentage by weight Sieve passing	I.S. Designation	Percentage by weight Sieve passing
4.75 mm	100	600 micron	40 - 85
2.36 mm	100	300 micron	5 - 50
1.18 mm	75 to 100	150 micron	0 - 10

**M-7. Stone Dust**

**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 using measuring cylinder. The method of determining silt contents by field test is given as under :

**7.2.** A sample of stone dust to be tested shall be placed without drying in 200 mm. measuring cylinder. The quantity of the sample shall be such that it fills the cylinder 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 modulus of stone dust shall not be less than 1.80

**M-8. Stone Grit**

**8.1.** Grit shall consist of crushed or broken stone and be hard, strong, dense, durable, clean of proper gradation and free from skin or coating likely to prevent 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 by weight	I.S. Sieve designation	Percentage by weight
12.5 mm	100 %	4.75 mm	0-20%
1000 mm	85 - 100%	2.36 mm	0-25%

**8.3.** The crushing strength of grit will be such as to allow the concrete in which it is used to build-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 free from clay dirt, ash or other deleterious matter

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

I.S. Designation	Percentage by weight Sieve passing	I.S. Designation	Percentage by weight Sieve passing
20 mm	100	4.75 mm	70
10 mm	86	2.36 mm	52

**M-10. Lime Mortar**

**10.1.** Lime : Lime shall conform to specification M-2, Water : Water shall conform to specification M-1 and Sand: 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 rain till used up, covering it by tarpaulin or open sheds.

**10.5. Use:**

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

**M-11. Cement Mortar**

**11.1.** Water shall conform to specification M-1, Cement : Cement shall conform to specifications M-3 and Sand : 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. Proportion of Mortar :**

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

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

**M-12. Stone Coarse Aggregate For Nominal Mix Concrete**

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

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

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

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	05	0.20	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 she aggregates are covered with dust, they shall be washed with water to make them clean. .

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

**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  $\pm 1/8"$  ( 3.0 mm.) Width  $\pm 1/16"$  ( 1.50 mm. ) Height  $\pm 1/16"$  ( 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 Carborundum.

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

**24.2. Ridges & Hips :**

**24.2.1.** Ridges and hips shall be of same thickness as that of A.C. sheets. The types, of ridges 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. Mangalore Pattern Roof Tiles**

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

**M-26. Shuttering**

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

**26.2.** The form work shall be sufficiently strong and shall have camber so that it assumes correct shape after deposition of the concrete and shall be able to resist forces caused by vibration of live load of men working over it and other incidental loads associated with it. The shuttering shall have smooth and even

surface and its joints shall permit leakage of cement grout

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

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

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

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

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

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

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

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

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

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

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

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

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

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

**28.2.** Copper sheet shall be of 1.25 mm. width and or 1 25 mm. width and the " U " shape in the middle. Copper strip shall have holdfast of 3 m.m diameter copper rod fixed to the plate soldered on strip at intervals of about 30 cm or as shown in the drawing or as directed. The width of each flange ( horizontal side ) of the copper plate to be embedded in the concrete work shall be 25 mm depth of "U" to be provided in the expansion joint, in the copper plate shall be of 25 mm.

**M-29. Teak wood**

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

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

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

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

**29.5. First class teak wood**

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

**29.6. Second Class Teak Wood:**

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

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

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

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

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

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

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

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

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

**30.4.** The shutters shall be tested for-

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

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

**(3) Glue adhesion test :** The flush door shall be tested for glue adhesive test in accordance with I S 2202 ( part -I ) 1980. The shutters shall be considered to have passed the test, if no delamination occurs in the glue lines in the plywood and if no single determination more than 80 mm in length and more than 3 mm in depth has occurred in the assembly glue lines between the plywood face and the style and rail. Delamination at the corner shall be measured continuously around the corner Delamination at the knots, knot hole and other permissible wood defectects shall not be considered in assessing the sample.

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

In Nominal thickness  $\pm 1.2$  mm. In Nominal height  $\pm 3$ 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 HEA-WP of I.S. 733-1975 and also to I.S. Designation WVG-WP of I.S. 1285-1975. The section shall be as specified in the drawing and design. The fabrication shall be done as directed.

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

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

**M-32. Rolling Shutters**

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

**32.2.** Guide channels shall be of mild steel deep channel section and of rolled pressed or built up ( fabricated ) joint less construction. The thickness of sheet used shall not be less than 3 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 rawl 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 of 10 Cms.

(b) Pivoted M.S. flats shall be 20 mm x 6 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 as well as oblong welded steel wire fabric shall be as directed. The steel wire fabric in panels shall be in one whole piece in each panel as far as stock 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  $\pm 10$  percent.

**35.2.** Expanded metal in panels shall be in one whole piece in each panel as far as stock sizes permit. The expanded metal sheets shall be coated with suitable protective coating to prevent corrosion.

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

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

**M-37. Plywood**

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

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

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

**TABLE**

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.		7 mm.		16 mm.	11 ply.	19 mm.
	6 mm.		8 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 weighting not less than 11.25 Kg/Sq. m. shall be used

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

**38.3. Plate Glass:**

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

**38.4. Obscured Glass:**

**38.4.1.** This type of glass transmits light so that vision is partially or almost completely obscured. Glass shall be plain rolled, figured, ribbed 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 plate 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 thickness, it shall be extremely resistant to sunlight, weather and low temperatures.

It shall not show any significant yellowing or change in physical properties or loss of light transmission over a longer period of use. The sheet shall be impact resistant also. Sheets should be 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 I.S. 3087-1905 "Specification for wood particle board for general purpose". The size and the thickness shall be as indicated.

**M-41. Expanded polystyrene or framed 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 I.S. 3144-1965 shall be followed

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

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

**M-43. Fixtures and fastenings**

**43.1. General:**

**43.1.1.** The fixtures and fastenings, that is butt hinges, tee and strap hinges, sliding door bolts, tower bolts, door latch, bath-room latch, handles, door 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 M S Sheet

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

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

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

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

**43.6. Door Latch:**

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

**43.7. Bathroom Latch:**

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

**43.8. Handle:**

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

**43.9. Door Catch:**

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

**43.10. Door Stoppers:**

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

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

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

**43.12. Casement Window Fastener:**

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

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

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

**43.14. Ventilator Catch:**

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

**43.15. Pivot:**

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

case of iron pivot and in single piece plate in the case of brass pivot.

**M-44. Paints:**

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

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

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

- (i) Paint shall not show excessive setting in a freshly opened full can and shall easily be ready spread with a paddle to a smooth homogeneous state. The paint shall show no curdling, levering, caking or colour separation and shall be free from lumps and skins
- (ii) The paint as received shall brush easily, possess good leveling properties and show no running or sagging tendencies
- (iii) The paint shall not skin within 48 hours in a three quarters filled closed container
- (iv) The paint shall dry to a smooth uniform finish free from roughness, grit, unevenness and other imperfections

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

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

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

**M-45. French Polish**

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

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

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

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

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

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

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

**M-47. Flooring Tiles**

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

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

**47.1.2.** The tiles shall be manufactured from a mixture of cement and natural aggregates by pressure process. During manufacture the tiles shall be subjected to pressure of not less than 140 Kg/Sq. Cm. The proportion of cement to aggregate in the backing of the tiles shall be not less than 1 : 3 by weight. The wearing face, through the tiles are of plain cement, shall be provided with stone chips of 1 to 2 mm. size. The proportions of cement to aggregate in the wearing layer of the tiles shall be three parts of cement to one part chips by weight. The minimum thickness of wearing layer shall be 3 mm. The colour and texture of wearing layer shall be uniform throughout its face and thickness. On removal from mould, the tiles shall be kept in moist 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 x 24.85 Cm. or 25 Cm x 25 Cm The thickness of tiles shall be 20 mm.

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

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

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

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

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

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

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

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

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

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

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

**48.2.** The size of the stones to be used for flooring shall be of size 600 mm x 600 mm and/or size 600 mm. x 450 mm as directed However smaller sizes will be allowed to be used to the extent of maintaining required pattern. Thickness shall be as specified

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

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

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

**M-49. Polished Kotah Stoics**

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

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

**M-50. Dholpur Stone Slab**

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

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

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

**M-51. Marble Slab**

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

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

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

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

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

**M-52. Granite Stone slab**

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

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

**52.3.** AH 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  $\pm 0.15$  mm.

(b) Length or Width

(1)	300 mm. Square tiles	$\pm 0.20$ mm.	(3)	900 mm Square tiles	$\pm 0.60$ mm.
(2)	600 mm. Square tiles	$\pm 0.40$ mm.	(4)	Sheets and roll	$\pm 0.10$ percent.

#### **53.4. Adhesive:**

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

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

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

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

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

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

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

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

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

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

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

#### **M-55. White glazed tiles**

**55.1.** The tiles shall be of best quality as approved by the Engineer-in-charge. They shall be flat and true to shape. They shall be free from cracks, crazing spots, chipped edges and corners. The glazing shall be of uniform shade.

