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TECHNICAL SPECIFICATIONS

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OBSERVATION	REVISION	DATE

SPECIFICATIONS Of MATERIALSINDEX

GENERAL TECHNICAL SPECIFICATIONS FOR BUILDING WORKSGENERAL:

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 ofagreement.*

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 referredto*

4. *All measurements and computations, unless otherwise specified, shall be carried out nearest to the followinglimits:*

(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 befollowed.

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 betaken asfinal.*

6. *Where no lead is specific, it shall mean "allleads"*

7. *Lift shall be measured from plinthlevel.*

8. *Up to "floor two level" means actual height of floor (Maxi 4 M) up to 3 Mt. above plinthlevel.*

9. *Definite particulars covered in the items of work, though not mentioned or elucidated in it specifications shall be deemed to be includedtherein.*

10. *Reference to specifications of materials as made in the detailed specification of the items of works is intheformofadesignationcontainingthemkuberofthespecificationofthematerialandprefix'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 theEngineer-in-charge.*

12. *The contract rate of the item of work shall be for the work completed in all aspects.*

13. *No collection of materials shall be made before it is got approved from the Engineer-in-charge.*

14. *Collection of approved materials shall be done at site of work in a systematic manner. Materials shall be stored in such a manner as to prevent damage, deterioration or intrusion of foreign matter and to ensure the preservation of their quality and fitness for the work*

15. *Materials, if and when rejected by the Engineer-in-charge, shall be immediately removed from the site of work.*

16. *No materials shall be stored prior to, during and after execution of a structure in such a way as to cause or lead to damage or overloading of the various components of the structure.*

17. *All works shall be carried out in a workmanlike manner as per the best techniques for the particular item.*

18. *All tools, templates, machinery and equipment for correct execution of the work as well as for checking lines, levels, alignment of the works during execution shall kept in sufficient numbers and in good working condition on the site of the work.*

19. *The mode, procedure and manner of execution shall be such that it does not cause damage or over- loading of the various components of the structure during execution or after completion of the structure.*

20. *Special modes of construction not adopted in general Engineering practice if proposed to be adopted by the Contractor, shall be considered only if the contractor provides satisfactory evidence that such special mode Of construction is safe, sound and helps in speedy construction and Completion of work to the required strength and quality. Acceptance of the same by the Engineer-in-Charge shall not, however absolve the contractor of the responsibility of any adverse effects and consequences of adopting the same in the course of execution of completion of thework.*

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 thecontractor.*

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 form totime.*

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 workitself.*

24. *The testing charges of all materials shall be borne by theContractor.*

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		26		51	
2		27		52	
3		28		53	
4		29		54	
5		30		55	
6		31		56	
7		32		57	
8		33		58	
9		34		59	
10		35		60	
11		36		61	
12		37		62	
13		38		63	
14		39		64	
15		40		65	
16		41		66	
17		42		67	
18		43		68	
19		44		69	
20		45		70	
21		46		71	
22		47		72	
23		48		73	
24		49		74	
25		50		75	

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
76		101		126	
77		102		127	
78		103		128	
79		104		129	
80		105		130	
81		106		131	
82		107		132	
83		108		133	
84		109		134	
85		110		135	
86		111		136	
87		112		137	
88		113		138	
89		114		139	
90		115		140	
91		116		141	
92		117		142	
93		118		143	
94		119		144	
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98		123		148	
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100		125		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 charge 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 undertest.

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 forcuring

1.5. Potable water will generally found suitable for curing mortar orconcrete.

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 earnedout:

(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 limestone.

(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 ofwork.

2.4. Field testing shall be done according to I.S 1624-1974 to show the acceptability ofmaterials.

M-3. Cement

3.1. Cement snail 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 of grey Portland cement as specified in the item of thework.

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 uniformcolour and shade. The pigments shall have such properties to provide for durability underexposure to sunlight andweather.

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 contain more than 8 percent of silt as determined by field test, if necessary thesand shall be washed to make itclean.

6.2. ***Coarse Sand*** :The fineness modulus of coarse sand shall not be less than 2.5 and shall not exceed3 0. The sieve analysis of coarse shall be asunder.

I.S. Sieve	***Percentage by weight***	***I.S. Sieve***	***Percentage by weight***
Designation	***Designation***	***Designation***	***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 asunder.

I.S. Sieve Designation	***Percentage by weight Designation***	***I.S. Sieve Designation***	***Percentage by weight passing sieve***
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 will measuring cylinder. The method of determining silt contents by fields test is given as under:

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

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

7.4. The fineness modules of stone dust shall not be less than1.80

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 whit-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 gritshall have no deleterious withcement.

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

I.S. sieve designation	***Percentage passing through siev***	***I.S. Sieve Designation***	***Percentage passing through Siev***
12,50 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 ft used to build-up the specified strength ofconcrete

8.4. The necessary tests for grit shall be carried out as per the requirements of I.S.2386- (parts-l to VIII} 1963r 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 varyingsizes

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

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

I.S.SieveDesignation	*Percentagebypassing*	*I.S.sieveDesignation*	*Percentage bypassing*
20 mm	100	4.75mm	70
10 mm	86	2.36mm	52

M-10. LimeMortar

10.1. Lime : Lime shall confirm to specification M-2, Water : Water shall conform to specification M-1 and Sand: Sand shall conform to specificationM-6

10.2. Proportion ofMix:

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 byvolume

10.3. Preparation ofmortar;

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 180revolutions.

10.4. Storage:

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

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 foruse.

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 toM-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 of 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 from 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 asdirected

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 30minutes

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 forplain 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. lessthan the minimum lateral clear distance between bars or 6- mm. less than the cover whichever issmaller.

TABLE

I S. Sieve Designation	Percentage passing for single Sized aggregates ofNominalsize			I S. Sieve Designation	Percentage passing for single Sized aggregates of Nominalsize		
	40mm	20mm	16mm		40mm	20mm	16mm
80 mm	-	-	-	12.5 mm	-	-	-
63 mm	100	-	-	10 mm	0.5	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	-	-	-
16mm	-	-	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 waterto 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 ofmortar.

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 withcement

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 thematerial.

13.4. If aggregate is covered with dust it shall be washed with water to make itclean.

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 of over burnt brick bats shall not beallowed.

14.2. The brick bats shall be measured by suitable boxes or asdirected.

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 uniformcolour.

The bricks shall be- moulded with a frog of 100 mm. x 40 mm. and 10 mrn. to 20 mm. deep on one of its flat sides. The bricks shall not break when thrown on the ground from a height of 600mm.

15.2. The size of modular bricks shall be 190 mm.x 90 mm.x 90mm.

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 75mm.

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 particularwork.

Length ± 1/8" (3.0 mm.) Width ± 1/16" (1.50 mm.) Height ± 1/16" (1.50 mm.)

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

(13)

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 day 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 isstarted

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 faceshall 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. LateriteStone***

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 inwork.

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 andsquare

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

17.4. Special corner stones shall be provided where sodirected.

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 ofplacing

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.	6mm	0.22 Kg/Rmt.	8.	20 mm.	2 47 Kg/Rmt	
2.	8mm.	0.39 Kg/Rmt.	9	22 mm.	2.98 Kg/Rmt.	
3.	10mm.	0.62 Kg/Rmt.	10.	25 mm.	3.85 Kg/Rmt.	
4.	12mm.	0.89 Kg/Rmt.	11.	28 mm.	4.83 Kg/Rmt.	
5.	14mm	1.21 Kg/Rmt.	12.	32 mm.	6.31 Kg/Rmt.	
6.	16mm	1 58 Kg/Rmt	13.	36 mm.	7 99 Kg/Rmt.	*
7.	18mm.	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 conformto 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 SteelBars.

M-20. High Tensile Steel Wires

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

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

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

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

M-21. Mild Steel Binding Wire

21.1. The mild steel wire shall be of 1.63 mm. or 1.22 mrn. (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 IndianStandards.

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 powderydeposit.

23.2. The length and width of G.I. sheets shall be as directed as per sitecondition.

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 ofbending.

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 ofbending.

M-24. Asbestos Cement Sheets

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

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 andlocation.

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 andlocation.

M-25. Manglore Pattern Roof Tiles

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

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. Inplaces of bullies props, brick pillar of adequate section built in mud mortar may beused

26.2. The form work shall be sufficiently strong and shall have camber so that it assumes correct shape after deposition of the concrete and shall b-j able to resist forces caused by vibration of live load of men working over it and other incidental leads associated with it. The shuttering shall have smooth and even surface and its joints shall permit leakage of cementgrout

26.3. If at any stage of work during or after placing concrete in the structure, the form work sags orbulges 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 from work shall be got inspected by and got approved form the Engineer-in-charge, before the reinforcement bars are placed inposition

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

26.5. Double wedges shall further be provided between the sole plate and the wooden props so as tofacilitate tightening and easing of shuttering without jerking theconcrete

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 bepermitted

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 bepermitted.

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 theEngineer-in-charge.

M- 27. Expansion Joints - Permoulded filler

27.1. The item provides for expansion joints in R.C C. frame structures for internal joints, as well as exposed joints, with the use of promoulded bituminous jointfiller.

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 berejected

27.3. Thickness of the per-moulded joints filler shall be 25 mm. unless otherwisespecified.

27.4. Premoulded bituminous joints filler shall conform to I S1838-1961

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 jointsfiller.

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 Jo be embedded in the concrete work shall be 25 mm depth of "U" to be provided in the expansion joint, in the copper plate shall be of 25mm.

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 ofwood is not specifically mentioned, good Indian teak wood as approved shall beused.

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

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

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

29.5. First class teakwood

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 thedimension shall be allowed at 1.5 mm. per face to beplaned.

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-pane! 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[1] hopping, rebating. opening of glazing, venation etc., shall be provided if specified in thedrawing.

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 eventexture.

30.4. The shutters shall be testedfor-

(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 thetest.

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

(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 thesample.

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

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

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 anypoints.

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 asdirected

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

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 otherwisespecified.

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 15mm.

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

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

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 beused.

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

32.7. The Shutters shall be completed with door suspension shafts, looking arrangements, pulling hooks, handles and otheraccessories.

M-33. Collapsible Steel Gate

33.1. The collapsible steel gate shall be in one or two leaves and size as per approved drawings or as specified. The gate shall be fabricated from best quality mild steel channels, flats etc. Either steel pulleys or ball-bearings shall be provided in every double channel Unless otherwise specified the particulars of collapsible gate shall be as under.

(a) Pickets : These shall be of 20 mm. M.S. channels of heavy sections unless otherwise shown on drawings. The distance centre to centre of pickets shall be 12 cms .with an opening or 10Cms

(b) Pivoted M.S. flats shall be 20 mm x6mm

(c) Top and bottom guides shall be from tee of flat iron of approvedsize.

(d) The fittings like stoppers fixing, locking cleats, brass handles and cast iron rollers shall be of approved design andsize

M-34. Welded Steel Wire Fabric

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

M-35 Expanded Metal Sheets

35.1. The expanded metal sheets shall he free from flaws joints broken strands laminations and other harmful surface defects. Expanded metal steel sheet shall confirm to IS-412-1975. except that blank sheets need not be with guaranteed mechanical properties The size of the diamond mesh of expanded metal and dimensions of strands (width and thickness) shall be as specified. The tolerance on nominal weight of expanded metal sheets shall be of ± 10percent.

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 preventcorrosion.

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

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

M-37. Plywood

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

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

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

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 uponthickness

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

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 classifiedinto 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 16percent.

37.6. Thickness of plywoodBoards.

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 asunder.

38.2. SheetGlass

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 600mm.

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 lessthan 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 beused

38.3. PlateGlass:

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 mrn. and a tolerance of 0.20 mm shall beadmissible

38.4. ObscuredGlass:

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 of 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 asdirected

38.5. WiredGlass:

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

M-39. Acrylic Sheets

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

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

M-40. Particle board

40.1. The particle boards used for face panels shall of best quality free from any defects. "I he particle boards shall be made with phenolmaldehyde adhesive The particle boards shall conform I S 3087-1905" Specification for wood particle board for general purpose" The size and the thickness shall be asindicated. ***M-41. Expanded polystyrene or framed styroper slabs***

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

M-42. Resign bonded fiber glass.

42.1. The resign bonded fiber glass tiles or roils shall be of approved make and shall be of sizes. thickness, and finish asindicated.

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

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

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

(2) Hessian cloth or Kraft paper for keeping outdust

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

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 itsspecification.

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 asspecified

43.1.3. The fixtures shall be heavy medium or light type. The fixtures and fastenings shall be smooth finished and shall be such as will ensue ease ofoperations.

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

43.1.5. Brass and anodised aluminium fixtures and fastenings shall be brightfinished

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 oppositedirections

43.3. Butt hinges:

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

43.3.2. Tee and strap hinges shall be manufactured from M SSheet

43.4. Siding door bolts(Aldrops):

43.4.1. The aldrops as specified in the item shall be used and shall be gotapproved.

43.5. Tower bolts (BarrelType):

43.5.1. Tower bolts as specified in the item shall be used and shall be gotapproved

43.6. DoorLatch:

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

43.7. BathroomLatch:

43.7.1. Bathroom latch shall be similar to towerbolt.

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. DoorCatch:

43.9.1. Door stoppers shall be either floor door stopper type or door catchtype Floor stopper shallbeof overall size as specified and-shall have a rubbercushion.

43.10. DoorStoppers:

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 ofcatch.

43.11. Wooden Door Stop withhinges:

43.11.1. Wooden door stop of size 100 mm x GO 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 WindowFastener:

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

43.13. Casement stays (Straight RedStay):

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. asdirected.

43.14. VentilatorCatch:

43.14.1. The pattern and shape of the catch shall be asapproved

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 welded to the base plate in case of iron pivot and in single piece plate in the case of brasspivot.

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 beuniform.

44.1.2. All the paints shall meet with the following generalrequirements

(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 andskins

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

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

(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 horn the manufacturers and generally according to their instructions and without any admixtureswhatsoever

44.2. (B) Enamelpaints:

44.2.1. The enamel paint shall satisfy in general requirements in specification of oil paints, Enamel paintshall 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 necessarymaterials:

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

45.2. The French polish so prepared shall conform to I S : 348-19C8.

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 andweathering.