**55.2.** The tiles shall be nominal size of 150 mm x 150 mm unless otherwise, specified. The maximum



variation 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 and on front for connecting flush pipes as directed. The inside of the bottom of the pan shall have sufficient slope from the front towards the outlet and surface shall be uniform and smooth. Pan shall be provided with 100 mm. diameter 'P' or 'S' trap with approximately 50 mm. Water seal and 50 mm. diameter vent horn.

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

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

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

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

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

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

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

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

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

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

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

**M-67. Flush cock.**

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

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

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

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

**68.3.** The size 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	Weight of pipe	excluding ears
1.	75 mm.	5.0 mm.	12.38 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-m-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 a 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 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 galvanised steel and it shall generally conform to I.S. 278-1978. The barbed wire shall be of types-I whose nominal diameter for line wire shall be 2.5 mm. and point wire 2.24 mm. The nominal distance between two barbs shall be 75 mm unless otherwise specified in the item. The 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  $\pm 0.08$  mm

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

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

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

Nominal 1000 meter Minimum 934 meter Maximum 1066 Meter.

## SECTION -4

### Excavation

#### 4.0.0. (A)      **Excavation for foundation up to 1.5 M. depth including sorting out and stacking of useful materials and disposing of the excavated stuff up to 50 meter lead in loose or soft soil.**

##### 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 removed as directed. The materials so obtained shall be property of the Government and shall be conveyed and stacked as directed within 50 m lead. The roots of the trees coming in the sides shall be cut and coated with a hot asphalt

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

##### 3.0.      **Setting out**

After clearing the site the 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 if not specified. The bottom of the excavated area shall be leveled both longitudinally and transversely as directed by removing and watering as required. No. earth filling will be allowed for bringing it to level. If by mistake or any excavation is made deeper or wider than, that shown on the plan or directed. The extra depth or width shall be made up with concrete of same proportion as specified for the foundation concrete at the cost of the contractor. The excavation up to 1.5 m depth shall be measured under this item.

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

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

5.2.      The balance of the excavated quantity shall be removed by the contractor from the site of work to a place as directed with lead up to 50 M. and all lift.

##### 6.0.      **Mode of 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

#### 4.0.0. (B):      **Excavation for foundation up to 1.5 M. depth including sorting out and stacking of useful materials and disposing of the excavated stuff up to 50 meter lead in dense or hard soil.**

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

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

##### 2.0.      **Workmanship**

The relevant specifications of item No. 4.0.0.(A) shall be followed except that the excavation work shall be carried out in dense or hard soil,

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

3.1.      The relevant specifications of item No. 4.0.0. (A) shall be followed

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

#### 4.0.0.(C):      **Excavation for foundation up to 1.5 M. depth including sorting out and stacking of useful**

**materials and disposing of the excavated stuff up to 50 meter lead in hard murrum.**

**1.0. Hard murrum.**

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

**2.0. Workmanship**

The relevant specification of item No. 4.0..0.(A) shall be followed except that the excavation work shall be carried in hard murrum.

**3.0. Mode of measurements & Payments**

**3.1.** The relevant specifications of item No. 4 0.0. (A) shall be followed.

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

**4.0.0.(D): Excavation for foundation up to 1.50 M. depth including sorting out and stacking of useful materials and disposing of the excavated stuff up to 50 meter lead-soft rock not requiring blasting.**

**1.0. Workmanship**

**1.1.** The relevant specifications of item No. 4.0.0.(A) shall be followed except that the excavation shall be earned out for foundation upon 1.5 M lift in soft rock not requiring blasting

**1.2.** The excavation in soft or disintegrated rock shall be carried out by crow bars, pickaxes or pneumatic drills or any other suitable means

**1.3.** If contractor desires to resort to blasting, he can do so with permission of the Engineer-in-charge but nothing extra shall be paid to him.

**1.4.** The materials available from soft excavation shall be properly stacked within 50 M. lead and 1 5 m. lift and shall be the property of department.

**1.5.** The classification of strata of the foundation soil shall be done by the Engineer-in-charge and shall be acceptable to the contractor

**1.6.** However this shall include the type of rock and boulder which may quarried or split with crow bars. Laterite and conglomerate also come under this category.

**2.0. Mode of measurements & Payment**

**2.1.** The relevant specifications of item No. 4.0 0 (A) shall be followed.

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

**4.0.0.(E): Excavation for foundation up to 1.5 M. depth including sorting out and stacking of useful material and disposing of the excavated stuff up to 50 meter lead in hard rocks.**

**1.0. Workmanship**

**1.1.** The relevant specification of item No. 4.0.0.(A) shall be followed except that the excavation for foundation work shall be carried out in hard rock.

**1.2.** Excavation shall be done by blasting to the dimensions shown in the drawings or as directed. The blasting shall be carried out only with written permission of the Engineer-in-charge. All the laws, regulations etc,- pertaining to the precautions, acquisition, transport, landing and use of explosive shall be rigidly followed. The Magazine for the storage for the explosive shall be built to the design and specifications of explosive authority and located at the approved site No unauthorised persons shall be admitted into the magazine and when not in use it shall be kept securely locked No matches or inflammable materials shall be allowed in Magazine. The Magazine shall have an-effective lightning conductor. The rules of explosive 1940 revised from time 10 time shall be followed strictly for obtaining starting, handling, undertaking blasting work.

**1.3.** The contractor shall be responsible for damage to property, workmen public due to any accident due to use of explosives and operations

**1.4. Precautions**

**1.4.1.** The blasting operation shall remain in charge of competent and experienced supervisor and workmen who are thoroughly acquainted with the detail of handling explosive and blasting operations. The blasting shall be carried out during fixed hours of the day, preferably during the mid-day lunch hours or at the close of the work as ordered in writing by the Engineer-in-charge. The hours of blasting shall be notified in advance to the people in the vicinity. All the charges shall be prepared by the man in charge only.

**1.4.2.** Red danger flags shall be displayed prominently in all direction during the blasting operations.

**1.4.3.** People except those who actually light the fuse shall be prohibited from entering into this area. The flags shall be stationed at 200 m. from the firing-site in all directions and all persons including workmen shall be excluded from the flagged area at least 1.0 minutes before the firing warning whistle being sounded for this purpose

**1.4.4.** During excavation in rock by blasting, the lowest 15 cm. of stratus shall be blasted with light charge so

as not to shatter or weaken the underlying rock on which the foundation will be actually laid. If excavation in rock is done to large widths and length than those shown on the drawings or as directed, no payment shall be made for such over break. If excavation is done to depths greater than shown on the drawings or directed, excess depth shall be made up with foundation grade concrete as directed at the contractor's cost.

**1.4.5.** The charged hole shall be drilled to the required depth and in suitable places when blasting is done with powder, the fuse cut to the required length shall be inserted in the holes and the powder dropped in. The powder shall be gently tamped with copper rod with rounded ends. The explosive powder shall then be covered with trapping materials which shall be tamped lightly out firmly. When blasting is done with dynamite and other high explosive, dynamite cartridges shall be prepared by inserting the square cut ends of fuse into the detonator, and finished with dippers at the open ends. The detonator should be gently pushed into the detonator and finished with dippers at the opened ends. The detonator should be gently pushed explosive. Bore holes shall be of such size that the cartridges can be easily passed down. The holes shall be cleared of all debris and explosive inserted. The space for about 20 cms, above the charge shall then be gently filled with dry clay pressed home and rest of tamping is with firmed any convenient materials gently packed with a wooden cover.

**1.4.6.** At a time not more than 10 such charge shall be prepared and fired. The man in charge shall blow a whistle in a recognised manner for cautioning the people. All the people shall then be required to move to number of explosions. He shall satisfy himself that all the charges have been exploded before allowing the workmen to go to the work site.

**1.4.7.** The contractor shall be fully responsible to strictly follow the prevailing rules and procedures regarding blasting procedures

### **1.5. Misfire**

**1.5.1.** In case of a misfire the following procedure shall be observed :

**1.5.2.** Sufficient time shall be allowed to account for the delayed blast. The man in charge shall inspect all the charges and determine the missed charge.

**1.5.3.** If it is the blasting powder charge it shall be completely flooded with water. A new hole shall be drilled at, about 45 cm. from the old and fired. This should blast the old charge. Should it not blast the old charge, the procedure shall be repeated till the old charge is blasted.

**1.5.4.** In case of charge of gelatins, dynamite etc, the man in charge shall gently remove the tamping and the primer with detonator and primer shall then be used to blast the charge. Alternatively the hole may be cleared of one foot of tamping and the direction then ascertained by placing a stick in the hole. Another hole may then be drilled 15 cm away and parallel to it. The man in charge shall report to the office all cases of misfire and cause of the same and what steps were taken in connection therewith.

**1.5.6.** If a misfire has been found to be due to defective or dynamite, the whole quantity in the box from which defective article was taken must be sent to authority as directed for inspection to ascertain whether all the remaining materials in the box are also defective or not.

### **1.6. Accidents:**

**1.6.1.** The contractor shall be solely responsible for any accident during the entire procedure of handling explosive and blasting and shall pay necessary compensation to persons affected or damage to lands or property etc, due to the blasting, without extra claims on the department.

### **1.7. Account:**

**1.7.1.** A careful and day to day account of explosives shall be maintained by the contractor in an approved manner and shall be open to inspection of the Engineer-in charge. Surprise visits may also be paid by the Engineer-in-charge to the storage and in case of any unaccountable shortage or unsatisfactory accounting, the contractor shall be liable to be penalised by forfeiture of part or whole of his Security Deposit or by cancellation of tender in which case he shall not be entitled for any compensation .-

### **1.8. Disposal of Excavated Materials:**

**1.8.1** No materials excavated from foundation trenches of whatever kind they may be, are to be placed even temporarily nearer than 1.5 m. or distance prescribed by the Engineer from the outer edge of excavation. All materials excavated shall remain the property of Government. Rate for excavation includes sorting out of useful materials and stacking them separately as directed within the specific lead. Materials suitable and useful for backfilling or other use shall be stacked in convenient places but not in such a way as to obstruct free movement of men, animals and vehicles or encroach upon the area required for constructional purpose. The site shall be left clean of all debris on completion.

**1.8.2.** Disposal of excavated materials is subject to the following :

Unsuitable materials obtained from clearing site and excavation shall be disposed off within a lead of 50 meters as directed. Useful materials obtained from clearing site and excavation shall be stacked within a lead of 50 M beyond the building areas as directed. Materials suitable for back-filling shall be stacked at convenient places within a lead of 50 M. from the structure for reuse. Useful stones from rock excavation shall be stacked neatly within a lead of 50 M. and will be allowed to be used by the contractor on payment at rates laid down in the contract or if not so laid down, at scheduled rates of the Division or at a mutually agreed rates if there are no such rates in the schedule of rates.

**1.8.3.** If surplus materials are required to be conveyed beyond 50 M, conveyance will be paid for under a separate item

**2.0. Mode of measurements & Payment**

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

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

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

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

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

**4.0.0.1.(A): Excavation for foundation for depth from 1.5 M. to 3.0 M. including sorting out and stacking of useful materials and disposing of the excavated stuff up to 50 M. lead-loose or soft soil.**

**1.0. Workmanship**

**1.1.** The relevant specifications of item No. 4.0.0. (A) shall be followed except that the excavation work shall be carried out to loose or soft soil with lift 1.5 M. to 3.0 M.

**2.0. Mode of Measurement & Payment**

**2.1.** The relevant specifications of item No. 4.0.0.(A) shall be followed.

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

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

**4.0.0.1.(B): Excavation for foundation for depth from 1.5 M. to 3.0 M. including sorting out and stacking of useful materials and disposing of excavated stuff up to 50 M. lead in Dense or Hard soil.**

**1.0. Workmanship**

The relevant specifications of item No. 4.0.0.(B) shall be followed except that the excavation work shall be carried out with 1.5 M. to 3.0 M. lift in dense or hard soil.

**2.0 Mode of Measurement & Payment**

**2.1** The relevant specifications of item No.4.0.0.(A) shall be followed.

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

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

**4.0.0.1.(C): Excavation for foundation for depth from 1.5 M. to 3.0 M. including sorting out and stacking of useful materials and disposing of excavated stuff up to 50 M. lead in Hard murrum.**

**1.0. Workmanship**

**1.1.** the relevant specifications of item No. 4.0.0. (A) shall be followed except that the excavation work shall be carried out from 1.5 M. to 3.0 M lift in hard murrum.

**2.0. Mode of Measurement & Payment**

**2.1.** The relevant specifications of item No. 4.0.0. (A) shall be followed.

**2.2.** The excavation work from 1.5 M to 3.0 M shall be measured under

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

**4.0.0.1.(D): Excavation for foundation for depth 1.5 M. to 3.0 M. including sorting out and stacking**



**of useful materials and disposing of excavated stuff up to 50 M. lead in soft rock not required blasting.**

**1.0. Workmanship**

The relevant specifications item No. 4.0.0.(D) shall be followed except that the excavation work shall be earned out from 1.5 M. to 3.0 M. lift in soft rock not required blasting.

**2.0. Mode of Measurement & Payment**

2.1. The relevant specifications of item No 4.0.0.(A) shall be followed.

2.2. The excavation work from 1.5 M, to 3.0 M lift shall be measured under this item.

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

**4.0.0.1.(E): Excavation for foundation for depth 1.5 M. to 3.0 M. including sorting out and stacking of useful materials and disposing of excavated stuff up to 50 M. lead in hard rock**

**1.0. Workmanship**

1.1. The relevant specifications of item No. 4.0.0.(E) shall be followed except that the excavation work shall be carried out from 1.5 M. to 3.0 M. lift in hard rock.

**2.0. Mode of Measurement & Payment**

2.1. The relevant specifications of item No. 4.0.0. (A) shall be followed.

2.2. The excavation-work from 1.5 M, to 3.0 lift shall be measured under this item

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

**4.0.0.2. (A): Excavation for foundation for depth from 3.0 M. to 5.0 M. including sorting out and stacking of useful materials and disposing of the excavated stuff Upton 50 M. lead in loose or soft soil.**

**1.0. Workmanship**

1.1. The relevant specifications of item No. 4.0.0.(A) shall be followed except that the excavation work shall be carried out from 3.0 M. to 5.0. M. lift in loose or soft soil.

**2.0. Mode of Measurement & Payment**

2.1. Relevant specifications of item No. 4.0.0.(A) shall be followed.

2.2. The excavation work from 3.0 M. to 5.0 M. lift shall be measured under this item.

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

**4.0.0.2.(B): Excavation for foundation for depth from 3.0 M. to 5.0 M. including sorting our and stacking of useful materials and disposing of the excavated stuff up to 50 M. lead in Dense or Hard soil.**

**1.0. Workmanship**

1.1. The relevant specifications of item No. 4 0.0.(B) shall be followed except that the excavation work shall be carried out from 3.0.m. to 5.0.m. lift in Dense or Hard soil.

**2.0. Mode of Measurement & Payment**

2.1. The relevant specifications of item No. 4.0.0.(A) shall be followed:

2.2. The excavation work from 3.0. M. to 5,0 M. lift shall be measured under this item.

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

**4.0.0.2.(C): Excavation for foundation for depth from 3.0 M. to 5.0 M. including sorting out and stacking of useful material and disposing of the excavated stuff up to 50 M. lead in Hard murrum.**

**1.0. Workmanship**

1.1. The relevant specifications items No. 4 0.0. (C) shall be followed except that the excavation work shall be carried out from 3.0 m to 5 0 M in Hard murrum.

**2.0. Mode of Measurement & Payment**

2.1. The relevant specifications of item No. 4.0.0.(A) be followed.

2.2. The excavation work from 3.0 M. to 5.0. lift shall be measured under this item.

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

**4.0.0.2.(D) Excavation for foundation for depth from 3.0 M. to 5.0 M. including sorting out and stacking of useful materials and disposing of the excavated stuff up to 50 M. in soft rock not required blasting.**

**1.0. Workmanship**

1.1. The relevant specification-of item NO 4 0.0.(D) shall be followed except that the excavation work shall be carried out from 3.0. M to 5.0. M soft rock not requiring blasting