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 orworks

46.3. The marble chips shall be machine crushed. They shall be free from foreign matter, dust etc. Exceptas above, the chips shall conform to I S2114-1962

M-47. Flooring Tiles

47.1. (A) Plain Cementtiles;

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 IndianStandards.

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

47.1.3 The wearing face of the tiles shall he 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 andtrue.

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

47.1.5. Tolerance of length and breadth shall be plus of minus one millimeter Tolerance on thickness shall be plus5mm.

47.1.6. The tiles shall satisfy the tests as regards transverse strength, resistance to wear and water absorption as per I.S1237-1980.

47.2. (B) Plain ColouredTiles:

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 toconcrete

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

47.3. (C) Marble mosaictiles:

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 andtrue.

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-m-charge, forapproval.

47.3.4. Any particular samples if found suitable shall be approved by the Engineer-in-charge, or he may askfor a few more samples to be presented The samples hall have of 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 backinglayer and wearing surface, materials, ingredients, colour, shade, chips, distribution etc.required.

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

47.4. (D) Chequered Tiles:

47.4.1. Chequered tiles shall be plain cement tiles or marble mosaic tiles. The fromer 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 then 25 mm. and not more than 50 mm. The overall thickness of the tile shal! be 22mm

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 form the top of the chequers shall not be less than 6 mm. The tiles shall be given the first grinding with machine before delivery tosite

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 note 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 offlaws.

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

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 ± 3mm

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 beuniform

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 doublepolished

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 uniformcolour

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 andplane

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 approvedsample

M-51. Marble Slab

51.1. Marble slab shall be white or of other and of best quality as approved by theEngineer-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 themortar

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 requiredpattern.

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 forreference

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 offlaws

52.2. The thickness of the stone shall be specified initems

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 uniformthickness.

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 disagreeableodour.

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

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 ± 015mm.

(b) Length orWidth

(1)	300 mm. Square tiles	±0.20mm.	(3)	900 mmSquaretiles	± 0.60mm.
(2)	600 mm. Square tiles	± 040mm.	(4)	Sheetsandroll	± 0.10percent.

53.4. Adhesive:

53.4.1. The adhesive for PVC flooring shall be of the type and make recommended by the manufacturesof PVCsheets/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 asfollows:

Size	Tolerancefor	
	1stClassBrick	2nd ClassBrick
19cm.	±6mm.	± 10 mm.
9cm.	±3mm.	± 7mm.
4cm.	±1.5mm.	± 3mm.

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

Facingdimensions	Permissibletolerance
Max. below19cms.	Max. 2.5mm.
-do- above19cms.	Max. 3.0mm.

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 25percent.

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

M-55. w h i t e Glazzed tile

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 he fee from cracks, crazing sports chipper) edges and corners. The glazing shall be of uniformshade.

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 snail be …… mm. Except as above the tiles shall conform to I.S.1977-19/0

M-56. Galavanised from pipes and fittings

56.1. Galavanised iron pipes shall be of the medium type and or 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 theflow

57.2. They shall be of screw down type and or 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 polishedbright.

57.3. The minimum finished weight of bib cock and stop cock shall be as givenbelow

Diameter	Bid cock	Stop cock	Diameter	Bid 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 wheeland 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 tofacilitate cleaning. Wash basin shall have single tap hole as specified. Each basin shall have a circular waste hole which is either welded 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 thebowl.

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 rnrn. 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 andsurface defects and shall have chromium plated brass hinges and rubber buffer of suitablesize.

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

M-62. A. Foot Rests

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

M-63. Glazed Earthen Ware Sink

63.1. The glazed earthen-ware sink shall be of specified size, colour and quality. They sink shall conform, to I.S. 771 part – lI – 1979. The brackets for sinks shall conform to I.S775-1970

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

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

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

M-65. Low level Enamel flushing tank

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

M-66. Cast iron flushing cistern.

66.1. The cast iron flushing cistern shall be of 15 liters capacity. It shall conform to I.S. 774-1971. The flushing cistern shall be of best quality free from any defects. The flushing cistern shall have outlet of 32 mm diameter. The lead pipe shall conform to I.S 404 (Part-l) - 1962; For fixing G.I. inlet pipes and overflowpipe 20 mm. dia. inlet and outlet shall be provided The flushing cistern shall be provided with galvanised iron chain and pull of sufficient length and shall be got approved from the Engineer-in-charge. The cast iron flushing cistern shall be painted with one coat of anticorrosive paint and two coats of paints The flushing cistern shall be fixed on two C I brackets The C [.brackets shall conform to I S775-1970.

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 IndianStandard.

M-68. Cast iron pipes and fittings.

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

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

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

68.4. Tolerances:

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

Sr. No.	Nominal dia. of bore	Thickness	Overall 1.5 m. long	Weight of pipe 1.8 m long	excluding ears 2.m long
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 10mm.

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 straightpipes.

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 cleaningdesign.

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

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 appropriatesize.

M-70. Gully Trap

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

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

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 seatingfaces.

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 shallbe 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 pipeshall be capable to withstand pressures or 1.5 M lead without showing sign of leakage. The thickness of thewall 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 thepipe.

71.2. The pipes shall generally conform to relevant I S651-1980.

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 approvedquality

73.2. The pipe shall have length as required for the thickness of will 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 asdirected

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 intent of pipe shall have is smooth finish, regular surface and regular internal diameter. The tolerance in all dimensions shall be as I.S. 1626-part-I-1980.

M-75. Crydon Ball valve

75.1. Mall 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 fromoutside.

77.2. The selected earth shall be good yellow soil and shall be got approved from the Engineer-in-charge. In no case black cotton soil or similar expansive and shrinkable soil shall be used. It shall be clean and free from all rubbish and perishable materials, stones or brick bats. The clods shall be broken to a size of 50 mm or less. Contractor shall make his own arrangement at his own cost for land for borrowing selected earth. The stacking of material shall be done as directed by the Engineer-in-charge in such a way not to interfere with any construction all activities and in properstacks.

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 mentionedabove

M-78. Barbed Wire

78.1. The barbed wire shall he 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 bribed wire shall be formed by twisting together two tine 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 $\pm$ 0.08mm

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 bards shall have a length of notless 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 thebarbs.

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 15meters.

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 1066Meter.

Sub- Head - I , Earth Work
Item no. 1.
Clearing and grubbing road including uprooting rank vegetation grass bushes, shrubs , sapling and trees girth upto 300mm removal stumps of trees cut earlier and disposal of unserviceable (D) By mechanical means in area of thorny jungle.

Clearing and Grubbing: This involves removing all vegetation and obstacles from the proposed area where the building will be constructed. It includes:

Uprooting rank vegetation: Removing thick, wild growth of plants and grasses.

Removing bushes, shrubs, and saplings: Clearing smaller woody plants and young trees.

Disposal of Unserviceable Material (D): This typically refers to disposing of the vegetation, stumps, and any other unusable materials that are cleared from the site. This disposal is done using mechanical means, which could involve machines like bulldozers, excavators, or chippers to grind down vegetation.

Overall, the process ensures that the proposed area is completely cleared of vegetation and obstacles to prepare it for road & Building construction, using mechanical equipment for efficiency and effectiveness in clearing large areas.

Workmanship
The relevant specification of item shall be followed as above.
Mode of measurements & payment
The rate shall include the cost of materials and labour involved in all the operations described above. The rate shall be a unit of Hactare.

Item no. 2.
Excavation for foundation upto 1.5m depth including sorting out and stacking of useful materials , back filling in sides of sides of foundations etc. in layers not exceeding 20cm .in depth consolidating each deposited layer by ramming and watering etc and disposing off the excavated stuff upto any lead and lift. Dense or hard soft soil

Dense or Hard 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., fail 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 remove! as directed The materials so obtained shall be property of the Government and shall be conveyed und stacked as directed within any lead. The roots of the trees coming in the sides shall be cut and coated with a hotasphalt

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

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 anddirected.

4.0. Excavation

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

Backfilling: Once the foundation work is complete, the sides of the foundation trench or pit/under Floor need to be filled back in. This is done in layers to ensure stability and proper compaction.

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-m-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.

The rate shall be for a unit of one cubic meter

Item no. 3.

Excavation for foundation for a depth from 1.5m to 3.0m depth including sorting out and stacking of useful materials back filling in sides of sides of foundations etc. in layers not exceeding 20cm .in depth consolidating each deposited layer by ramming and watering etc and disposing off the excavated stuff upto any lead . (D)Dense or hard soft soil . Quantity for excavation shall be paid based on actual dimensions in the drawings

Dense or Hard Soil

1.0. Workmanship

The relevant specifications of item No. 2 shall be followed except that the excavation work shall becarried 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.2 shall be followed.

2.2. The excavation work from 1.5 to 30M shall be measured under this item

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

Item no. 4.

Excavation for foundation for a depth from 3.0m to 5.0m depth including sorting out and stacking of useful materials back filling in sides of sides of foundations etc. in layers not exceeding 20cm .in depth consolidating each deposited layer by ramming and watering etc and disposing off the excavated stuff upto any lead . (D)Dense or hard soft soil . Quantity for excavation shall be paid based on actual dimensions in the drawings

1.0. Workmanship

1.1. The relevant specifications of item No.2 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. 2 shall be followed:

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

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

Item no. 5.

Excavation for foundation for a depth from 5.0 m to 6.0m depth including sorting out and stacking of useful materials back filling in sides of sides of foundations etc. in layers not exceeding 20cm .in depth consolidating each deposited layer by ramming and watering etc and disposing off the excavated stuff upto any lead . (D)Dense or hard soft soil . Quantity for excavation shall be paid based on actual dimensions in the drawings

1.2. Workmanship

1.3. The relevant specifications of item No.2 shall be followed except that the excavation work shall be carried out from 5.0.m. to 6.0.m. lift in Dense or Hard soil.

2.3. Mode of Measurement &Payment

2.4. The relevant specifications of item No. 2 shall be followed:

2.5. The excavation work from 5.0. M. to 6,0 M. lift shall be measured under this item.

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

Item no. 6.

Filling in plinth with (good quality) sand under floors including watering, ramming, consolidating and dressing etc. complete.

1.0. Materials

1.1. Sand shall conform to M6

2.0. Workmanship

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

1.1. 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.

1.2. 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.

1.3. The finished level of filling shall be kept to shape intended to be given tofloor.

1.4. 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.

1.5. 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.

including watering, ramming, consolidating and dressing etc , complete.

3.0. Mode of Measurements &Payment

3.1. The relevant specifications of shall be followed as above.

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

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

Item no. 7.

Carring out plinth treatment to post construction / during construction by spraying chemical solution for termite control treatment including labour and material consistment with I.S.I specification. Using Chlordene and Chiorpurfiles 20 EC. As Per 6131_paret-II Concentration Weight one percent is recommended i.e one litre 20EC chemical emulsion with 19 liter give 1% concentration inclusive of one litre chemical emulsion appication at the rate of 5Litre chemical / Sqm of surface is recommended as per I.S. Plinth area only shall be measured for payment purpose.

workmanship

Chemicals:

Any one of the following chemicals in water emulsion to achieve the percentage concentration specified against each chemical shall be used:

(i) Chlorphriphos emulsifiable concentrate of 20%

(ii) Lindane emulsifiable concentrate of 20%

Anti-termite treatment chemical is available in concentrated form in the market and concentration is indicated on the sealed containers. To achieve the specified percentage of concentration, Chemical should be diluted with water in required quantity before it is used. Graduated containers shall be used for dilution of chemical with water in the required proportion to achieve the desired percentage of concentration. For example, to dilute chemical of 20% concentration. 19 parts of water shall be added to one part of chemical for achieving 1% concentration. Engineer -in-Charge shall procure the chemical of required concentration in sealed original containers directly from the reputed and authorized dealers, chemical shall be kept in the custody of the Engineer-in-Charge or his authorized representatives and issued for use to meet the day's requirements. Empty containers after washing and concentrated chemical left unused at the end of the day's work shall be returned to the Engineer-in-Charge or his authorized representative

Treatment

Treatment along outside of foundations and under floor - The soil in contact with the external wall of the building shall be treated with chemical emulsion at the rate of 7.5 litres per square metre of vertical surface of the sub-structure to a depth of 300 mm. To facilitate this treatment, a shallow channel shall be excavated along and close to the wall face. The chemical emulsion shall be directed towards the wall at 1.75 litres per running metre of the channel. Rodding with 12 mm diameter mild steel rods at 150 mm apart shall be done in the channel. If necessary, for uniform dispersal of the chemical to 300 mm depth from the ground level. The balance chemical of 0.5 litre per running metre shall then be used to treat the backfill earth as it is returned to the channel directing the spray towards the wall surface.

If there is a concrete or masonry apron around the building, approximately 12 mm diameter holes shall be drilled as close as possible to the plinth wall about 300 mm apart, deep enough to reach the soil below and the chemical emulsion pumped into these holes to soak the soil below at the rate of 2.25 litres per linear metre. In soils which do not allow percolation of chemicals to desired depth, the uniform disposal of the chemical to a depth of 300 mm shall be obtained by suitably modifying the mode of treatment depending on site condition.

Measurements:

The length and breadth shall be measured correct to the nearest cm at plinth level and area worked out in square metre correct to two places of decimal.

The rate shall be for a unit of one sqm.

Item no. 8.

Providing & laying cement concrete 1:3:6 (1: cement: 3 coarse sand: 6 machine crust stone aggregates 40 mm nominal size) for all depths below and up to plinth level in foundations and curing etc. complete including cost of formwork in Footings & Ground, Plinth Beams & below Floors

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 toM-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 20cms.

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

ail the interstices to be filled with mortar.

2.6. Curing:

2.6.1. After the final set, the concrete-shall be kept continuously wet if required by pounding for a period of not less then 7 days form 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 asdirected.

The rate shall be for a unit of one cubicmeter.

Item no. 9.

Providing and laying cement concrete 1:4:8 (1- Cement : 4- coarsesand : 8- hand broken stone aggregates 40 mm nominal size) and curing complete excluding cost of formwork in (A) Foundation and Plinth

1.0. Materials

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

2.0. Workmanship

2.1. Relevant Specifications of item No 8 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

The rate shall be for a unit of one cubic meter

Item no. 10.

Providing and laying cement concrete 1:2:4 (1 Cement :2-coarse sand :4-crushed stone aggregates 20 mm nominal size) In Foundation & plinth and curing complete including cost of form work, dewatering etc. Rates are incl. shoring & strutiing and dewatering. No extra payment will be made for Shoring, Strutting and dewatering

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 theitem

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 asunder:

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 waterper 50 Kegs. ofcement maximum
1	2	3	4
M-100 (1:3:6)	300 Liters	Generally 1:2 for line	34 Liters
M-150 (1:2:4)	220 Liters	aggregate to coarse aggregate	32 Liters
M-200 (1:1.1/2:3)		by volume 160 but subject to	30 Liters
M-250 (1:1:2)	100 Liters	an upper limit of 1:1.1/2 and lower limit	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 thetable is notexceeded.

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 meansavailable.

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.

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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 bemade.

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 he done for less than 2 minutes after-oil ingredients have been put into themixer.

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 tuning over the ingredients of concrete before and after adding water Mixing platform shall be so arranged that no foreign malarial gets mixed with concrete nor does the mixing water flow out. Cement in required number of bags shall be spread in n layer of uniform thickness on the mixing platform. Dry coarse and fine aggregate and cement shall then be mixed thoroughly be 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 thatspecified

3.2.3. Mixers which haw 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 skimp 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 safely 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 andlaying:

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 from work shall be cleaned and made free from standing water dust, show or ice immediately before placing of concrete. No concrete shall be placed in any part of the structure until the approval of the engineer-in-charge has beenobtained.

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 othercases.

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 closespots.

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 stats 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 charges, frost and drying out process. It shall be covered with wet sacking has Si an 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 14days

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 then the minimum specified.

3.7. Stripping:

3.7.1. The Engineer-in-charge shall be informed in advance by the contractor of hr> 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 formwork.

3.7.2. 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.

3.7.3. Immediately after the removal of forms, all exposed bolts etc. passing through the cement concrete member and used for stuttering or any other purpose shall be cut inside the cement concrete member to a depth of at least 25 m. 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 comers and other defects, shall be thoroughly cleaned", saturated with water and carefully pointed an 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 through 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 madefor

(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 centre of specified strength. The rate includes the cost of formwork.

The rate shall be for a unit of one cubicmeter.

Item no. 11.

Providing and laying damp proof course 100 mm thick cement concrete 1:2:4 (1- Cement: 2coarse sand: 4stone aggregate 10 mm nominal size) and curing complete including providing and mixing water proofing material in cement concrete in mix proportion recommended by the manufacturers.

The specifications of item No. 9 of ordinary concrete 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 100 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

The rate shall be for a unit one sq.meter

Item no. 12.

Providing and filling in Aereated block bats (broken pieces) in single or multiple layers in super structure , filling the joints with sand mortar (not more than 20%)20mm thick cement sand mortar screed in proportion of 1:6 shall be laid asper drawing. Crushing strength

of aerated concrete block /bats shall not be less than 40 kg/sqcm, minimum density in dry oven condition between 651 to 750 kg /cum, thermal conductivity shall not exceed 0.3W / mk, fire resistance 4 hours , in line and plumb , cleaning the surface with tools and tackles , at all level, all height , all floors including curing , scaffolding , complete as per specifications , drawings and directed by engineer in charge.

1. workmanship

To fulfill the requirements for providing and filling in aerated concrete block bats (broken pieces) in superstructure, along with filling joints with sand mortar and laying cement sand mortar screed, follow these detailed steps:

1.Aerated Concrete Block Bats Broken pieces of aerated concrete blocks meeting the following criteria:

a) Crushing strength not less than 40 kg/sqcm.

b) Minimum density in dry oven condition between 651 to 750 kg/cum.

c)Thermal conductivity not exceeding 0.3 W/mK.

d)Fire resistance of 4 hours.

e) Sand as per M-6)

f) Cement as per M-3)

g) Water as per M -1)

the substrate should be clean, free of debris, and adequately prepared to receive the aerated concrete block bats and after that Aerated Concrete Block Bats shall be filled. Place the broken pieces of aerated concrete blocks (bats) in single or multiple layers as required . cement sand mortar shall be 1:6 (1 part cement to 6 parts sand). Ratio of Cement sand mortar and Aerated Block Bats shall be ratio 1:4 (1 sand cement mortar :4Aerated block bats).

2.0. Mode of measurements &payment

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

The rate shall be for a unit one cum.

Item no. 13.

Making plinth protection 50mm thick of cement concrete 1:3:6 (1cement:3 coarse sand:6 graded stone aggregate 20mm nominal size over 75mm thick bed of dry brick ballast 40mm nominal size , well rammed and consolidated and grouted with fine sand , including necessary excavation, levelling and dressing & finishing the top smooth, including toe wall 230mm wide and 450mm deep on the edge to plinth protection with common burnt clay bricks including grouted with cement mortar 1:4 (1cement:4 fine sand)

1. workmanship

Excavation of the area where plinth protection is to be provided to the required depth, with proper levelling and compacting of the sub-base.75mm thick Dry Brick Ballast of 40mm nominal size. This bed shall be laid with rammed and consolidated . The Plinth level shall be finished with 50mm thick Cement concrete layer of mix proportion 1:3:6 (1 part cement, 3 parts coarse sand, 6 parts graded stone aggregate 20mm nominal size) .

2.0. Mode of measurements &payment

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

The rate shall be for a unit one sqm.

Item no. 14.

Providing TMT Bar FE 500D reinforcement for RCC work including bending, binding with G.I Binding wire and placing in position complete at all heights, all lifts and all levels as shown in the drawing

1.0. Materials

1.1. TMT Bar FE 500D bars shall conform to M-19. 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 lime 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 of power to attain proper radius of bends. Bass 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 then twice the diameter of the round bar and the length of the straight part of the bar beyond the end of the curve shall be at least four times 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 m exact position shown on the drawings, and shall be securely held in position miring 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 concreteas the work progresses for adjusting bar spacing shall not be allowed Pieces of broken stone of brick and wooden blocks shall not be used Layers of bars snailbe at all heights, all lifts and all levels.

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 form corrosion, concrete cover shall be provided as indicated on drawings. All the bars protruding from concrete and to which other bars are to be sliced and which are likely to be exposed for a period exceeding 10 days shall be protected by a thick coat of neat cementgrout.

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 andconcreting.

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 them. 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 spanwhere neither shear non bending moment ismaximum.

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 bull- welded so as to transmit their full stresses. Welded joints shall preferably be located at points when steel will not besubject to more than 75 percent of the maximum permissible stresses and welds so staggered that at any one section not more than 20 percent of the rods are welded. Only electric are welding using a pieces 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 tow or three stages, previous surface shall be cleaned properly. Ends of the bars shall be cleaned of ell loose scale, rust, stages, paint and other foreign matter before welding. Only competent welders shall be employed on the work. The M.S. electrodes used for welding shall conform 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

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.

3.1. 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.

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

Item no. 15.

Providing and laying in position machine batched and machine mixed design mix M-300 grade concrete for reinforced cement conctere work , using cement content as per approved Design Mix manufactured in fully automatic batching plant and transported to site of work in transit mixer for any lead having continuous agitated mixer , manufactured as per mix design of specified grade for RCC work including pumping of RMC from transit mixer to site of laying including the cost of centering shuttering finishing and excluding reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. Without Fly Ash (Min cement level as per latest IS 456 shall be maintained) (Cement level 410 kg) for Footing/Raft /grade slab upto plinth 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 conformM-12.

2.0. General

2.1. The relevant specification of item No. 10. 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 mix design concrete shall be in grades of M-100, M- 150, M-200, M-250, M-300, M-350 & M-400 with prefix admixer 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./Crnt.

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 asunder:

Grade Concrete	Compressive strength of 15 cms. cubes inKg./Cmt.at 28 days, conducted in accordance withI.S.5161959.Preliminary test Min.	Work test Min.
M-150	200	150
M-200	260	200
M-250	320	250
M-300	380	300
M-350	400	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 form bulk stocks at site and not by bags, it shall be weighed separately from the aggregate. Water, shall either be measured by volume in calibrated tanks or weighed. All measuring equipment shall be maintained in clean, and serviceable condition. Their accuracy shall be periodically checked.

4.0. 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-Ill) shall be referred to. Suitable adjustments shah also be made in the weights of aggregates due to variation in their moisture content. Minimum quantity of cement to be used in mix concrete shall be mentioned as per boq item.

Mode of measurement &payment

4.1. The relevant specifications of itemNo.10 shall be followed ,except that the design mix concrete R.C.C. work as specified in item shall be measured under this item. The rate includes the cost of form work refer item no. 65 but excluding Reinforcement. the cement Consumption in the Mix shall be followed as per BOQ item. The Location ,type of component of Concrete and levels shall be followed as per boq item.

Item no. 16.

Providing and laying in position machine batched and machine mixed design mix M-300 grade concrete for reinforced cement conctere work , using cement content as per approved Design Mix manufactured in fully automatic batching plant and transported to site of work in transit mixer for any lead having continuous agitated mixer , manufactured as per mix design of specified grade for RCC work including pumping of RMC from transit mixer to site of laying including the cost of centering shuttering finishing and excluding reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. Without Fly Ash (Min cement level as per latest IS 456 shall be maintained) (Cement level 410 kg) for Beam upto Plinth.

Workmanship

The relevant specifications of item No.15 shall be followed

Mode of Measurement &Payment

The relevant specifications of item No. 15 shall be followed:

Item no. 17. Providing and laying in position machine batched and machine mixed design mix M-450grade concrete for reinforced cement conctere work , using cement content as per approved Design Mix manufactured in fully automatic batching plant and transported to site of work in transit mixer for any lead having continuous agitated mixer , manufactured as per mix design of specified grade for RCC work including pumping of RMC from transit mixer to site of laying including the cost of centering shuttering finishing and excluding reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. Without Fly Ash (Min cement level as per latest IS 456 shall be maintained) (Cement level 480 kg) for Columns, pillars Post Struts upto Plinth.

Workmanship

The relevant specifications of item No.15 shall be followed

Mode of Measurement &Payment

The relevant specifications of item No. 15 shall be followed:

Item no. 18. Providing and laying in position machine batched and machine mixed design mix M-450grade concrete for reinforced cement conctere work , using cement content as per approved Design Mix manufactured in fully automatic batching plant and transported to site of work in transit mixer for any lead having continuous agitated mixer , manufactured as per mix design of specified grade for RCC work including pumping of RMC from transit mixer to site of laying including the cost of centering shuttering finishing and excluding reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. Without Fly Ash (Min cement level as per latest IS 456 shall be maintained) (Cement level 480 kg) for , Shear wall upto Plinth.

Workmanship
The relevant specifications of item No.15 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 15 shall be followed:

Item no. 19. Providing and laying in position machine batched and machine mixed design mix M-300 grade concrete for reinforced cement conctere work , using cement content as per approved Design Mix manufactured in fully automatic batching plant including the cost of centering shuttering finishing and excluding reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. Without Fly Ash (Min cement level as per latest IS 456 shall be maintained) (Cement level 440 kg) for basement Wall upto Plinth.

Workmanship
The relevant specifications of item No.15 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 15 shall be followed:

Item no. 20. Providing and laying in position machine batched and machine mixed design mix M-300 grade concrete for reinforced cement conctere work , using cement content as per approved Design Mix manufactured in fully automatic batching plant and transported to site of work in transit mixer for any lead having continuous agitated mixer , manufactured as per mix design of specified grade for RCC work including pumping of RMC from transit mixer to site of laying including the cost of centering shuttering(height upto 4.2M) finishing and excluding reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. Without Fly Ash (Min cement level as per latest IS 456 shall be maintained) (Cement level 410 kg) for Slab /Shelves/ landing balconies, access platform , staircase at Basement Floor

Workmanship
The relevant specifications of item No.15 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 15 shall be followed:

Item no. 21. Providing and laying in position machine batched and machine mixed design mix M-300 grade concrete for reinforced cement conctere work , using cement content as per approved Design Mix manufactured in fully automatic batching plant including the cost of centering shuttering (height upto 4.2M) finishing and excluding reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. Without Fly Ash (Min cement level as per latest IS 456 shall be maintained) (Cement level 410 kg) for /beams/Cantilevers Girders Bressumers at Ground Floor

Workmanship
The relevant specifications of item No.15 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 15 shall be followed:

Item no. 22. Providing and laying in position machine batched and machine mixed design mix M-300 grade concrete for reinforced cement conctere work , using cement content as per approved Design Mix manufactured in fully automatic batching plant and transported to site of work in transit mixer for any lead having continuous agitated mixer , manufactured as per mix design of specified grade for RCC work including pumping of RMC from transit mixer to site of laying including the cost of centering shuttering (height upto 4.2M) finishing and excluding reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. Without Fly Ash (Min cement level as per latest IS 456 shall be maintained) (Cement level 410 kg) for beams/Cantilevers Girders Bressumers at First Floor

Workmanship
The relevant specifications of item No.15 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 15 shall be followed:

Item no. 23. Providing and laying in position machine batched and machine mixed design mix M-300 grade concrete for reinforced cement conctere work , using cement content as per approved Design Mix manufactured in fully automatic batching plant and transported to site of work in transit mixer for any lead having continuous agitated mixer , manufactured as per mix design of specified grade for RCC work including pumping of RMC from transit mixer to site of laying including the cost of centering shuttering (height upto 4.2M) finishing and excluding reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. Without Fly Ash (Min cement level as per latest IS 456 shall be maintained) (Cement level 410 kg) for beams/Cantilevers Girders Bressumers at Second Floor

Workmanship
The relevant specifications of item No.15 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 15 shall be followed:

Item no. 24. Providing and laying in position machine batched and machine mixed design mix M-300 grade concrete for reinforced cement conctere work , using cement content as per approved Design Mix manufactured in fully automatic batching plant and transported to site of work in transit mixer for any lead having continuous agitated mixer , manufactured as per mix design of specified grade for RCC work including pumping of RMC from transit mixer to site of laying including the cost of centering shuttering (height upto 4.2M) finishing and excluding reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. Without Fly Ash (Min cement level as per latest IS 456 shall be maintained) (Cement level 410 kg) for beams/Cantilevers Girders Bressumers at Third Floor

Workmanship
The relevant specifications of item No.15 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 15 shall be followed:

Item no. 25. Providing and laying in position machine batched and machine mixed design mix M-300 grade concrete for reinforced cement conctere work , using cement content as per approved Design Mix manufactured in fully automatic batching plant and transported to site of work in transit mixer for any lead having continuous agitated mixer , manufactured as per mix design of specified grade for RCC work including pumping of RMC from transit mixer to site of laying including the cost of centering shuttering (height upto 4.2M) finishing and excluding reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. Without Fly Ash (Min cement level as per latest IS 456 shall be maintained) (Cement level 410 kg) for beams/Cantilevers Girders Bressumers at Fourth Floor

Workmanship
The relevant specifications of item No.15 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 15 shall be followed:

Item no. 26. Providing and laying in position machine batched and machine mixed design mix M-300 grade concrete for reinforced cement conctere work , using cement content as per approved Design Mix manufactured in fully automatic batching plant and transported to site of work in transit mixer for any lead having continuous agitated mixer , manufactured as per mix design of specified grade for RCC work including pumping of RMC from transit mixer to site of laying including the cost of centering shuttering (height upto 4.2M) , finishing and excluding reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. Without Fly Ash (Min cement level as per latest IS 456 shall be maintained) (Cement level 410kg) for beams/Cantilevers Girders Bressumers at Fifth Floor

Workmanship
The relevant specifications of item No.15 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 15 shall be followed:

Item no. 27. Providing and laying in position machine batched and machine mixed design mix M-300 grade concrete for reinforced cement conctere work , using cement content as per approved Design Mix manufactured in fully automatic batching plant and transported to site of work in transit mixer for any lead having continuous agitated mixer , manufactured as per mix design of specified grade for RCC work including pumping of RMC from transit mixer to site of laying including the cost of centering shuttering (height upto 4.2M) finishing and excluding reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. Without Fly Ash (Min cement level as per latest IS 456 shall be maintained) (Cement level 410 kg) for beams/Cantilevers Girders Bressumers at Sixth Floor

Workmanship
The relevant specifications of item No.15 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 15 shall be followed:

Item no. 28. Providing and laying in position machine batched and machine mixed design mix M-300 grade concrete for reinforced cement conctere work , using cement content as per approved Design Mix manufactured in fully automatic batching plant and transported to site of work in transit mixer for any lead having continuous agitated mixer , manufactured as per mix design of specified grade for RCC work including pumping of RMC from transit mixer to site of laying including the cost of centering shuttering (height upto 4.2M) finishing and excluding reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. Without Fly Ash (Min cement level as per latest IS 456 shall be maintained) (Cement level 410 kg) for beams/Cantilevers Girders Bressumers at seventh Floor

Workmanship
The relevant specifications of item No.15 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 15 shall be followed:

Item no. 29. Providing and laying in position machine batched and machine mixed design mix M-300 grade concrete for reinforced cement conctere work , using cement content as per approved Design Mix manufactured in fully automatic batching plant and transported to site of work in transit mixer for any lead having continuous agitated mixer , manufactured as per mix design of specified grade for RCC work including pumping of RMC from transit mixer to site of laying including the cost of centering shuttering (height upto 4.2M)finishing and excluding reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. Without Fly Ash (Min cement level as per latest IS 456 shall be maintained) (Cement level 475 kg) for beams/Cantilevers Girders Bressumers at Eightth Floor

Workmanship
The relevant specifications of item No.15 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 15 shall be followed:

Item no. 30. Providing and laying in position machine batched and machine mixed design mix M-300 grade concrete for reinforced cement conctere work , using cement content as per approved Design Mix manufactured in fully automatic batching plant and transported to site of work in transit mixer for any lead having continuous agitated mixer , manufactured as per mix design of specified grade for RCC work including pumping of RMC from transit mixer to site of laying including the cost of centering shuttering (height upto 4.2M) finishing and excluding reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. Without Fly Ash (Min cement level as per latest IS 456 shall be maintained) (Cement level 410 kg) for beams/Cantilevers Girders Bressumers at Ninth Floor

Workmanship
The relevant specifications of item No.15 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 15 shall be followed:

Item no. 31. Providing and laying in position machine batched and machine mixed design mix M-300 grade concrete for reinforced cement conctere work , using cement content as per approved Design Mix manufactured in fully automatic batching plant and transported to site of work in transit mixer for any lead having continuous agitated mixer , manufactured as per mix design of specified grade for RCC work including pumping of RMC from transit mixer to site of laying including the cost of centering shuttering(height upto 4.2M) finishing and excluding reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. Without Fly Ash (Min cement level as per latest IS 456 shall be maintained) (Cement level 410 kg) for beams/Cantilevers Girders Bressumers at Terrace Floor

Workmanship
The relevant specifications of item No.15 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 15 shall be followed:

Item no. 31a Providing and laying in position machine batched and machine mixed design mix M-300 grade concrete for reinforced cement conctere work , using cement content as per approved Design Mix manufactured in fully automatic batching plant and transported to site of work in transit mixer for any lead having continuous agitated mixer , manufactured as per mix design of specified grade for RCC work including pumping of RMC from transit mixer to site of laying including the cost of centering shuttering(height upto 4.2M) finishing and excluding reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. Without Fly Ash (Min cement level as per latest IS 456 shall be maintained) (Cement level 410 kg) for Sill/ Lintels for all Floors.

Workmanship
The relevant specifications of item No.15 shall be followed
Mode of Measurement &Payment

The relevant specifications of item No. 15 shall be followed:

Item no. 31b Providing and laying in position machine batched and machine mixed design mix M-300 grade concrete for reinforced cement conctere work , using cement content as per approved Design Mix manufactured in fully automatic batching plant and transported to site of work in transit mixer for any lead having continuous agitated mixer , manufactured as per mix design of specified grade for RCC work including pumping of RMC from transit mixer to site of laying including the cost of centering shuttering(height upto 4.2M) finishing and excluding reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. Without Fly Ash (Min cement level as per latest IS 456 shall be maintained) (Cement level 410 kg) for RCC Bands for all Floors.

Workmanship
The relevant specifications of item No.15 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 15 shall be followed:

Item no. 32. Providing and laying in position machine batched and machine mixed design mix M-450 grade concrete for reinforced cement conctere work , using cement content as per approved Design Mix manufactured in fully automatic batching plant and transported to site of work in transit mixer for any lead having continuous agitated mixer , manufactured as per mix design of specified grade for RCC work including pumping of RMC from transit mixer to site of laying including the cost of centering shuttering finishing and excluding reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. Without Fly Ash (Min cement level as per latest IS 456 shall be maintained) (Cement level 480kg) for Columns, pillars Post Struts at Ground Floor

Workmanship
The relevant specifications of item No.15 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 15 shall be followed:

Item no. 33. Providing and laying in position machine batched and machine mixed design mix M-450 grade concrete for reinforced cement conctere work , using cement content as per approved Design Mix manufactured in fully automatic batching plant and transported to site of work in transit mixer for any lead having continuous agitated mixer , manufactured as per mix design of specified grade for RCC work including pumping of RMC from transit mixer to site of laying including the cost of centering shuttering finishing and excluding reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. Without Fly Ash (Min cement level as per latest IS 456 shall be maintained) (Cement level 480kg) for Columns, pillars Post Struts at First Floor

Workmanship
The relevant specifications of item No.15 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 15 shall be followed:

Item no. 34. Providing and laying in position machine batched and machine mixed design mix M-450 grade concrete for reinforced cement conctere work , using cement content as per approved Design Mix manufactured in fully automatic batching plant and transported to site of work in transit mixer for any lead having continuous agitated mixer , manufactured as per mix design of specified grade for RCC work including pumping of RMC from transit mixer to site of laying including the cost of centering shuttering finishing and excluding reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. Without Fly Ash (Min cement level as per latest IS 456 shall be maintained) (Cement level 480kg) for Columns, pillars Post Struts at Second Floor

Workmanship
The relevant specifications of item No.15 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 15 shall be followed:

Item no. 35. Providing and laying in position machine batched and machine mixed design mix M-450 grade concrete for reinforced cement conctere work , using cement content as per approved Design Mix manufactured in fully automatic batching plant and transported to site of work in transit mixer for any lead having continuous agitated mixer , manufactured as per mix design of specified grade for RCC work including pumping of RMC from transit mixer to site of laying including the cost of centering shuttering finishing and excluding reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. Without Fly Ash (Min cement level as per latest IS 456 shall be maintained) (Cement level 480kg) for Columns, pillars Post Struts at Third Floor

Workmanship
The relevant specifications of item No.15 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 15 shall be followed:

Item no. 36. Providing and laying in position machine batched and machine mixed design mix M-450 grade concrete for reinforced cement conctere work , using cement content as per approved Design Mix manufactured in fully automatic batching plant and transported to site of work in transit mixer for any lead having continuous agitated mixer , manufactured as per mix design of specified grade for RCC work including pumping of RMC from transit mixer to site of laying including the cost of centering shuttering finishing and excluding reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. Without Fly Ash (Min cement level as per latest IS 456 shall be maintained) (Cement level 480kg) for Columns, pillars Post Struts at Fourth Floor

Workmanship
The relevant specifications of item No.15 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 15 shall be followed:

Item no. 37. Providing and laying in position machine batched and machine mixed design mix M- 400 grade concrete for reinforced cement conctere work , using cement content as per approved Design Mix manufactured in fully automatic batching plant and transported to site of work in transit mixer for any lead having continuous agitated mixer , manufactured as per mix design of specified grade for RCC work including pumping of RMC from transit mixer to site of laying including the cost of centering shuttering finishing and excluding reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. Without Fly Ash (Min cement level as per latest IS 456 shall be maintained) (Cement level 460 kg) for Columns, pillars Post Struts at Fifth Floor

Workmanship
The relevant specifications of item No.15 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 15 shall be followed:

Item no. 38. Providing and laying in position machine batched and machine mixed design mix M-400 grade concrete for reinforced cement conctere work , using cement content as per approved Design Mix manufactured in fully automatic batching plant and transported to site of work in transit mixer for any lead having continuous agitated mixer , manufactured as per mix design of specified grade for RCC work including pumping of RMC from transit mixer to site of laying including the cost of centering shuttering finishing and excluding reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. Without Fly Ash (Min cement level as per latest IS 456 shall be maintained) (Cement level 460 kg) for Columns, pillars Post Struts at Sixth Floor

Workmanship
The relevant specifications of item No.15 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 15 shall be followed:

Item no. 39. Providing and laying in position machine batched and machine mixed design mix M-400 grade concrete for reinforced cement conctere work , using cement content as per approved Design Mix manufactured in fully automatic batching plant and transported to site of work in transit mixer for any lead having continuous agitated mixer , manufactured as per mix design of specified grade for RCC work including pumping of RMC from transit mixer to site of laying including the cost of centering shuttering finishing and excluding reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. Without Fly Ash (Min cement level as per latest IS 456 shall be maintained) (Cement level 460 kg) for Columns, pillars Post Struts at Seventh Floor

Workmanship
The relevant specifications of item No.15 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 15 shall be followed:

Item no. 40. Providing and laying in position machine batched and machine mixed design mix M-400 grade concrete for reinforced cement conctere work , using cement content as per approved Design Mix manufactured in fully automatic batching plant and transported to site of work in transit mixer for any lead having continuous agitated mixer , manufactured as per mix design of specified grade for RCC work including pumping of RMC from transit mixer to site of laying including the cost of centering shuttering finishing and excluding reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. Without Fly Ash (Min cement level as per latest IS 456 shall be maintained) (Cement level 460kg) for Columns, pillars Post Struts at Eightth Floor

Workmanship
The relevant specifications of item No.15 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 15 shall be followed:

Item no. 41. Providing and laying in position machine batched and machine mixed design mix M-400 grade concrete for reinforced cement conctere work , using cement content as per approved Design Mix manufactured in fully automatic batching plant and transported to site of work in transit mixer for any lead having continuous agitated mixer , manufactured as per mix design of specified grade for RCC work including pumping of RMC from transit mixer to site of laying including the cost of centering shuttering finishing and excluding reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. Without Fly Ash (Min cement level as per latest IS 456 shall be maintained) (Cement level 460 kg) for Columns, pillars Post Struts at Ninth Floor

Workmanship
The relevant specifications of item No.15 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 15 shall be followed:

Item no. 42. Providing and laying in position machine batched and machine mixed design mix M-400grade concrete for reinforced cement conctere work , using cement content as per approved Design Mix manufactured in fully automatic batching plant and transported to site of work in transit mixer for any lead having continuous agitated mixer , manufactured as per mix design of specified grade for RCC work including pumping of RMC from transit mixer to site of laying including the cost of centering shuttering finishing and excluding reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. Without Fly Ash (Min cement level as per latest IS 456 shall be maintained) (Cement level 460kg) for Columns, pillars Post Struts at Terrace Floor

Workmanship
The relevant specifications of item No.15 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 15 shall be followed:

Item no. 43. Providing and laying in position machine batched and machine mixed design mix M-450 grade concrete for reinforced cement conctere work , using cement content as per approved Design Mix manufactured in fully automatic batching plant and transported to site of work in transit mixer for any lead having continuous agitated mixer , manufactured as per mix design of specified grade for RCC work including pumping of RMC from transit mixer to site of laying including the cost of centering shuttering finishing and excluding reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. Without Fly Ash (Min cement level as per latest IS 456 shall be maintained) (Cement level 480kg) for Wall / shear wall Ground Floor

Workmanship
The relevant specifications of item No.15 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 15 shall be followed:

Item no. 44. Providing and laying in position machine batched and machine mixed design mix M-450grade concrete for reinforced cement conctere work , using cement content as per approved Design Mix manufactured in fully automatic batching plant and transported to site of work in transit mixer for any lead having continuous agitated mixer , manufactured as per mix design of specified grade for RCC work including pumping of RMC from transit mixer to site of laying including the cost of centering shuttering finishing and excluding reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. Without Fly Ash (Min cement level as per latest IS 456 shall be maintained) (Cement level 480kg) for Wall / shear wall First Floor

Workmanship
The relevant specifications of item No.15 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 15 shall be followed:

Item no. 45. Providing and laying in position machine batched and machine mixed design mix M-450 grade concrete for reinforced cement conctere work , using cement content as per approved Design Mix manufactured in fully automatic batching plant and transported to site of work in transit mixer for any lead having continuous agitated mixer , manufactured as per mix design of specified grade for RCC work including pumping of RMC from transit mixer to site of laying including the cost of centering shuttering finishing and excluding reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. Without Fly Ash (Min cement level as per latest IS 456 shall be maintained) (Cement level 480kg) for Wall / shear wall Second Floor