**2.0. Mode of Measurement & Payment**

- 2.1. The relevant specification of item No. 4.0 O.(A) shall be followed.
- 2.2. The excavation work from 30 M. to 50 M. lift shall be measured under this item.
- 2.3. The rate shall be for a unit of one cubic meter
- 4.0.0.2.(E): Excavation for foundation depth from 3.0 M. to 5.0 M. including sorting out and stacking of useful material land disposing of the excavated stuff up to 50 M. lead in Hard rock.**
  - 1.0. Workmanship**
    - 1.1. The relevant specifications of item No 4.0.0.(E) shall be followed except that the excavation work shall be earned out from 3.0. M. to 5.0 M in hard rock
  - 2.0. Mode of Measurement & Payment**
    - 2.1. The relevant specification of item No. 4.0.0.(A) shall be followed.
    - 2.2. The excavation work from 3.0. M to 5.0 M. lift shall be measured under this item.
    - 2.3. The rate shall be for a unit of one cubic meter.
- 4.0.0.3.(A): Extra for additional depth more than 5.0 M. for excavation for foundation including sorting out and stacking of useful material disposing of the excavated stuff up to 50 M. lead in loose or soft soil.**
  - 1.0. Workmanship**
    - 1.1. The relevant specification of item. No 4 0.0 (A) shall be followed except that the excavation work shall be earned out from more than 50 M. lift in loose or soft soil
  - 2.0. Mode of Measurement & Payment**
    - 2.1. The relevant specifications of item No. 4.0.0.(A) shall be followed
    - 2.2. The rate shall be paid extra over and above the rate of item No. 4 0 0.2.(A) for carrying' out excavation work for additional depth from 5.0 M. and above.
    - 2.3. The rate shall be for a unit of cubic per meter
- 4.0.0.3.(B): Extra for additional depth more than 5.0 M. for excavation for foundation including sorting and stacking of useful materials disposing of excavated stuff up to 50 M. lead in Dense or Hard soil.**
  - 1.0. Workmanship**
    - 1.1. The relevant specifications of item No. 4.0.0.(B) shall be followed except that the excavation work shall be carried out from more than 5.0. M. lift in dense or hard soil.
  - 2.0. Mode of Measurement & Payment**
    - 2.1. The relevant specifications of item No. 4 0.0 (A) shall be followed.
    - 2.2. The rate shall be paid extra over and above the rate of item No 4 0.0 2.(B) for carrying out excavation work for additional depth from 50 M. and above.
    - 2.3. The rate shall be for a unit of one cubic meter.
- 4.0.0.3.(C): Extra for additional depth more than 5.0 M. for excavation for foundation including sorting out and stacking of useful materials disposing of excavated stuff up to 50 M. lead in Hard murrum.**
  - 1.0. Workmanship**
    - 1.1. The relevant specification of item No. 4.0.0 (C) shall be followed except that the excavation work shall be carried out from more than 50 M. lift in hard murrum.
  - 2.0. Mode of Measurements & Payment**
    - 2.1. The relevant specification of item No. 4.0.0.(A) shall be followed.
    - 2.2. The rate shall be paid extra over and above the rate item No 4.0.0 2.{C}for carrying out excavation work for additional depth from 50 M. and above.
    - 2.3. The rate shall be for a unit of one cubic meter.
- 4.0.0.3.(D): Extra for additional depth more than 5.0 M. for excavation for foundation including sorting out and stacking of useful materials disposing of excavated stuff up to 50 M. lead in soft rock not requiring blasting.**
  - 1.0. Workmanship**
    - 1.1. The relevant specifications of Item No. 4.0.0.(D) shall be followed except that the excavation work shall be carried out from more than 5.0 M. lift in soft rock not requiring blasting.
  - 2.0. Mode of Measurement & Payment**
    - 2.1. The relevant specifications of item No. 4.0.0.(A) shall be followed.

2.2. The rate shall be paid extra over and above the rate of item No. 4.0.0.2.(D) for carrying out excavation work for additional depth from 5.0 (M) and above.

2.3. The rates shall be for a unit of one cubic meter per meter

**4.0.0.3.(E): Extra for additional depth more than 5.0 M. for excavation for foundation including sorting out and stacking of useful material disposing of excavated stuff up to 50 M. lead in hard rock.**

**1.0. Workmanship**

1.1. The relevant specification of item No 4.0.0(E) shall be followed except that the excavation work shall be carried out from more than 50 m. lift in hard rock

**2.0. Mode of Measurement & Payment**

2.1. The relevant specifications of item No.4.0 O.(A) shall be followed.

2.2. The rates shall be paid extra over and above the rate of item No. 4.0.0 2.(E) for carrying out excavation work for additional depth from 5.0. M. and above.

2.3. The rate shall be unit of one cubic meter per meter

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

**1.0. Workmanship**

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

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

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

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

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

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

**2.0. Mode of Measurements & Payment**

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

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

**4.24. Filling in plinth with sand under floors including watering, ramming consolidating and dressing etc. complete.**

**1.0. Materials**

1.1. Sand shall conform to M 6

**2.0. Workmanship**

The relevant specifications of item No. 4.12 shall be followed except that sand shall be filled in under floors, including watering, ramming, consolidating and dressing etc , complete.

**3.0. Mode of Measurements & Payment**

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

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

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

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

**1.0. Materials**

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

**2.0. Workmanship**

**2.1.** The relevant specifications of item No. 4.12 shall be followed except that the murrum or selected soil shall be filled in foundations and plinth in 20 cms layer including consolidating, ramming, watering, dressing etc. complete

**3.0. Mode of Measurements & Payment**

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

**3.2.** The rate includes cost of collecting and carting murrum / or selected earth of approved quality with all lead and labour required for filling in trenches and plinth.

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

**4.0.0.5. Filling in foundation and plinth with brick-bats / chhara in layers of 20 cms. thickness including watering, ramming and consolidating etc. complete.****1.0. Materials**

Brick bats shall conform to M.14

**2.0. Workmanship**

The relevant specification of item No. 4.12 shall be followed except that brick bats of-burnt bricks shall be filled in foundation and plinth in 20 cms layer including watering, ramming, consolidating etc.,\*complete.

**3.0. Mode of Measurements & Payment**

**3.1.** The relevant specification item No. 4 12 shall be followed.

**3.2.** The rate includes cost of collecting and carting brick bats/chhara with all lead and labour required filling in trenches and plinth.

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

**4.27. Boring holes 3.5 M. deep in ordinary soil (for cast in situ piles) and getting out the soil disposal of the surplus excavated soil as directed within a lead of 50 M. for following diameter for piles, (i) 200 mm. (ii) 250 mm, (iii) 300 mm.****1.0. Workmanship**

**1.0.** The ground shall be roughly leveled and after making the position of piles, the holes shall be bored with a spiral angle to the 3.5 M. depth and specified diameter using boring guide.

**2.0.** The bore holes shall be truly vertical and uniform bore through out of specified diameter, After boring to the required depth, the bore shall be cleared off the loose soil and disposal of surplus excavated stuff as directed within a lead of 50 M. . 2.0? Mode of Measurement & Payment

**2.1.** The rate for boring holes shall include :

(a) roughly leveling the ground in positions where piles are to be provided (b) Making the position of piles by pegs and boring guide and also for shifting of boring guide. (c) Bailing out water, if any met with during boring, (d) Disposal or surplus excavated soil within a lead of 50 M and'(e) All tools, plants, equipments and labour required for satisfactory completion or. work.

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

**4.28. Extra for under ramming inside the bore holes for under rammed piles of following nominal diameter :(i) 200 mm. (ii) 250, (iii) 300 mm.****1.0. Workmanship**

The relevant specifications of item No. 4.27 shall be followed except that after boring to the required depth, the bore shall be enlarged at the bottom by an under rammer 2 to 2 1/2 times the diameter of the bore as directed It shall be ensured that the bore for the pile shall be enlarged to the correct diameter.

**2.0. Mode of Measurement & Payment**

**2.1.** The relevant specification of item No. 4.27 for under reaming the piles.

**2.2.** The rate shall be paid extra over and above the rate of item No. 4.27 for under ramming the piles.

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

**SECTION 5****Plain & RCC Work**

- 5.1.6. Providing and laying in foundation and plinth/under floors lime concrete with hard broken aggregate 40 mm. nominal size and 40% mortar comprising of 1 Lime putty : 2 fine sand and curing complete excluding cost of form work.**

**1.0. Materials**

Water shall conform to M-1. Sand shall conform to M-6 Lime shall conform to M-2. Graded aggregate 40 mm. nominal size shall conform to M-12

**2.1. General**

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

**2.2. Proportion of Mix**

**2.2.1.** The proportion of lime, sand and aggregate shall be specified in the item of the work and shall be measured by volume.

**2.2.2.** The lime mortar shall consist of proportion of 1 lime putty : 2 sand by volume. The lime mortar shall be prepared by wet process. Power driven mill shall be used for preparation of lime mortar. The slaked lime shall be placed in the mill in even layer and ground for 180 revolutions with sufficient water. The water shall be added as required during grinding and care shall be taken not to add more water so that it will bring the mixed materials to a consistency of stiff paste, thoroughly wetted sand shall then be added evenly and the mixture ground for another 180 revolutions.

**2.2.3.** Lime mortar shall be kept, protected from sun and rain till used-up, covering it by tarpaulin or open sheds.

**2.2.4.** All the lime mortar shall be used as soon as possible after grinding. It should be used on the day on which it is prepared but in no case mortar- made earlier than 36 hours shall be permitted for use.

**2.3. Mixing:**

**2.3.1.** The concrete shall be mixed in mechanical mixer. Mixing shall be continued until there is uniform distribution of the materials and the mass is uniform in colour and consistency but in no case mixing shall be done for less than 2 to 3 minutes.

**2.4. Laying & Compacting:**

**2.4.1.** The concrete shall always be used while quite fresh It shall be laid (not thrown) in layers not exceeding 150 mm. in thickness and shall be well and quickly rammed with wooden or iron rammers, till the required compaction is achieved. The concrete laid shall not be of too fluid consistency. After it has been mixed no more water shall be added, but the surface during and after compaction shall be kept damp. In laying consecutive layers, the layer cast shall be well watered and made rough before the upper layer is laid. The concrete shall be kept continuously wet for period of 7 days from the date of placing of until it- is built over whichever is more.

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

**2.5.1.** The concrete work shall be measured in length, breadth and depth as specified on drawing or as directed, correct up to nearest centimeter and cubical content shall be worked out nearest up to two places of decimals.