Workmanship
The relevant specifications of item No.15 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 15 shall be followed:

Item no. 46. Providing and laying in position machine batched and machine mixed design mix M-450 grade concrete for reinforced cement conctere work , using cement content as per approved Design Mix manufactured in fully automatic batching plant and transported to site of work in transit mixer for any lead having continuous agitated mixer , manufactured as per mix design of specified grade for RCC work including pumping of RMC from transit mixer to site of laying including the cost of centering shuttering finishing and excluding reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. Without Fly Ash (Min cement level as per latest IS 456 shall be maintained) (Cement level 480kg) for Wall / shear wall Third Floor

Workmanship
The relevant specifications of item No.15 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 15 shall be followed:

Item no. 47. Providing and laying in position machine batched and machine mixed design mix M-450 grade concrete for reinforced cement conctere work , using cement content as per approved Design Mix manufactured in fully automatic batching plant and transported to site of work in transit mixer for any lead having continuous agitated mixer , manufactured as per mix design of specified grade for RCC work including pumping of RMC from transit mixer to site of laying including the cost of centering shuttering finishing and excluding reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. Without Fly Ash (Min cement level as per latest IS 456 shall be maintained) (Cement level 480kg) for Wall / shear wall Fourth Floor

Workmanship
The relevant specifications of item No.15 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 15 shall be followed:

Item no. 48. Providing and laying in position machine batched and machine mixed design mix M-400 grade concrete for reinforced cement conctere work , using cement content as per approved Design Mix manufactured in fully automatic batching plant and transported to site of work in transit mixer for any lead having continuous agitated mixer , manufactured as per mix design of specified grade for RCC work including pumping of RMC from transit mixer to site of laying including the cost of centering shuttering finishing and excluding reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. Without Fly Ash (Min cement level as per latest IS 456 shall be maintained) (Cement level 460kg) for Wall / shear wall Fifth Floor

Workmanship
The relevant specifications of item No.15 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 15 shall be followed:

Item no. 49. Providing and laying in position machine batched and machine mixed design mix M-400 grade concrete for reinforced cement conctere work , using cement content as per approved Design Mix manufactured in fully automatic batching plant and transported to site of work in transit mixer for any lead having continuous agitated mixer , manufactured as per mix design of specified grade for RCC work including pumping of RMC from transit mixer to site of laying including the cost of centering shuttering finishing and excluding reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. Without Fly Ash (Min cement level as per latest IS 456 shall be maintained) (Cement level 460kg) for Wall / shear wall Sixth Floor

Workmanship
The relevant specifications of item No.15 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 15 shall be followed:

Item no. 50. Providing and laying in position machine batched and machine mixed design mix M-400 grade concrete for reinforced cement conctere work , using cement content as per approved Design Mix manufactured in fully automatic batching plant and transported to site of work in transit mixer for any lead having continuous agitated mixer , manufactured as per mix design of specified grade for RCC work including pumping of RMC from transit mixer to site of laying including the cost of centering shuttering finishing and excluding reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. Without Fly Ash (Min cement level as per latest IS 456 shall be maintained) (Cement level 460kg) for Wall / shear wall Seventh Floor

Workmanship
The relevant specifications of item No.15 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 15 shall be followed:

Item no. 51. Providing and laying in position machine batched and machine mixed design mix M-400 grade concrete for reinforced cement conctere work , using cement content as per approved Design Mix manufactured in fully automatic batching plant and transported to site of work in transit mixer for any lead having continuous agitated mixer , manufactured as per mix design of specified grade for RCC work including pumping of RMC from transit mixer to site of laying including the cost of centering shuttering finishing and excluding reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. Without Fly Ash (Min cement level as per latest IS 456 shall be maintained) (Cement level 460kg)for Wall / shear wall Eightth Floor

Workmanship
The relevant specifications of item No.15 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 15 shall be followed:

Item no. 52. Providing and laying in position machine batched and machine mixed design mix M-400 grade concrete for reinforced cement conctere work , using cement content as per approved Design Mix manufactured in fully automatic batching plant and transported to site of work in transit mixer for any lead having continuous agitated mixer , manufactured as per mix design of specified grade for RCC work including pumping of RMC from transit mixer to site of laying including the cost of centering shuttering finishing and excluding reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. Without Fly Ash (Min cement level as per latest IS 456 shall be maintained) (Cement level 460kg)for Wall / shear wall Ninth Floor

Workmanship
The relevant specifications of item No.15 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 15 shall be followed:

Item no. 53. Providing and laying in position machine batched and machine mixed design mix M-400 grade concrete for reinforced cement conctere work , using cement content as per approved Design Mix manufactured in fully automatic batching plant and transported to site of work in transit mixer for any lead having continuous agitated mixer , manufactured as per mix design of specified grade for RCC work including pumping of RMC from transit mixer to site of laying including the cost of centering shuttering finishing and excluding reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. Without Fly Ash (Min cement level as per latest IS 456 shall be maintained) (Cement level 460kg) for Wall / shear wall Terrace Floor

Workmanship
The relevant specifications of item No.15 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 15 shall be followed:

Item no. 54. Providing and laying in position machine batched and machine mixed design mix M-300 grade concrete for reinforced cement conctere work , using cement content as per approved Design Mix manufactured in fully automatic batching plant and transported to site of work in transit mixer for any lead having continuous agitated mixer , manufactured as per mix design of specified grade for RCC work including pumping of RMC from transit mixer to site of laying including the cost of centering shuttering(height upto 4.2M) finishing and excluding reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. Without Fly Ash (Min cement level as per latest IS 456 shall be maintained) (Cement level 410 kg) for Slab /Shelves/ landing balconies, access platform , staircase at Ground Floor

Workmanship
The relevant specifications of item No.15 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 15 shall be followed:

Item no. 55. Providing and laying in position machine batched and machine mixed design mix M-300 grade concrete for reinforced cement conctere work , using cement content as per approved Design Mix manufactured in fully automatic batching plant and transported to site of work in transit mixer for any lead having continuous agitated mixer , manufactured as per mix design of specified grade for RCC work including pumping of RMC from transit mixer to site of laying including the cost of centering shuttering(height upto 4.2M) finishing and excluding reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. Without Fly Ash (Min cement

level as per latest IS 456 shall be maintained) (Cement level 410 kg) for Slab /Shelves/ landing balconies, access platform , staircase at First Floor

Workmanship
The relevant specifications of item No.15 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 15 shall be followed:

Item no. 56. Providing and laying in position machine batched and machine mixed design mix M-300 grade concrete for reinforced cement conctere work , using cement content as per approved Design Mix manufactured in fully automatic batching plant and transported to site of work in transit mixer for any lead having continuous agitated mixer , manufactured as per mix design of specified grade for RCC work including pumping of RMC from transit mixer to site of laying including the cost of centering shuttering (height upto 4.2M) finishing and excluding reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. Without Fly Ash (Min cement level as per latest IS 456 shall be maintained) (Cement level 410 kg) for Slab /Shelves/ landing balconies, access platform , staircase at Second Floor

Workmanship
The relevant specifications of item No.15 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 15 shall be followed:

Item no. 57. Providing and laying in position machine batched and machine mixed design mix M-300 grade concrete for reinforced cement conctere work , using cement content as per approved Design Mix manufactured in fully automatic batching plant and transported to site of work in transit mixer for any lead having continuous agitated mixer , manufactured as per mix design of specified grade for RCC work including pumping of RMC from transit mixer to site of laying including the cost of centering shuttering (height upto 4.2M) finishing and excluding reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. Without Fly Ash (Min cement level as per latest IS 456 shall be maintained) (Cement level 410 kg) for Slab /Shelves/ landing balconies, access platform , staircase at Third Floor

Workmanship
The relevant specifications of item No.15 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 15 shall be followed:

Item no. 58. Providing and laying in position machine batched and machine mixed design mix M-300 grade concrete for reinforced cement conctere work , using cement content as per approved Design Mix manufactured in fully automatic batching plant and transported to site of work in transit mixer for any lead having continuous agitated mixer , manufactured as per mix design of specified grade for RCC work including pumping of RMC from transit mixer to site of laying including the cost of centering shuttering (height upto 4.2M) finishing and excluding reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. Without Fly Ash (Min cement level as per latest IS 456 shall be maintained) (Cement level 410 kg) for Slab /Shelves/ landing balconies, access platform , staircase at Fourth Floor

Workmanship
The relevant specifications of item No.15 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 15 shall be followed:

Item no. 59. Providing and laying in position machine batched and machine mixed design mix M-300 grade concrete for reinforced cement conctere work , using cement content as per approved Design Mix manufactured in fully automatic batching plant and transported to site of work in transit mixer for any lead having continuous agitated mixer , manufactured as per mix design of specified grade for RCC work including pumping of RMC from transit mixer to site of laying including the cost of centering shuttering (height upto 4.2M) finishing and excluding reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. Without Fly Ash (Min cement level as per latest IS 456 shall be maintained) (Cement level 410 kg) for Slab /Shelves/ landing balconies, access platform , staircase at Fifth Floor

Workmanship
The relevant specifications of item No.15 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 15 shall be followed:

Item no. 60. Providing and laying in position machine batched and machine mixed design mix M-300 grade concrete for reinforced cement conctere work , using cement content as per approved Design Mix manufactured in fully automatic batching plant and transported to site of work in transit mixer for any lead having continuous agitated mixer , manufactured as per mix design of specified grade for RCC work including pumping of RMC from transit mixer to site of laying including the cost of centering shuttering (height upto 4.2M) finishing and excluding reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. Without Fly Ash (Min cement level as per latest IS 456 shall be maintained) (Cement level 410 kg) for Slab /Shelves/ landing balconies, access platform , staircase at Sixth Floor

Workmanship
The relevant specifications of item No.15 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 15 shall be followed:

Item no. 61. Providing and laying in position machine batched and machine mixed design mix M-300 grade concrete for reinforced cement conctere work , using cement content as per approved Design Mix manufactured in fully automatic batching plant and transported to site of work in transit mixer for any lead having continuous agitated mixer , manufactured as per mix design of specified grade for RCC work including pumping of RMC from transit mixer to site of laying including the cost of centering shuttering (height upto 4.2M) finishing and excluding reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. Without Fly Ash (Min cement level as per latest IS 456 shall be maintained) (Cement level 410 kg) for Slab /Shelves/ landing balconies, access platform , staircase at Seventh Floor

Workmanship
The relevant specifications of item No.15 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 15 shall be followed:

Item no. 62. Providing and laying in position machine batched and machine mixed design mix M-300 grade concrete for reinforced cement conctere work , using cement content as per approved Design Mix manufactured in fully automatic batching plant and transported to site of work in transit mixer for any lead having continuous agitated mixer , manufactured as per mix design of specified grade for RCC work including pumping of RMC from transit mixer to site of laying including the cost of centering shuttering (height upto 4.2M) finishing and excluding reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. Without Fly Ash (Min cement level as per latest IS 456 shall be maintained) (Cement level 410 kg) for Slab /Shelves/ landing balconies, access platform , staircase at Eightth Floor

Workmanship
The relevant specifications of item No.15 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 15 shall be followed:

Item no. 63. Providing and laying in position machine batched and machine mixed design mix M-300 grade concrete for reinforced cement conctere work , using cement content as per approved Design Mix manufactured in fully automatic batching plant and transported to site of work in transit mixer for any lead having continuous agitated mixer , manufactured as per mix design of specified grade for RCC work including pumping of RMC from transit mixer to site of laying including the cost of centering shuttering (height upto 4.2M) finishing and excluding reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. Without Fly Ash (Min cement level as per latest IS 456 shall be maintained) (Cement level 410 kg) for Slab /Shelves/ landing balconies, access platform , staircase at Ninth Floor

Workmanship
The relevant specifications of item No.15 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 15 shall be followed:

Item no. 64. Providing and laying in position machine batched and machine mixed design mix M-300 grade concrete for reinforced cement conctere work , using cement content as per approved Design Mix manufactured in fully automatic batching plant and transported to site of work in transit mixer for any lead having continuous agitated mixer , manufactured as per mix design of specified grade for RCC work including pumping of RMC from transit mixer to site of laying including the cost of centering shuttering (height upto 4.2M) finishing and excluding reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. Without Fly Ash (Min cement level as per latest IS 456 shall be maintained) (Cement level 410 kg) for Slab /Shelves/ landing balconies, access platform , staircase at Terrace Floor

Workmanship
The relevant specifications of item No.15 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 15 shall be followed:

Item no. 65.

Extra for Additional height of proping and centering where the height of propping and centering exceeds 4.2 m between supporting floor to ceilling upto 8.4 M.

Workmanship
FORM WORK (CENTRING & SHUTTERING)

Form Work Form work shall include all temporary or permanent forms or moulds required for forming the concrete which is cast-in-situ, together with all temporary construction required for their support.

Design & Tolerance in Construction Form work shall be designed and constructed to the shapes, lines and dimensions shown on the drawings with the tolerance given below.
(a) Deviation from specified dimension of cross section of columns and beams +10 mm -5 mm (b) Deviation from dimensions of footings (i) Dimension in Plan (+ 50 mm (-10 mm (ii) Eccentricity in plan 0.02 times the width of the footing in the direction of deviation but not more than 50 mm. (iii) Thickness +50mm Or ± 0.05 times the specified thickness Whichever is less (Note- These tolerance apply to concrete dimensions only, and not to positioning of vertical steel or dowels).

General Requirement It shall be strong enough to withstand the dead and live loads and forces caused by ramming and vibrations of concrete and other incidental loads, imposed upon it during and after casting of concrete. It shall be made sufficiently rigid by using adequate number of ties and braces, screw jacks or hard board wedges where required shall be provided to make up any settlement in the form work either before or during the placing of concrete. Form shall be so constructed as to be removable in sections in the desired sequence, without damaging the surface of concrete or disturbing other sections, care shall be taken to see that no piece is keyed into the concrete.

Material for Form Work (a) Propping and Centering : All propping and centering should be either of steel tubes with extension pieces or built up sections of rolled steel.

(a) Centering/Staging : Staging should be as designed with required extension pieces as approved by Engineer-in-Charge to ensure proper slopes, as per design for slabs/ beams etc. and as per levels as shown in drawing. All the staging to be either of Tubular steel structure with adequate bracings as approved or made of built up structural sections made form rolled structural steel sections. (b) In case of structures with two or more floors, the weight of concrete, centering and shuttering of any upper floor being cast shall be suitably supported on one floor below the top most floor already cast. (c) Form work and concreting of upper floor shall not be done until concrete of lower floor has set at least for 14 days.
Shuttering: Shuttering used shall be of sufficient stiffness to avoid excessive deflection and joints shall be tightly butted to avoid leakage of slurry. If required, rubberized lining of material as approved by the Engineer-in-Charge shall be provided in the joints. Steel shuttering used or concreting should be sufficiently stiffened. The steel shuttering should also be properly repaired before use and properly cleaned to avoid stains, honey combing, seepage of slurry through joints etc. (a) Runner Joists: RSJ, MS Channel or any other suitable section of the required size shall be used as runners. (b) Assembly of beam head over props. Beam head is an adopter that fits snugly on the head plates of props to provide wider support under beam bottoms. (c) Only steel shuttering shall be used, except for unavoidable portions and very small works for which 12 mm thick water proofing ply of approved quality may be used.

Form work shall be properly designed for self weight, weight of reinforcement, weight of fresh concrete, and in addition, the various live loads likely to be imposed during the construction process (such as workmen, materials and equipment). In case the height of centering exceeds 3.50 metres, the prop may be provided in multi-stages.
Camber: Suitable camber shall be provided in horizontal members of structure, especially in cantilever spans to counteract the effect of deflection. The form work shall be so assembled as to provide for camber. The camber for beams and slabs shall be 4 mm per metre (1 to 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 1/50th of the projected length or as directed by the Engineer-in-Charge.

Walls : The form faces have to be kept at fixed distance apart and an arrangement of wall ties with spacer tubes or bolts is considered best. The two shutters of the wall are to be kept in place by appropriate ties, braces and studs,

Removal of Form work (Stripping Time) : In normal circumstance and where various types of cements are used, forms, may generally be removed after the expiry of the following periods: Type of Form work Minimum period Before Striking Form work for OPC 33 grade Minimum period Before Striking Form work for OPC 43 grade Minimum period Before Striking Form work for PPC (a) Vertical form work to columns, walls,

Type of Form work Minimum period Before Striking Form work for OPC 33 grade Minimum period Before Striking Form work for OPC 43 grade Minimum period Before Striking Form work for PPC (b) Soffit form work to slabs (Props to be refixed immediately after removal of formwork) 3 days 3 days 4 days (c) Soffit form work to beams (Props to be refixed immediately after removal of formwork 7 days 7 days 10 days (d) Props to slabs: (1) Spanning upto 4.5m (2) Spanning over 4.5m 7 days 14 days 7 days 14 days 10 days 20 days (e) Props to beams and arches: (1) Spanning upto 6m (2) Spanning over 6m 14 days 21 days 14 days 21 days 20 days 30 days

Note 1: For other types of cement, the stripping time recommended for ordinary Portland cement may be suitably modified. Generally If Portland Pozzolana or low heat cement or OPC with direct addition of fly ash has been used for concrete, the stripping time will be 10/7 of the period stated for OPC with 43 grade cement above.
Note 2: The number of props left under, their sizes and disposition shall be such as to be able to safely carry the full dead load of the slabs, beam or arch as the case may be together with any live load likely to occur during curing or further construction.
Note 3: For rapid hardening cement, 3/7 of above periods for OPC 33 grade will be sufficient in all cases except for vertical side of slabs, beams and columns which should be retained for at least 24 hours.
Note 4: In case of cantilever slabs and beams, the centering shall remain till structures for counter acting or bearing down have been erected and have attained sufficient strength.
Note 5: Proper precautions should be taken to allow for the decrease in the rate of hardening that occurs with all types of cement in cold weather and accordingly stripping time shall be increased. Note 6: Work damaged through premature or careless removal of forms shall be reconstructed within 24 hrs.
Surface Treatment

Oiling the Surface : Shuttering gives much longer service life if the surfaces are coated with suitable mould oil which acts both as a parting agent and also gives surface protections. A typical mould oil is heavy mineral oil or purified cylinder oil containing not less than 5% pentachlorophenol conforming to IS 716 well mixed to a viscosity of 70-80 centipoises. After 3-4 uses and also in cases when shuttering has been stored for a long time, it should be recoated with mould oil before the next use. The second categories of shuttering oils / leavening agents are Polymer based water soluble Compounds. They are available as concentrates and when used diluted with water in the ratio of 1:20 or as per manufacturer specifications. The diluted solution is applied by brush applications on the shuttering both of steel as well as ply wood. The solution is applied after every use. The design of form work shall conform to sound Engineering practices and relevant IS codes. 5.2.5 Inspection of Form Work The completed form work shall be inspected and approved by the Engineer-in-Charge before the reinforcement bars are placed in position. Proper form work should be adopted for concreting so as to avoid honey combing, blow holes, grout loss, stains or discoloration of concrete etc. Proper and accurate alignment and profile of finished concrete surface will be ensured by proper designing and erection of form work which will be approved by Engineer-in-Charge. Shuttering surface before concreting should be free from any defect/ deposits and full cleaned so as to give perfectly straight smooth concrete surface. Shuttering surface should be therefore checked for any damage to its surface and excessive roughness before use.
Erection of Form Work (Centering and shuttering): Following points shall be borne in mind while checking during erection. (a) Any member which is to remain in position after the general dismantling is done, should be clearly marked. (b) Material used should be checked to ensure that, wrong items/ rejects are not used. (c) If there are any excavations nearby which may influence the safety of form works, corrective and strengthening action must be taken. (d) (i) The bearing soil must be sound and well prepared and the sole plates shall bear well on the ground. (ii) Sole plates shall be properly seated on their bearing pads or sleepers. (iii) The bearing plates of steel props shall not be distorted. (iv) The steel parts on the bearing members shall have adequate bearing areas. (e) Safety measures to prevent impact of traffic, scour due to water etc. should be taken. Adequate precautionary measures shall be taken to prevent accidental impacts etc. (f) Bracing, struts and ties shall be installed along with the progress of form work to ensure strength and stability of form work at intermediate stage. Steel sections (especially deep sections) shall be adequately restrained against tilting, over turning and form work should be restrained against horizontal loads. All the securing devices and bracing shall be tightened. (g) The stacked materials shall be placed as catered for, in the design. (h) When adjustable steel props are used. They should: 1. be undamaged and not visibly bent. 2. have the steel pins provided by the manufacturers for use. 3. be restrained laterally near each end. 4. have means for centralizing beams placed in the forkheads. (i) Screw adjustment of adjustable props shall not be over extended. (j) Double wedges shall be provided for adjustment of the form to the required position wherever any settlement/ elastic shorting of props occurs. Wedges should be used only at the bottom end of single prop. Wedges should not be too steep and one of the pair should be tightened/ clamped down after adjustment to prevent shifting. (k) No member shall be eccentric upon vertical member. (l) The number of nuts and bolts shall be adequate. (m) All provisions of the design and/or drawings shall be complied with. (n) Cantilever supports shall be adequate. (o) Props shall be directly under one another in multistage constructions as far as possible. (p) Guy ropes or stays shall be tensioned properly. (q) There shall be adequate provision for the movements and operation of vibrators and other construction plant and equipment. (r) Required camber shall be provided over long spans. (s) Supports shall be adequate, and in plumb within the specified tolerances.

Guidelines for Multistage Certering: The proper handling the situation of multistage centering in buildings or where height of casting of concrete is higher than normal height of 3.5 M or where higher loadings are coming during casting of concrete or large span structures and in situations of casting of some special structures like Domes, Vaults etc. In all situations, centering/scaffolding/staging for casting of these structures should be properly designed by a qualified and experienced person/agency having past experience in design of false work (centering) for concrete structures and should be proof checked by similar experienced person/ agency and it should be properly approved and issued to contractor by Engineer-In-Charge. The provisions of clause 7 of IS:14687 may be referred for design of false work (centering). A method statement for erection and dismantling of the centering/scaffolding/staging and process of concreting shall be prepared by contractor and submitted to Engineer-in-Charge for approval and the work shall be commenced only after approval of method statement by Engineer-in-Charge. The provisions of clause 9 of IS:14687 may be referred for erection of false work (centering), safety precautions and other site operations, pertaining to false work (centering). Experienced form watcher shall be engaged during erection, concreting and dismantling for early detection of any movement or instability in the system. The field engineers shall ensure that CPWD specifications and provisions of BIS codes are strictly followed. A detailed programme of field safety inspection of centering/scaffolding/form work of such structures during different stages should be chalked out and strictly followed. Provision of

safety net, fall arresting system including other safety gears, for workers, working over these structures shall be made in contract and should be followed strictly. 5.2.6 MEASUREMENTS
5.2.6.1 General : The form work shall include the following: (a) Splayed edges, notching, allowance for overlaps and passing at angles, sheathing battens, strutting, bolting, nailing, wedging, easing, striking and removal. (b) All supports, struts, braces, wedges as well as mud sills, piles or other suitable arrangements to support the form work. (c) Bolts, wire, ties, clamps, spreaders, nails or any other items to hold the sheathing together. (d) Working scaffolds, ladders, gangways, and similar items. (e) Filleting to form stop chamfered edges of splayed external angles not exceeding 20mm wide to beams, columns and the like. (f) Where required, the temporary openings provided in the forms for pouring concrete, inserting vibrators, and cleaning holes for removing rubbish from the interior of the sheathing before pouring concrete. (g) Dressing with oil to prevent adhesion and (h) Raking or circular cutting

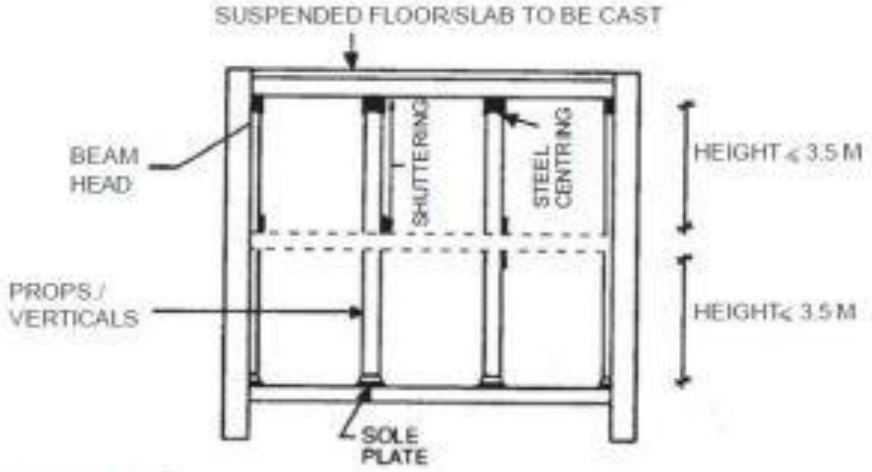
Classification of Measurements: Where it is stipulated that the form work shall be paid for separately, measurements shall be taken of the area of shuttering in contact with the concrete surface. Dimensions of the form work shall be measured correct to a cm. The measurements shall be taken separately for the following. (a) Foundations, footings, bases of columns etc. and for mass concrete (b) Walls (any thickness) including attached pilasters, buttresses, plinth and string courses etc. (c) Suspended floors, roofs, landings, shelves and their supports and balconies. (d) Lintels, beams, plinth beams, girders, bressummers and cantilevers. (e) Columns, pillars, piers, abutments posts and struts. (f) Stairs (excluding landings) except spiral staircase. (g) Spiral staircases (including landings). (h) Arches, Domes, vaults, shells roofs, arch ribs, curvilinear shaped folded plates (i) Extra for arches, domes, vaults exceeding 6 m span other than curvilinear shaped (j) Chimneys and shafts. (k) Well steining. (l) Vertical and horizontal fins individually or forming box, louvers and bands.facias and eaves board (m) Waffle or ribbed slabs. (n) Edges of slabs and breaks in floors and walls (to be measured in running metres where below 200 mm in width or thickness). (o) Cornices and mouldings. (p) Small surfaces, such as cantilevers ends, brackets and ends of steps, caps and boxes to pilasters and columns and the like. (q) Chullah hoods, weather shades, chajjas, corbels etc. including edges and (r) Elevated water reservoirs.
Centering, and shuttering where exceeding 3.5 metre height in one floor shall be measured and paid for separately.
Where it is not specifically stated in the description of the item that form work shall be paid for separately, the rate of the RCC item shall be deemed to include the cost of form work.

No deductions from the shuttering due to the openings/ obstructions shall be made if the area of each openings/ obstructions does not exceed 0.4 square metre. Nothing extra shall be paid for forming such openings.
Form work of elements measured under categories of arches, arch ribs, domes, spiral staircases, well steining, shell roofs, curvilinear folded plates & curvilinear eaves board, circular shafts & chimneys shall not qualify for extra rate for circular work.
Extra for circular work shall be admissible for surfaces circular or curvilinear in plan or in elevation beyond the straight edge of supporting beam in respective mode of measurement. However, there may be many different types of such structures. In such cases, extra payment shall be made judiciously after deducting areas where shuttering for circular form work is not involved.

Rate The rate of the form work includes the cost of labour and materials required for all the operations described above
Mode of Measurement &Payment
The rate shall be for a unit of one sq. meter

TYPICAL DETAILS OF MULTI STAGE SHUTTERING

Sub Head : R.C.C. (Form Work)
Clause : 5.2.3.4



All Members are of Steel

Fig. 5.9A : Suspended Floor – Multi Stage Shuttering (Vertical Section)

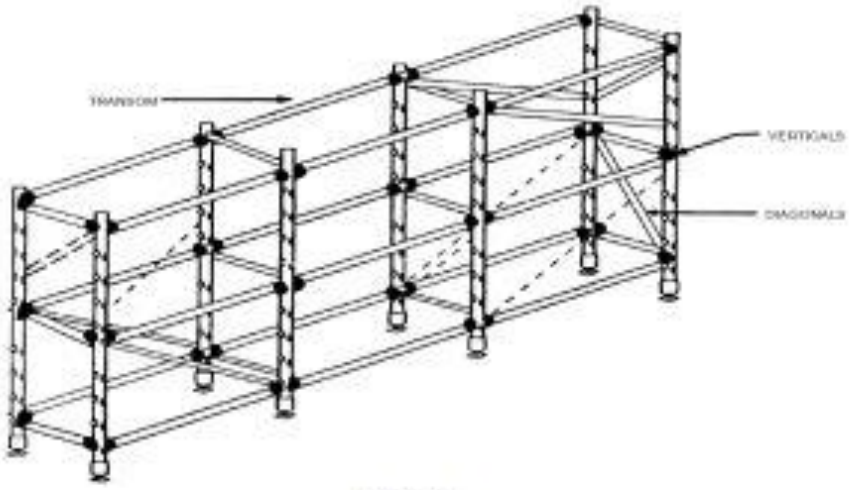


Fig. 5.9B

Fig. 5.9 : Typical Details of Multi-State Shuttering

Item no. 66.
Providing and fixing in position Stainless steel Grade 304 plate-1.0 mm thick as per design for expansion joints 200mm wide.