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

- 5.1.8. Providing and laying in foundation and plinth/under floors lime concrete with graded bricks aggregate 40 mm. nominal size and 40% mortar comprising of 1 lime putty : 2 fine sand and curing complete, excluding cost of form work.**

**1.0. Materials**

**1.1.** Water shall conform to M-1. Lime mortar shall conform to M-10. Brick bats aggregate 40 mm. nominal sizes shall conform to M-14.

**2.0. Workmanship**

**2.1.** The relevant specification of item No. 5.1.6. shall be followed except that brick aggregate shall be used instead of graded stone aggregate.

**3.0. Mode of Measurements & Payment**

**3.1.** The concrete work shall be measured in length, breadth and depth as specified in drawing or as directed. Correct up to nearest centimeter and cubical content shall be worked out up to two places of decimals.

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

**5.3.2.(A) Providing and laying cement concrete 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm. nominal size) and curing complete excluding the cost of form work in foundations and plinth.**

**1.0. Materials**

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

**2.0. Workmanship**

**2.1. General**

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

**2.2. Proportion of Mix:**

2.2.1. The proportion of cement, 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.

**2.3. Mixing:**

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

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

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

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

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

**2.6. Curing:**

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

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

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

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

**5.3.3.(A) Providing and laying cement concrete 1:4:8 (1 cement: 4 coarse sand : 8 graded stone aggregate 40 mm. nominal size) and curing complete, excluding cost of form work in foundations and plinth.**

**1.0. Materials**

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

**2.0. Workmanship**

2.1. Relevant Specifications of item No. 5.3.2 shall be followed except that cement concrete shall be mixed in the preparation of 1:4:8 instead of 1:3:6 by volume.

**3.0. Mode of measurement and payment**

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

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

**5.3.14.(A) Providing and laying cement concrete 1:3:6 (1 cement : 3 coarse sand : 6 crushed stone aggregate 20 mm. nominal size) and curing complete including cost of form work in wall caps/coping.**

**1.0. Material & Workmanship**

1.1. The relevant specification of item No. 5.3.2. (A) shall be followed except that the work shall be carried out for coping and wall caps, except the stone aggregate 20 mm. nominal size shall be used. The concrete work of wall caps/coping.

**2.0. Mode of measurements and payment**

2.1. The relevant specification of item No. 5.3.2. (A) shall be followed except that the rate includes cost of necessary form work.

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

5.3.3. **Providing and laying brick bats cement 1:4:8 (1 cement : 4 coarse sand : 8 graded bricks bats), and curing complete excluding the cost of form work in foundation and plinth.**

**1.0. Materials**

1.1. Water shall be conform to M-1 Cement shall conform to M-3. Sand shall conform to M-6 Brick bat shall conform to M-14

**2.0. Workmanship**

2.1. The specification of this item shall be followed as per item No 5.3.14 (A) except that the proportion of brick bat cement concrete shall be 1 4:8 i e 1 part of cements 4 part of coarse sand and 8 parts of graded brick bat by volume, using graded brick bat as coarse aggregate instead of stone aggregates

**3.0. Mode of Measurements & Payment**

3.1. The concrete work shall be measured in length, breadth and depth as specified on drawing limiting dimensions to those specified on drawings or as directed.

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

5.3.4.(A) **Providing and laying cement concrete 1:5:10 (1 cement : 5 coarse sand : 10 graded stone aggregate 40 mm. nominal size) and curing complete, excluding the cost of form work, for foundation and plinth.**

**1.0. Materials**

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

**2.0. Workmanship**

2.1. The relevant specification of item No. 5.3.2. (A) shall be followed for the work except that the work is to be carried out in cement concrete 1:5:10

**3.0. Mode of Measurement & Payment**

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

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

5.3.8.(A) **Providing and laying cement concrete 1:5:10 (1 cement : 5 coarse sand : 10 graded brick bats 10 mm. nominal size) and curing complete excluding, cost of form work in foundation and plinth.**

**1.0. Materials**

1.1. Water shall conform to M-1 Sand shall conform to M-6 Cement shall conform to M-3. Brick bats shall conform to M-14.

**2.0. Workmanship**

2.1. The relevant specification of item No 5.3.4 shall followed except that brick bats aggregate shall be used instead of stone aggregate.

**3.0. Mode of Measurement & Payment**

3.1. The relevant specification of item No 5.3.4 shall be followed

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

5.3.2.(B) **Providing and laying brick bat cement concrete 1:3:6 (1 cement : 3 coarse sand : 6 graded-brick bats) and curing complete excluding cost of form work in foundation and plinth.**

1.0. The specification of item No 5 3.2 (A) shall be followed except that the brick bats shall be used as coarse aggregate instead of stone aggregates.

**2.0. Mode of Measurement & Payment**

2.1. The relevant specification of item No 5.3.5 (A) shall be followed for mode of measurements and payment except that it excludes the cost of form work.

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

5.4.18. **Providing throating or plaster drip and molding to R.C.C. Chhajjas.**

**1.0. Materials**

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

**2.0. Workmanship**

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

**5.7.5. Extra for providing and mixing Water Proofing material in cement concrete in mix proportions recommended by the manufacturers.**

**2.0. Workmanship**

**2.1.** The proportions of materials for the cement concrete shall be mentioned with the specifications of that item. The quantity of water proofing materials to be added and the method of addition shall be as specified by manufacturers.

**2.2. Mixing:**

**2.2.1.** The mixing of the water proofing materials in cement, water or concrete shall be done according to the specifications of the manufacture.

**3.0. Mode of Measurements and Payment**

**3.1.** The payment is extra over and above the rate of concrete for mixing water proofing proper.

**3.2.** The rate shall be for a unit of one lithe or kg. per quintal of cement in which water proofing material is added.

**5.7.1. Providing and laying damp proof course 25 mm. thick cement concrete 1:2:4 (1 cement : coarse sand :4 stone aggregate 10 mm. nominal size) and curing complete.**

**1.0.** The specifications of item No. 5.3.13. (A) of ordinary concrete with or without reinforcement shall be followed except that the size of the stone aggregate shall be 10 mm nominal size and the concrete work shall be carried out in 25 mm. thick damp proof course

**2.0. Mode of measurements & payment**

**2.1.** The rate includes cost of all materials and labour required to complete the item

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

**5.3.13. Providing and laying cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm. nominal size) and curing complete excluding cost of form work in (A) foundation and plinth, (B) Independent piers, columns and pillars up to floor two level.**

**1.0. Materials**

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

**2.0. General**

**2.1.** The concrete mix is not required to be designed by preliminary testes. 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 designation ordinary M-100, M-150m M-200, M-250 specified as per I.S. correspond approximately to 1:3:6, 1:2:4, 1:1:1/2:3 and 1:1:2 nominal mix of ordinary concrete by volume respectively

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

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

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

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

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



**2.7.** For reinforced concrete work; coarse aggregates having a nominal size of 20 mm. are generally considered satisfactory.

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

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

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

### **3.0. Workmanship**

**3.1.** Proportioning : Proportioning shall be done by volume, except which shall be measured in terms of bags of 50 kg. weight, the volume of one such bag being taken as 0.0342 cu. meter Boxes of suitable size shall be used for measuring sand aggregate. The size of boxes (internal) shall be 35 x 25 cms. and 40 cms deep while measuring the aggregate and sand the boxes shall be filled without shaking ramming or hammering. The proportioning of sand shall be on the basis of its dry volume and in case of damp saner, allowances for bulk age shall be made.

### **3.2. Mixing :**

**3.2.1.** For all work, concrete shall be mixed in a mechanical mixed which along with other accessories shall be. kept in first class working condition and so maintained throughout the construction Measured quantity of aggregate, sand and cement required for each batch shall be poured into the claim of the mechanical mixer while it is continuously running. After half a minute of dry mixing measured quantity of water required for each batch of concrete mix shall be added gradually and mixing continued for another one and a half minute Mixing shall be continued till materials are uniformly distributed and uniform colour of the entire mass is obtained and each individual particle of the coarse aggregate shows complete coating of mortar containing its proportionate amount of cement. In no case shall the mixing be done for less than 2 minutes after oil ingredients have been put into the mixer.

**3.2.2.** When hand mixing is permitted by the Engineer-in-charge for small jobs or for certain other reasons, it shall be done on the smooth watertight platform large enough to allow efficient turning over the ingredients of concrete before and after adding water Mixing platform shall be so arranged that no foreign material gets mixed with concrete nor does the mixing water flow out. Cement in required number of bags shall be spread in a layer of uniform thickness on the mixing platform. Dry coarse and fine aggregate and cement shall then be mixed thoroughly by turning over to get a mixture to uniform colour. Specified quantity water shall then be added gradually through a rose can and the mass turned over till a mix of required consistency is obtained. In hand mixing quantity of cement shall be increased by 10 percent above that specified

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

### **3.3. Consistency:**

**3.3.1.** The degree of consistency which shall depend upon the nature of the work and methods of vibration of concrete, shall be determined by regular slump tests in accordance with I.S. 1199-193. The slump of 10 mm. to 25 mm shall be adopted when vibrators are used and 80 mm. when vibrators are not used.