EXPANSION JOINT COVERING WITH STAINLESS STEEL GRADE 304
5.7B.1 Material: General requirement to the supply of material shall conform to IS 1387:1993 Stainless steel sheets and strips shall be free from harmful defects such as scale, rust, blisters, laminations, cracked edges and seams.
5.7B.2 Chemical composition: It shall be as given in table 1 of IS 5522 : 2014 with permissible variations between specified analysis and check analysis as per table 2 of IS 5522 : 2014 when the analysis of steel carried out according to IS :228 and its relevant parts.
5.7B.3 Tolerances: The tolerances for thickness shall be as per clause 10.1 of IS 1387 : 1993
5.7B.4 Mechanical properties: The mechanical properties of the material shall be as per Table-3 of IS 1387 : 1993
5.7B.5 Frequency of sampling: One test shall be made on each coil and for every 100 sheets for each size of the same cast.
5.7B.6 Measurement :The length of sheet shall be measured, correct to a cm.
5.7B.7 Rate : The rate shall be inclusive of all material and labour involved in fixing stainless steel plate over expansion joints.

Item no. 67.
Providing and fixing of expansion joint system related with floor location as per drawings and direction of Engineer-In-Charge. The joints system will be of extruded aluminum base members, self aligning / self centering arrangement and support plates etc. as per ASTM B221-02. The system shall be such that it provides floor to floor /floor to wall expansion control system for various vertical localtion in load application areas that accommodates multi directional seismic movement without stress to it's components. System shall consist of metal profiles with a universal aluminum base member designed to accommodate various project conditions and finish floor treatments. The cover plate shall be designed of width and thickness required to satisfy projects movement and loading requirements and secured to base members by utilizing manufacturer's pre-engineered self-centering arrangement that freely rotates / moves in all directions. 100mm gap

General requirement of material The expansion joint system will be of extruded aluminum base members, self aligning /self centering arrangement and support plates etc. as per ASTM B221-02. The system shall be such that it provides floor to floor/ floor to wall expansion control system for various vertical locations in load application areas that accommodate multi directional seismic movement without stress to its components. The system shall consist of metal profiles with universal aluminum base member designed to accommodate various project conditions and finish floor treatments. The cover plate shall be designed of width and thickness required to satisfy projects movement and loading requirements and secured to base members by utilizing manufacturer's pre-engineered self centering arrangement that freely rotates/ moves in all directions. The self-centering arrangements shall exhibit circular sphere ends that lock and slide inside the corresponding aluminum extrusion cavity to allow freedom of movement and flexure in all directions including vertical displacement. Provision of moisture barrier membrane in the joint system to have water tight joint is mandatory requirement. The scope of work includes all labour, materials, equipments and services and perform all operations required for complete installation of expansion joint system. 5.12.1.2 Performance Requirement: Material and works shall conform to the latest edition of reference specifications as specified in the item and to all applicable codes and requirement of local authorities having jurisdiction.
5.12.1.3 Approval of expansion joint system : Sample of expansion joint system along with manufacturers latest published literature for material specified herein, material test reports, shop drawings etc. shall be submitted for obtaining approval before material are delivered at the site. The expansion joint cover assembly should be from one source (from single manufacturer)
5.12.1.4 Installation of expansion joint system: In all cases the manufacturer's standard written instruction or specific instructions for installation shall be followed.
5.12.1.5 Measurement :The length of expansion joint shall be measured, correct mtr.
5.12.1.6 Rate : The rate shall be inclusive of all material and labour involved in providing & fixing of expansion joint.

Item no. 68.
Providing and fixing of expansion joint system of approved make and manufactures for various roof locations as per approved drawings and direction of Engineer-In-Charge. The joints shall be of extruded aluminum base members with, self aligning and self centering arragement support plates asper ASTM B221-02. The system shall be such that it provides watertight roof to roof/roof to corner joint cover expansion control system that is capable of accommodating multidirectional seismic movement without stress to its components. System shall consist of metal profile that incorporates a universal aluminum base member designed to accommodate various project conditions and roof treatments. The cover plate shall be designed of width and thickness required to satisfy movement and loading requirements and secured to base members by utilizing manufacturer's pre-engineered self-centering arrangement that freely rotates / moves in all directions. 100mm gap

General requirement of material The expansion joint system related with wall joint (internal/ external) shall be of extruded aluminum base members, self aligning / centering arrangement and support plates as per ASTM B221-02. The material shall be such that it provides an Expansion joints systems suitable for vertical wall to wall/ wall to corner application, both new and existing construction in office buildings & complexes with no slipping down tendency amongst the components of the joint system. The Joint System shall utilize light weight aluminum profiles exhibiting minimal exposed aluminum surfaces mechanically snap locking the multicellular to facilitate movement. (Material shall confirm to ASTM 6063)
5.12.2.2 Performance Requirement: Material and works shall conform to the latest edition of reference specifications as specified in the item and to all applicable codes and requirement of local authorities having jurisdiction.
5.12.2.3 Approval of expansion joint system : Sample of expansion joint system along with manufacturers latest published literature for material specified herein, material test reports, shop drawings etc. shall be submitted for obtaining approval before material are delivered at the site. The expansion joint cover assembly should be from one source (from single manufacturer)
5.12.2.4 Installation of expansion joint system: In all cases the manufacturer's standard written instruction or specific instructions for installation shall be followed.
5.12.2.5 Measurement :The length of expansion joint shall be measured, correct to a cm.
5.12.2.6 Rate : The rate shall be inclusive of all material and labour involved in providing & fixing of expansion joint.

Item no. 69.
Providing and fixing of expansion joint system of approved make and manufactures for various roof locations as per approved drawings and direction of Engineer-In-Charge. The joints shall be of extruded aluminum base members with, self aligning and self centering arragement support plates asper ASTM B221-02. The system shall be such that it provides watertight roof to roof/roof to corner joint cover expansion control system that is capable of accommodating multidirectional seismic movement without stress to its components. System shall consist of metal profile that incorporates a universal aluminum base member designed to accommodate various project conditions and roof treatments. The cover plate shall be designed of width and thickness required to satisfy movement and loading requirements and secured to base members by utilizing manufacturer's pre-engineered self-centering arrangement that freely rotates / moves in all directions. 100mm gap

General requirement of material Theexpansion joint system for various roof locations shall be of extruded aluminum base members with, self aligning and self centering arrangement support plates as per ASTM B221-02. The system shall be such that provides that is capable to accommodating multidirectional seismic movement without stress to its components. System shall consist of metal profile that incorporates a universal aluminum base member designed to accommodate various project conditions and roof treatments. The cover plate shall be designed of width and thickness required to satisfy movement and loading requirements and secured to base members by utilizing manufacturer's pre-engineered self-centering arrangement that freely rotates/ moves in all directions. The self centering arrangement shall exhibit circular sphere ends that lock and slide inside the corresponding aluminum extrusion cavity to allow freedom of movement and flexures in all directions including vertical displacement. The joint system shall resists damage or deterioration from the impact of allying ice, exposure to UV, airborne contaminants and occasional foot traffic from maintenance personnel. Provision of moisture barrier membrane in the joint system to have water tight joint is mandatory requirement. 5.12.3.2 Performance Requirement: Material and works shall conform to the latest edition of reference specifications as specified in the item and to all applicable codes and requirement of local authorities having jurisdiction. 5.12.3.3 Approval of expansion joint system : Sample of expansion joint system along with manufacturers latest published literature for material specified herein, material test reports, shop drawings etc. shall be submitted for obtaining approval before material are delivered at the site. The expansion joint cover assembly should be from one source (from single manufacturer) 5.12.3.4 Installation of expansion joint system: In all cases the manufacturer's standard written instruction or specific instructions for installation shall be followed. 5.12.3.5 Measurement :The length of expansion joint shall be measured, correct to a cm. 5.12.3.6 Rate : The rate shall be inclusive of all material and labour involved in providing & fixing of expansion joint.

Item no. 70. Constructing cast-in situ RCC diaphragm wall by providing and laying machine batched, machine mixed, self compacting, ready mix reinforced cement concrete, tramie controlled, of M 30 grade using minimum 400 kg. cement per cum of concrete including providing and mixing required admixtures in recommended proportions as per IS : 9103, as approved by the Engineer-in-charge, for achieving 150- 200mm slump, for diaphragm wall having thickness as per approved structural design not exceeding 600 mm, in pannels of required depth and lengths as per approved drawing, including constructing necessary guide walls as required and as specified including boring in all kinds of soils and rocks,including working in or under water and / or liquid mud, in foul conditions and pumping or bailing out of water and removing slush, including disposal of earth/ rock / slush etc. for all leads and all lifts, including preparing,providing and re-circulating bentonite slurry in the trench as and when required for all depths, including agitating bentonite slurry during trenching etc., providing and fixing stop ends or form tubes, upto the required depth of diaphragm wall including extracting the same after casting,including chipping off the bentonite adulterated concrete or unsound concrete up to the cut off level for obtaining the sound concrete, dressing undulations on the exposed face of diaphragm wall after excavation by chipping / chiseling etc. including filling the depression/ cavities with sound concrete etc. complete and as directed by the Engineer-in-charge, including providing recess for bearing plates and fixing insert boxes for inclined rock anchors etc. complete as per the specifications and approved design and as directed by the Engineer-in-charge, but excluding the cost of reinforcement and inserts.

5.8B R.C.C. DIRPHRAGM WALL
5.8B.1 GENERAL Reinforced cement concrete work shall be cast-in-situ as directed by Engineer-in-Charge according to the nature of work. Reinforced cement concrete work shall comprise of the following which may be paid collectively as per the description of the item of work. Form work shall be paid separately.
(a) Reinforcement
(b) Self compacting design mix concrete of minimum grade M30 with suitable Retarder / Plasticizer: (Cast-in-situ) with tremie controlled pipe
(c) Bentonite slurry
(d) Concrete mix 1:2:4 for guide walls.
5.8B.2 MATERIALS
5.8B.2.1 Water, cement, fine and coarse aggregate shall be as specified under respective clauses of chapter 03 of mortars, chapter 04 of concretework and chapter 20 of Pile Work as applicable. 5.8B.2.2 Fly Ash admixed cement concrete (FACC) and fly ash blended cements in Cement Concrete (PPCC) in RCC structures. 5.8B.2.2.1 Fly ash Blended Cements conforming to IS 1489 (Part I) may be used in RCC structures as per guidelines given below:
5.8B.2.2.2 General (i) IS 456- 2000 Code of Practice for Plain and Reinforced Concrete (as amended up to date) shall be followed in regard to Concrete Mix Proportion and its production as under:
(a) The concrete mix design shall be done as "Design Mix Concrete" as prescribed in clause-9of IS 456 mentioned above.
(b) Concrete shall be manufactured in accordance with clause 10 of above mentioned IS 456covering quality assurance measures both technical and organizational, which shall alsonecessarily require a qualified Concrete Technologist to be available during manufacture ofconcrete for certification of quality of concrete. (ii) Minimum M-30 grade of concrete shall be used in all structural elements. (iii) The mechanical properties such as modulus of elasticity, tensile strength, creep and shrinkage offly ash mixed concrete or concrete using fly ash blended cements (PPCs) are not likely to besignificantly different and their values are to be taken same as those used for concrete made with OPC. (iv) To control higher rate of carbonation in early ages of concrete both in fly ash admixed as well as PPC based concrete, water/binder ratio shall be kept as low as possible, which shall be closelymonitored during concrete manufacture. If necessitated due to low water/binder ratio, required workability shall be achieved by use

ofchloride free chemical admixtures conforming to IS 9103. The compatibility of chemical admixtures and super plasticizers with each set OPC, fly ash and /or PPC received from different sources shall be ensured by trials. (v) In environment subjected to aggressive chloride or sulphate attack in particular, use of fly ash admixed or PPC based concrete is recommended. In cases, where structural concrete isexposed to excessive magnesium sulphate, flyash substitution/content shall be limited to 18% byweight. Special type of cement with low C3A content may also be alternatively used. Durabilitycriteria like minimum binder content and maximum water /binder ratio also need to be given dueconsideration in such environment. (vi) Curing as per provision in IS 456:2000 (with amendment). Wet curing period shall be enhanced to a minimum of 10 days or its equivalent. In hot & aridregions, the minimum curing period shall be 14 days or its equivalent. 5.8B.3 Steel for reinforcement Steel shall be thermo mechanically treated bar Fe-500D as perIS1786-2008 (with amendments) or more as per as per clause 5.1.3 of CPWD Specification Vol.I, 2019 with upto date correction slips.

5.8B.3.1 Cover Cover as per IS456:2000 (with amendment) and clause 5.3.3.5 of CPWD Specification Vol.I, 2019

5.8B.4 Concreting Constructing cast-in situ RCC diaphragm wall by providing and laying machine batched, machine mixed, self-compacting, ready mix reinforced cement concrete, tremie controlled.

5.8B.4.1 Strength of concrete As per IS 456:2000 with amendments. 5.8B.5 SELF COMPACTING CONCRETE Self-compacting concrete shall be able to flow under its own weight and completely fill the formwork, even in the presence of dense reinforcement, without the need of any vibration, whilst maintaining homogeny.