### **3.4. Inspection:**

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

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

### **3.5. Transporting and laying:**

**3.5.1.** The method of transporting and placing concrete shall be as approved. Concrete shall be so transported and placed that no contamination, segregation or loss of its constituent material takes place. All form work shall be cleaned and made free from standing water 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.

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

**3.5.3.** Unless otherwise agreed to by the Engineer-in-charge concrete shall be dropped in to place from a height exceeding 2 meters. When trucking or chutes are used they shall be kept close and used in such a way as to avoid segregation. When concreting has to be resumed on a surface which has hardened, it shall be roughened, swept clean, thoroughly wetted and covered with a 13 mm. thick layer of mortar composed of cement and sand in the same ratio as in the concrete mix itself. This 13 mm. layer of mortar shall be freshly mixed and placed immediately before placing of new concrete. Where concrete has not fully hardened, all lateness shall be removed by scrubbing the wet surface with wire or bristle brushes, care being taken to avoid dislodgement of any particles of coarse aggregate. The surface shall then be thoroughly wetted, all free water removed and then coated with neat cement grout. The first layer of concrete to be placed on this surface shall not exceed 150 mm. in thickness and shall be well rammed against old work, particular attention being given to corners and close spots.

**3.5.4.** All concrete shall be compacted to produce a dense homogeneous mass with the assistance of vibrators, unless otherwise permitted by the Engineer-in-charge for exceptional cases, such as concreting under water, where vibrators cannot be used. Sufficient vibrators in serviceable condition shall be kept at site so that spare equipment is always available in the even of breakdowns. Concrete shall be judged to be compacted when the mortar fills the spaces between the coarse aggregate and begins to cream up to form an even surface. Compaction shall be completed before the initial setting starts i.e. within 30 minutes of addition of water to dry mixture. During compaction, it shall be observed that needle vibrators are not applied on reinforcement which is likely to destroy the bond between concrete and reinforcement.

### **3.6. Curing:**

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

### **3.7. Sampling and testing of concrete:**

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

Quantity of concrete in the work.	No of samples	Quantity of concrete in the works	No of samples
1-5 cmt.	1	16-30 cmt.	3
6.15 cmt.	2	31-50 cmt.	4
51 and above	4± one additional for each additional 50 mm. or part thereof.		

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

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

### **3.8. Stripping:**

**3.8.1.** The Engineer-in-charge shall be informed in advance by the contractor of his intention to strike the form work. While fixing the time of removal of form work, 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. In normal circumstances (generally where temperatures are above 20°C) and where ordinary concrete is used, forms may be struck after expire or periods specified in item No.9.1 (A) for respective item of form work.

**3.8.2.** All form work shall be removed without causing any shock or vibration as would damage the concrete. Before the soft and struts are removed, the concrete surface shall be gradually exposed, where necessary in order to ascertain that concrete has sufficiently hardened. Centering shall be gradually and uniformly lowered in such a manner as to permit the concrete to take stresses due to its own weight uniformly and gradually. Where internal metal tiles are permitted, they or their removable parts shall be extracted without causing any damage to the concrete and remaining holes filled with mortar. No permanently embedded metal part shall have less than 25 mm. cover to the finished concrete surface. Where it is intended to re-use the form work, it shall be cleaned and made good to the satisfaction of the Engineer-in-charge. After removal of form work and shutting, the Executive Engineer shall inspect the work and satisfy by random checks that concrete produced is of good quality.

**3.8.3.** Immediately after the removal of forms, all exposed bolts etc. 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 be filled by cement mortar, all fins, caused by form joints, all cavities produced by the removal of form tiles and all other holes and depressions, honeycomb spots, broken 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 proportions used in the grade of concrete that is being furnished and of as dry consistency as is possible to use. Considerable pressure shall be applied in filling and pointing to ensure thorough filling in all voids. Surface which are pointed shall be kept moist for a period of 24 hours. If rock pockets/honeycombs in the opinion of the Engineer-in-charge are of such an extent or character as to effect the strength of the structure materially or to endanger the life of the steel reinforcement, he may declare the concrete defective and require the removal and replacement of the portions of structure affected.

#### **4.0. Mode of Measurement & Payment**

**4.1.** 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.

**4.2.** 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 excludes the cost of form work.

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

**5.4.1. Providing and laying cement concrete 1:2:4 (1 cement : 2 coarse sand :4 graded stone aggregate 20 mm. nominal size) and curing complete excluding cost of form work and reinforcement for reinforced work in : (A) Foundations, footing base of columns and mass concrete. (C) Slabs, landings, shelves, balconies, lintels, beams, girders and cantilever up to floor two level. (D) Columns, pillars, pots, and struts up to floor up to floor two level (E) Staircase up to floor two level (K) Vertical and horizontal fins up to floor two level.**

#### **1.0. Materials & Workmanship**

**1.1.** The relevant specifications of item No. 5.3.13 shall be followed except that the work shall be carried out for reinforced concrete work for work as specified in item 1.2. In addition, the following stipulations shall be followed for:

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

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

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

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

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

**2.1.** The relevant specifications of item No. 5.3.13 shall be followed.

- 2.2. The volume Occupied by reinforcement shall not be deducted from R.C.C. work.
- 2.3. The rate shall be for a unit of one cubic meter.
- 5.4.4. **Providing and laying cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm. nominal size) for reinforced concrete chhajjas not exceeding 10cms. thickness up to floor two level including finishing the exposed surface with cement mortar 1:3 (1 cement : 3 fine sand) to give a smooth and even surface, centering and form work and curing complete excluding cost of reinforcement.**
- 1.0. **Materials & Workmanship**
- 1.1. The cement mortar shall conform to m-11.
- 1.2. The relevant specification of item No. 5.3.13 and 5.4.1 shall be followed except that the work shall be carried out for reinforced concrete chhajjas not exceeding 10 cms. in thickness.
- 1.3. The specifications for form work and centering shall be as per item No. 9.1.
- 1.4. The finishing work in cement mortar 1:3 (1 cement : 3 fine sand) shall be carried out as per specifications of item No. 17.49 (I), Before the plastering is done, the surface of the concrete shall be raked for proper bond.
- 2.0. **Mode of measurements & payment**
- 2.1. The relevant specification of item No. 5.3.13 and 5.4.1 shall be followed except that the work of chhajjas up to 10 cms. shall be earned out including centering form work and finishing the surface with cement mortar 1:3 ( 1 cement : 3 fine sand).
- 2.2. The rate shall be for a unit of one cubic meter,
- 5.4.10. **Providing an Mild Steel reinforcement for R.C.C. work including bending binding and placing in position etc. complete up to floor two level.**
- 1.0. **Materials**
- 1.1. Mild Steel bars shall conform to M-18. Mild steel binding wires shall conform to M-21.
- 2.0. **Workmanship**
- 2.1. The work shall consist of furnishing and-placing reinforcement to the shape and dimensions shown as on the drawings or as directed
- 2.2. Steel shall be clean and free from rust and loose mill scale at the time of fixing in position and subsequent concreting.
- 2.3. Reinforcing steel shall conform accurate to the dimensions given in the bar bending schedules shown on relevant drawings. Bars shall be bent cold to specified shape and dimensions or as directed, using a proper bar bender, operated by hand or power to attain proper radius of bends. Bars shall not be bent or straightened in a manner that will injure the material. Bars bent during transport-or handling shall be straightened before being used on the work. They shall not be heated to facilitate bending Unless otherwise specified a "U" type hook at the end of each bar shall invariably be provided to main reinforcement. The radius of the bend shall not be less than twice the diameter of the round bar and the length of the straight part of the bar beyond the end of the curve shall be at least four times 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 splitting of the concrete.
- 2.4. All the reinforcement bars shall lie 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 stay blocks or metal chair spacers, metal hangers supporting wires or other approved devices at sufficiently close intervals, Bars shall not be allowed to sag between supports nor displaced during concreting or any other operations of the work. All devices used for positioning shall be of non-corrodible material. Wooden and metal supports shall not extend to the surface of concrete, except where shown on drawings. Placing bars on layers of freshly laid concrete as the work progresses for adjusting bar spacing shall not be allowed Pieces of broken stone or brick and wooden blocks shall not be used Layers of bars shall be separated by spacer bars, precast mortar blocks or other approved devices Reinforcement after being placed in position shall be maintained in a clean condition until completely embedded in concrete. Special care shall be exercised to prevent any displacement of reinforcement in concrete already placed. To prevent reinforcement from corrosion, concrete cover shall be provided as indicated on drawings. All the bars protruding from concrete and to which other bars are to be lapped and which are likely to be exposed for a period exceeding 10 days shall be protected by a thick coat of neat cement grout.
- 2.5. 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 each other at the time of fixing and concreting.
- 2.6. As far possible, bars of full length shall be used. In case this is not possible. Over lapping of bars shall be done as directed When practicable, overlapping bars shall not touch each other, but be kept apart by 25 mm. Where not feasible, overlapping bars shall be bound with annealed wires not less than 1 mm. thick

twisted tight. The overlaps shall be staggered for different bars and located at points, along the span where neither shear nor bending moment is maximum.

**2.7.** Whenever indicated on the drawings or desired by the Engineer-in-charge, bars shall be jointed by couplings which shall have a cross-section sufficient to transmit the full stresses of bars. The ends of the bars that are joined by coupling shall be upset for sufficient length so that the effective cross section at the base of threads is not less than the normal cross-section of the bar. Threads shall be standard threads. Steel for coupling shall conform to I.S. 226.

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

**3.0. Mode of Measurements & Payment**

**3.1.** For the purpose of calculating consumption, wastage shall not be permitted beyond 5 percent. Excess consumption over 5% will be charged at penal rate.

**3.2.** Reinforcement shall be measured in length including overlaps, separately for different diameters as actually used in the work. Where welding or coupling is resorted to in place 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 M-18 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.

**3.3.** The rate for reinforcement includes cost of steel binding wires, its carting from Department store to work site, cutting, bending, placing, 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.

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

**5.4.11. High yield deform bars steel reinforcement for R.C.C. work including bending, binding and placing in position complete up to floor two level.**

**1.0. Materials**

**1.1.** Cold twisted steel bars (high yield strength deformed bars) shall conform to M.19 Mild steel binding wires shall conform to M-21.

**2.0. Workmanship**

**2.1.** The specifications of item No. 5.4.10 shall be followed except that the cold twisted steel bars shall be used with or without hooks at the ends. Deformed bars without hooks shall, however, comply with relevant anchorage requirements.

**3.0. Mode of Measurement & Payment**

**3.1.** The relevant specifications of item No. 5.4.10 shall be followed.

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

**5.4.13. Extra for additional lift of concrete for all R.C.C. work above floor two level excluding cost of reinforcement.**

**1.0. Materials & Workmanship**

The relevant specifications for item No. 5.4.1 shall be followed for the work except that the R.C.C. work shall be done for ground floor i.e. above plinth level to first floor level.

**2.0. Mode of Measurement & Payment**

**2.1.** The relevant specifications of item No. 5.4.1 shall be followed except that rate shall be for extra lift above plinth to floor two level over and above the rate of concrete at floor two level.

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

**5.4.13.(A) Extra for additional lift of reinforcement steel for all R.C.C. work above floor two level.**

**1.0. Materials & Workmanship**

**1.1.** The relevant specifications of item No. 5.4.10 as may be applicable, shall be followed except that the work shall be carried out above floor two level for each floor.

**2.0. Mode of measurement & payment**

**2.1.** The relevant specifications of item No. 5.4.10 or 5.4.11 as may be applicable shall be followed except

that the work shall be carried out above floor tow level.

2.2. The rate shall be for a unit of one kg. per floor.

5.6.2. **Providing up to floor two level precast cement concrete or grill 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 6 mm: nominal size) reinforced with 1.6 mm. dia mild steel size wire including roughening, cleaning fixing and finishing in cement mortar 1:3 and curing complete.**

**(A) 50 mm. thick (B) 40. mm. thick (C) 25. mm. thick (E) 100 mm. thick.**

#### 1.0. Materials

1.1. Water shall conform to M-1. Cement shall conform to M-3. Sand shall conform to M-6. Mortar shall conform to M-11. Aggregates shall conform to M-12. Mild steel wire shall conform to M-21. Shattering shall conform to M-26.

#### 2.0. Workmanship

It shall be cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 6 mm. nominal size), reinforced with 1.6. mm. dia mild steel wire unless otherwise specified. The thickness of the jali shall be as specified in the item. The jali shall be set in position true to line and level before the jambs sills and soffits to the opening are plastered. It shall then be properly cemented with cement mortar 1:3 (1 cement : 3 sand) and rechecked for levels. Finally the jambs, sills and soffits shall be plastered gripping the jali uniformly on all sides.

#### 3.0. Mode of measurement of payment

3.1. The item shall be measured in square meter.

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

5.8.1. **Providing and laying controlled concrete M-150 and curing complete excluding the cost of form work and reinforcement for reinforced concrete work in:**

**(A) Foundation, footings, base of columns, and mass concrete, (B) Walls from top of foundation/level up to floor two level. (C) Slabs, pillars, posts and struts, up to floor two level (E) Staircase up to floor two level. (F) Vertical and horizontal fins up to floor two level.**

#### 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 Course aggregate shall conform M-12.

#### 2.0. General

2.1. The relevant specification of item No. 5.4.1. of ordinary concrete shall be followed except that the concrete mix shall be designed form preliminary tests. 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./Cmt.

2.2. 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 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-1 50	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 ft can be shown to the satisfaction of the Engineer-in-charge, that supply of properly graded aggregate of uniform quality can be maintained till the completion of work, grading of aggregate shall be controlled by obtaining the coarse aggregates in different sizes and bending them in the right proportions as required. Aggregates of different sizes shall be

stocked in separate stock piles. The required quantity of material shall be stock piled several hours, preferably a day before use. The grading of coarse and fine aggregate shall be checked as frequently as possible, the frequency for a given job being determined by Engineer-in-charge to ensure that the suppliers are maintaining the uniform grading as approved for samples used in the preliminary tests..

**3.2.** In proportioning concrete, the quantity of both cement and aggregate shall be determined by weight. Where the weight of cement is determined by accepting the maker's weight per bag, a reasonable number of bags shall be weighted separately to check the net weight. Where cement is weighted from bulk stocks at site and not by bags, it shall be weighed separately from the aggregate. Water, shall either be measured by volume in calibrated tanks or weighed. All measuring equipment shall be maintained in clean, and serviceable condition. Their accuracy shall be periodically checked.

**3.3.** It is most important to keep the specified water cement ratio constant and at its correct value. To this end, moisture content in both fine and coarse aggregates shall be determined by the Engineer-in-charge according to the weather conditions. The amount of mixing water shall then be adjusted to compensate for variations in the moisture content. For the determination of moisture content in the aggregates. I.S. 2386 (Part-III) shall be referred to. Suitable adjustments shall also be made in the weights of aggregates due to variation in their moisture content. Minimum quantity of cement to be used in controlled concrete shall not be less than 220 kg./M-3 in plain concrete and not less than 250 kg/M-3 in reinforced concrete.

**4.0. Mode of measurement & payment**

**4.1.** The relevant specifications of item No.5.4.1 shall be followed, except that the controlled concrete R.C.C. work as specified in item shall be measured under this item. The rate excludes cost of form work.

**5.8.2. Providing and laying controlled cement concrete M-200 and curing complete, excluding the cost of form work and reinforcement for reinforced concrete work in :**

**(A) Foundations, footings base of columns, and mass concrete. (B) walls from top of foundation up to floor two level (C) Slabs, landings, shelves, balconies lintels, beams, girders and cantilever up to floor two level, (D) Columns, pillars, posts and struts upto floor two level (E) Stair cases up to floor two level (K) Vertical and horizontal fins upto floor two level.**

**1.0. Materials & Workmanship**

The relevant specifications of item No. 5.8.1 shall be followed except that the grading of concrete shall be controlled concrete M-200 grades for works 35 specified in item.

**2.0. Mode of measurement and payment**

**2.1.** The relevant specifications of item No, 5.8.1. shall be followed.

**2.2.** The rate shall be for one cubic meter.

**5.8.3. Providing and laying controlled cement concrete M-250 and curing complete excluding the cost of reinforcement of reinforced concrete work in:**

**(A) Foundations, footings, bases of columns, and the like and mass concrete (B) Walls from, top of foundation level up to floor two level (C) Slabs, landing, shelves, balconies, beams, girders and cantilever up to floor two level (D) Columns, pillars, struts up to floor two level.**

**1.0. Materials & Workmanship**

**1.1.** The relevant specifications of item No. 5.8.1. shall be followed except the grading of concrete shall be controlled concrete M-250 grades for the works as specified in the item.

**2.0. Mode of measurements & payment**

**2.1.** The relevant specifications of item No. 5.8.1. shall be followed.

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

**5.00.1. Providing and laying ordinary concrete 1:2:4 (1 cement : 2 coarse sand :4 graded stone aggregates 20 mm. nominal size) and finishing smooth with curing etc., complete including the cost of form work but excluding the cost of reinforcement for R.C.C. work in: (I) Slabs up to 8 cms. thickness (II) Slabs having more than 8 cms. and up to (III) Slabs having more than 10 cms. and up to 13 cms. thickness (IV) Slabs having more than 13 cms. and up to 15 cms. thickness.**

**1.0. Materials & Workmanship**

1.1. The relevant specifications for item No. 5.4.1. shall be followed for concrete work and relevant specifications of item No. 9.1. shall be followed for form work and centering. The concrete surface shall be smooth finished with cement mortar 1:3 (1 cement: 3 fine sand) as per item No. 17.59 (I) The thickness shall be as specified in the item.

**2.0. Mode of measurement & payment**

2.1. The relevant specification for item No. 5.4.1 shall be followed except that item shall include the item providing from work and centering work as directed.

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

**5.00.2. Providing and laying controlled cement M-150 and finishing smooth with curing etc. complete including the cost of form work but excluding the cost of reinforcement for R.C.C. work in :**  
**(I) slabs up to 8 cms. thickness (II) Slabs more than 8 cms. 10 cms. (III) Slabs more the 10 cms. and up to 13 cms. (IV) Slabs more than 13 cms. and up to 15 cms.**

**1.0. Materials & Workmanship**

1.1. The relevant specifications of item No. 5.8.1. shall be followed for concrete work and item No. 9.1. shall be followed for form work and centering. The concrete surface shall be smooth finished with cement mortar 1:3 (1 cement : 3 fine sand) as per No. 17.59 (I) The thickness shall be as specified in the item.

**2.0. Mode of Measurement & Payment**

2.1. The relevant of item No. 5.8.1. shall be followed except that the item shall include the cost and from work and centering.

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

**5.00.3. Providing and laying ordinary cement concrete 1:2:4 (1 cement: 2 coarse sand : 4 graded stone aggregates 20 mm. nominal size) exposed work with curing etc. complete. including the cost of work but excluding the cost of reinforcement for R.C.C. work in : (I) Slabs up to 8 cms. thickness (II) Slabs having more than 8 cms.-and up to 10 cms. thickness (HI) Slabs having more than 10 cms. and up to 13 cms. thickness. (IV) Slabs having more than 13 cms. and up to 15 cms. thickness.**

**1.0. Materials & Workmanship**

1.1. There relevant specifications of item No. 5.4.1. shall be followed for concrete work and that of form work and centering work shall be followed as per item No. 9.1. and 9.7. the thickness of the slab shall be as specified in the item.

**2.0. Mode of Measurement & Payment**

2.1. The relevant specifications of item No. 5.4.1. shall be followed except that form work and centering work shall be included in the item.

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

**5.00.4. Providing any laying controlled cement concrete M-150 exposed work with curing ere., complete including the cost of form work but excluding the cost of reinforcement for R.C.C. work in : (I) Slabs up to 8 cms. thickness (II) Slabs having more than 8 cms. and up to 10 cms. thickness (III) Slabs having more than 10 cms. and up to 13 cms. thickness. (IV) Slabs having more than 13cms. and up to 15 cms. thickness.**

**1.0. Materials & Workmanship**

1.1. The relevant specification of item No 5.4.1. shall be followed for controlled concrete and the relevant specifications of item No. 9.7. and 9.1. shall be followed for exposed concrete form work and centering work. The thickness of the stab shall he as specified in the item.

**2.0. Mode of Measurement & Payment**

2.1. The relevant specifications of item No. 5.8.1. shall be followed except that the form work and centering work shall be included in the item.

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

**5.00.5. Providing and laying ordinary cement concrete 1:2:4 ( 1 cement : 2 coarse sand : 4 grades stone aggregate 20 mm. nominal size) for R.C.C. lintel including finishing smooth with curing etc. complete including the cost of form work but excluding the cost of reinforcement.**

**1.0. Materials & Workmanship**

1.1. The relevant specifications of item No. 581. shall be followed for concrete work, relevant specifications of item No. 17.59.(I) for finishing work and relevant specifications of item No. 9.1. shall be followed form work and centering work The concrete work shall be followed for the form work and centering work for exposed concrete work.

**2.0. Mode of measurement & payment**

2.1. The relevant specification of item No. 5.3.1. shah be followed except that the item includes the cost form work for exposed concrete work



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

5.00.6. **Providing and laying cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm. nominal size) and finishing smooth with curing etc., complete, including the cost of form work but excluding reinforcement for R.C.C. work in :** (A) Beams : (I) Having cross sectional areas 0.05 to 0.08 Sq. meter. (II) Having cross sectional area more than 0.08 Sq. up to 0.12 Sq. mt (III) Having cross sectional area more than 0.12 Sq. Mt. and up to 0.18 Sq. Mt (B) Column; (I) Having cross sectional area 0.05. to 0.08 Sq. mt. (III) Having cross sectional area more than 0.12 Sq.Mt. and up to 0.18 Sq.mt.

**1.0. Materials & Workmanship**

1.1. The relevant specifications of item No. 5.4.1. shall be followed for concrete work and item No. 9.1. shall be followed for form work and centering work. The finishing shall be done in cement mortar 1:3 (1 cement: 3 fine sand) as per item No. 17.59(1). The cross sectional area of beam shall be specified in item.

**2.0. Mode of measurement & payment**

2.1. The relevant specification of item No. 5.4.1. shall be followed but the from work and centering work shall be included in the item.

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

5.00.7. **Providing and laying controlled cement concrete M-150 exposed work with curing etc. complete, including the cost of form work but excluding the cost of reinforcement for R.C.C. work in :** (A) Beams : (I) Having cross sectional area 0.05 to 0.08 Sq. mt. (II) Having cross sectional area more than 0.08 Sq. mt. up to 0.12 Sq.mt (III) Having cross sectional area more than 0.12 Sq. mt. and up to 0.18 Sq.mt.: (B) Columns; (I) Having cross sectional area of 0.05 to 0.08 Sq.mt (II) Having cross sectional area more than 0.08 sq.mt. and up to 0.12 sq.mt. (III) Having cross sectional area more than 0.12 Sq.Mt and up to 0.18 Sq.mt.

**1.0. Materials & Workmanship**

1.1. The relevant specifications of item No. 5.8.1. shall be followed for controlled concrete work as specified in item for M-150 and relevant specifications of item 9.1 shall be followed for the form work centering work for exposed cement work.

**2.0. Mode of measurement & payment**

2.1. The relevant specifications of item No. 5.8.1 shall be followed except that the form work and centering work shall be included in the item.

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

5.00.8. **Providing and laying controlled cement concrete M-200 exposed work with curing etc. complete, including the cost of form work but excluding the cost of reinforcement for R.C.C. work in (A) Beams :** (I) Having cross section area 0.05 to 0.08 Sq. mt (II) Having cross sectional area 0.08 Sq.mt and up to 0.12 Sq. mt. (III) Having cross sectional area 0.12 Sq. and up to 0.18 Sq. Mt. (B) Columns : (I) Having cross sectional area 0.05 to 0.08 Sq.Mt. (II) Having cross sectional area more than 0.08 Sq.Mt and up to 0.12 Sq.Mt. (III) Having cross sectional area more than 0.12 Sq. mt. and up to 0.18 Sq.Mt.

**1.0. Materials & Workmanship**

1.1. The relevant specifications of item No. 5.8.1. shall be followed for controlled concrete work for work as specified in item for M-200 and relevant specifications of item 9.7 and 9.1 shall be followed for the form work and centering work for exposed cement work.

**2.0. Mode of measurements & payment**

2.1. The relevant specification of item No. 5.8.1. shall be followed except that the item includes the cost of form work and centering work for exposed work.

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

5.00.9. **Providing and laying controlled cement concrete M-250 exposed work with curing etc. complete including the cost of from work but excluding the cost of reinforcement for R.C.C. work in :** (A) Beams : (I) Having cross sectional area 0.05 to 0.08 Sq.mt.(II) Having cross sectional areas more than 0.08 Sq.mt. and up to 0.12 Sq. mt (III) Having cross sectional area more than 0.12 Sq.mt. and up to 0.18 Sq. Mt. (5) Columns :(I) Having cross sectional area 0.05 to 0.08. Sq.Mt (II) Having cross sectional area more than 0.08 Sq. mt. and up to 0.12 Sq. mt. (III) Having cross sectional area more than 0.12 Sq.mt. and up to 0.18 Sq.mt.

**1.0. Materials & Workmanship**

1.1. The relevant specifications of item No. 5.8.1. shall be followed for controlled concrete work for the work as specified in the item for M-250 and the relevant R.C.C. lintels shall be carried out.

**2.0. Mode of measurement & payment**

2.1. The relevant specifications of item No. 5.4.1 shall be followed except that the cost of form work finishing and centering shall be included in the item.

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

## SECTION – 6

### Masonry Work

**6.12 (A) Brick work using common burnt clay building bricks having crushing strength not less than 35 Kg/Sq. Cm. in foundations and plinth in cement mortar 1:5 (1 cement :5 fine sand) modular bricks.**

**1.0. Materials**

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

**2.0. Workmanship**

**2.1. Proportion:**

**2.1.1.** The proportion of the cement mortar shall be 1:5 (1 cement: 5 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, man son's spirit level, square half meter rub, and pins, string and plumb shall be kept on the site of work for frequent checking during the progress of work.

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

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

**3.0. Mode measurements & payment**

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