5.8B.5.1 Guiding Technical specification for Self compacting concrete. The specification, performance and conformity requirements for structural concrete are given in IS 456-2000 Annex - J. Test methods. The filling ability and stability of self-compacting concrete in the fresh state shall be defined by four key characteristics like flow ability viscosity, passing ability &Segregation resistance. Each characteristic shall be addressed by one or more test methods: Grade M30 & above Cementitious content 400 – 600kg / m3 Admixtures PCE based & Viscosity Modifiers or as per design mix Flow 550 – 850 mm T 50 time Time of 2-5 seconds V-Funnel Time Max 25 seconds L – Box ratio 0.8 – 1.0 Compressive Strength As per Specification of IS 456. Characteristic Preferred test method(s) Flow ability Slump-flow test Viscosity (assessed by rate of flow) T500 Slump-flow test or V-funnel test Passing ability L-box test

5.8B.5.2 Slump-flow Slump-flow value describes the flow ability of a fresh mix in unconfined conditions. It is a sensitive test that will normally be specified for all SCC, as the primary check that the fresh concrete consistence meets the specification. Visual observations during the test and/or measurement of the T500 time can give additional information on the segregation resistance and uniformity of each delivery. The following are typical slump-flow classes for a range of applications: SF1 (550 - 650 mm) is appropriate for: • Unreinforced or slightly reinforced concrete structures that are cast from the top with free displacement from the delivery point (e.g. housing slabs) • Casting by a pump injection system (e.g. tunnel linings) • Sections that are small enough to prevent long horizontal flow (e.g. piles and some deep foundations). SF2 (660 - 750 mm) is suitable for many normal applications (e.g. walls, columns) SF3 (760 – 850 mm) is typically produced with a small maximum size of aggregates (less than 16 mm) and is used for vertical applications in very congested structures, structures with complex shapes, or for filling under formwork. SF3 will often give better surface finish than SF 2 for normal vertical applications but segregation resistance is more difficult to control. Target values higher than 850 mm may be specified in some special cases but great care should be taken regarding segregation and the maximum size of aggregate should normally be lower than 12 mm.

5.8B.5.3 Viscosity Viscosity can be assessed by the T500 time during the slump-flow test or assessed by the V-funnel flow time. The time value obtained does not measure the viscosity of SCC but is related to it by describing the rate of flow. Concrete with a low viscosity will have a very quick initial flow and then stop. Concrete with a high viscosity may continue to creep forward over an extended time. Class Slump – Flow in mm Conformity criteria SF 1 550 to 650 >520 & 640 & 740 &

5.8B.6 Specifications for diaphragm wall

(i) Cast-in-situ RCC diaphragm wall shall be as per IS14344:1996.

(ii) Rigid type of diaphragm wall or plastic concrete diaphragm wall shall be constructed by resorting to either successive panel method or alternate panel method. For cement bentonite slurry trench diaphragm wall, alternate panel method of construction is suitable in view of the time that is require to achieve hardness of the mix put in the trench.

5.8B.6.1 Tolerance:

(i) Guide walls: Finished faces of the guide wall toward the trench shall be vertical. There shall be no rigid or abrupt change of the guide wall and variation from a straight line or a specified profile shall not exceed 25mm in 3 meter.

(ii) Diaphragm wall: Verticality Face of the wall and ends of panel shall be vertical within a tolerance of 1:80. In positioning of reinforcement longitudinal tolerance of cage head at top of the guide wall measured along the trench, shall be 75mm and vertical tolerance at caged head in relation to top of guide wall shall be 50mm.

(iii) Testing Testing of material to be used for the work shall be done in a laboratory to confirm their usability as per applicable IS Standard. Mix for rigid concrete, plastic concrete and cement bentonite slurry shall be design in a laboratory and testing shall be done to ascertain various parameters like compressive and tensile strength, permeability, modulus of elasticity, erodibility, PH value, etc. to be confirm that the mix design satisfies the design parameter. Sample of mix at the time of placing shall be collected and kept in air tight sealed molds of specified size till due dates of various tests. Important test to be perform are as under: - (a) Compressive strength: Test shall be carried out at 7, 28 and 90 days. (b) Triaxial compressive strength test shall be carried out on filling material like plastic concrete, cement, bentonite etc. to determine stress strain characteristic, modulus of elasticity and shear parameters, test shall be carried out at 7, 28 and 90 days in consolidated undrained conditions. (c) Permeability test on sample shall be conducted after 28 days in membrane permeameter.

5.8B.6.2 Instrumentation:

(i) Placement of instruments simultaneously with casting of panel is difficult, as there is a possibility of damaging the instruments, wires etc., or losing their sensitivity due to vibrations generated during placement of concrete. It is, therefore, preferable to install the instrument outside the completed diaphragm wall to measure in-situ performance.

5.8B.6.2.1 Deformation of the structure For the purpose of measuring deformation behavior of the diaphragm, inclinometers at various location shall be installed close to the diaphragm wall.

5.8B.6.2.2 Settlement gauge Settlement gauged may be installed at selected locations to measured vertical displacement. Gauges shall not have an error of more than 1mm.

5.8B.6.2.3 Piezometric levels: To judge the efficiency in water tightness of the diaphragm wall, residual discharge collected downstream of the cut off wall is the essential measurement. This can be determined by a double network of Piezometers placed on either side of the wall and well protected by filters. Chemical and physical analysis water may be useful to pinpointed its source. Observations frequency shall not be more than 15 days.

5.8B.6.2.4 Permeability 100mm diameter tubes extending to random depths, shall be placed at the center of the thickness of the diaphragm panel at randomly chosen locations. After a period of 28 days bore holes may be drilled into the diaphragm below the tubes and permeability test by pumping in method carried out. The in-situ permeability of the diaphragm shall be compared with the specified limit as per requirement.

5.8B.7 Records Following records shall be maintained in a manner approved by the Engineer-in-charge.

(i) Name of Project/work.
(ii) Panel No. & reference drawing no.
(iii) Date of commencement and completion of excavation
(iv) Date of concreting of panel
(v) Length of panel
(vi) Thickness of panel
(vii) Top of guide wall level
(viii) Depth of guide wall
(ix) Top level of wall as cast, in relation to top of guide wall at the edges and at the center.
(x) Depth of panel from base of top of guide wall
(xi) Strata encountered
(xii) Volume of panel and volume of concrete used, slump, water cement ratio.
(xiii) Cube taken and their result.
(xiv) Details of reinforcement (cage type)
(xv) Detail of any obstructions/ peculiar conditions encountered and time spent and measures taken in overcoming them.
(xvi) Type and proportion of any additives used and reason for use.

5.8B.8 Measurement Actual area of diaphragm wall correct to two places of decimal, from design bottom level to the design cut off level (including portion incurred in the rock upto the design bottom level) only shall be measured for payment. “Excess/less cement used for design mix including the extra cement required under water concreting is payable/recoverable separately”.

5.8B.9 Rate The rate include cost of all inputs of labour, material and T&P, cost of handling, lifting and placing in position the reinforcement cage in the trench, including cost of reinforcement bar, welding, etc. involved in the work and all other incidental expenditure for completing the work as directed by the Engineer-in-charge shall include the cost of labour and material involved in all the operation described above.

Item no. 71. Brick work using common burnt clay building bricks having minimum crushing strength not less than 35 kg/ sq cm in foundation and plinth in cement mortar 1 : 6 (1 cement : 6 fine sand)

Materials

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

2.0. Workmanship

2.1. Proportion:

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

2.2. Wetting of bricks:

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

2.3. Laying:

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

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

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

2.3.4. The brick shall be laid with frog up wards. A set of tools comprising of wooden straight edges, 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 45degrees.

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 todone.

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 theday.

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.

3.2. No deduction shall be made from the quantity of brick work, for any extra payment made for embedding in masonry or making holes in respect of following items:

(1) Ends of joists, beams, posts, girders, purlins, trusses, corbel, steps etc. where cross sectional area does not exceed 500Sq.Cm.

(2) Openings not exceeding 1000Sq.Cm.

(3) Wall plates and bed plates, bearing of slabs, chajjas and the like whose thickness does not exceed 10 Cms. And the bearing does not extend to the full thickness of wall.

(4) Drainage holes, and recesses for cement concrete blocks to embed hold fasts for doors, windows etc.

(5) Iron fixtures, pipes up to 300 mm. dia hold fasts, and doors and windows built into masonry and pipes etc. for concealed wiring.

(6) Forming chases of section not exceeding 350 -Sq. Cm. in masonry.

3.3. Apertures for fire places shall not be deducted nor shall be paid for separately.

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

Item no. 72.

Masonary work using Aerated light weight concrete block having crushing strength not less than 35 kg/sqcm for super structure above plinth level laid with approved block laying polymer modified adhesive mortar all complete as per direction of engineer in charge and Technical Specification . Ground Floor

Workmanship

6.14 AUTOCLAVED AERATED CONCRETE BLOCK MASONRY WORK

6.14.1 Terminology For the purpose of, Autoclave Aerated Concrete Block masonry work, the following definitions shall apply

1. Autoclaved -Steam curing of concrete Products, sand lime bricks, asbestos cement products, hydrous calcium silicate insulation Products, or cement in an autoclave at maximum ambient temperatures generally between 1700C to 2150C.
2. Block - A concrete masonry unit, any one of the external dimensions of which is greater than the corresponding dimension of a brick as specified in IS : 3952-1978 and of such size and mass as to permit it to be handled by one man. Furthermore, to avoid confusion with slabs and Panels, the height of the block shall not exceed either its length or six times its width.
3. Block Density - The density calculated by dividing the mass of a block by the overall volume, including holes or cavities and end recesses..
4. Drying Shrinkage - The difference between the length of specimen which has been immersed in water and then subsequently dried to constant length, all under specified conditions; expressed as a percentage of the dry length of the specimen.
5. Gross Area-The total area occupied by a block on its loading face, including areas of the cavities and end recesses.
6. Height -The vertical dimension of the exposed face of a block, excluding any tongue or other device designed to provide mechanical keying
7. Length - The horizontal dimension of the exposed face of a block excluding any tongue or other device designed to provide mechanical keying.
8. Width -The external dimension of a block at the bedding plane, measured at right angles to the length and height of the block.

6.14.2 Dimensions & Tolerances: Autoclave Aerated Concrete Block shall be made in sizes and shapes to fit different concrete needs. They include stretcher, corner, double corner or pier, jamb, header, bull nose, partition block and concrete floor units. Autoclave Aerated Concrete Block shall be referred to by its normal dimension the term ‘normal’ means that the dimension includes the thickness of the mortar joints. The actual dimension shall be 10mm short of the normal dimension (or 6mm short in special areas finer joints as specified).

6.14.2.1 The normal dimension of the concrete block shall be as follows:- Length : 400, 500 or 600 mm Height : 200, 250 or 300 mm Width : 100, 150, 200 or 250 mm In addition, Autoclave Aerated Concrete Block shall be manufactured in half length of 200, 250 or 300 mm correspond to the full lengths.

6.14.2.2 The nominal dimensions of the units are so designed that taking account of the thickness of mortar joints, they will produce wall length sand heights which will conform to the principles of modular co-ordination.

6.14.2.3 Block of sizes other than those specified above, may also be used if so specified in the case of special Autoclave Aerated Concrete Block such as jallie or screen wall and ornamental block ,the specified size may not necessarily apply.

6.14.2.4 The maximum variation in the length of the Autoclave Aerated Concrete Block shall not be more than plus/minus 5mm and maximum variation in the height and width of Autoclave Aerated Concrete Block, not more than plus/minus 3mm.

6.14.2.5 The faces of Autoclave Aerated Concrete Block shall be flat & Rectangular, opposite faces shall be parallel and all arises shall be square. The bedding surfaces shall be at right angle to the face of the Blocks.

6.14.2.6 The Autoclave Aerated Concrete Block with special faces shall be manufactured and supplied if so specified.

6.14.3 The autoclaved Autoclave Aerated Concrete Block shall be classified in two grades according to their compressive strength as indicated in table

S. No.	Density in oven dry condition (Kg/m^2)	Compressive Strength (Min)		Thermal Condition in Air dry condition (W/m.k)
		Grade-I (N/mm^2)	Grade-II (N/mm^2)	
1	451 to 550	2.00	1.50	0.21
2	551 to 650	4.00	3.00	0.24
3	651 to 750	5.00	4.00	0.30
4	751 to 850	6.00	5.00	0.37
5	851 to 1000	7.00	6.00	0.42

6.14.4.1 Cement complying with any of the Indian Standard may be used as per the direction of the manufacturer.
6.14.4.2 Use of Fly ash conforming to IS 3812-1981 may be permitted to a limit of 20% in cement conforming to IS 269-1976.
6.14.4.3 The lime shall satisfy the requirement for class C lime specified as IS 712-1973.
6.14.4.4 The aggregate used for the manufacture of Autoclave Aerated Concrete Block shall conform to the following requirements (a) Sand-Conforming to IS 383-1970 except for the grading which may be made to suit the product and silica content shall not be less than 80%. (b) Fly ash – Conforming to IS 3812-1981 with loss on ignition not more than 6%.
6.14.4.5 The water used in the manufacture of Autoclave Aerated Concrete Block shall be free from matter harmful to concrete or reinforcement or matter likely to cause efflorescence in the block and shall meet the requirements of IS 456-2000.
6.14.4.6 Additives and Admixtures may be added either as additives to the cement during manufacturing or as additive or admixtures to the concrete mix. Additive or admixtures used in the manufacture of concrete block may be (a) Accelerating , water reducing and air – entraining admixtures conforming to IS 9103-1979 (b) Water proofing agent conforming to IS 2645-1975 (c) Colouring pigments
6.14.5 Physical requirements
6.14.5.1 All Autoclave Aerated Concrete Block shall be sound, free of cracks or other defects which interfere with the proper placing of block units, impair the strength or performance of the construction.
6.14.5.2 Where block units are to be used in exposed wall construction, the face or faces that are to be exposed shall be free of chips, cracks or other imperfections except that if not more than 5% of a consignment contains slight cracks or small chippings not larger than 25mm, this shall not be deemed grounds for rejection.
6.14.5.3 Dimensions- The overall dimension of the block units when measured shall be in accordance with para 6.14.2.1 subjected to the tolerances mentioned in para 6.14.2.4
6.14.5.4 Block Density - The Block density shall conform to the requirements specified in table of para 6.14.3, when tested accordance with para 6.14.6 (1)
6.14.5.5 Compressive Strength - The min. compressive strength being the average of twelve block units shall be as prescribed in table of para 6.14.3, when tested accordance with para 6.14.6(2) 6.14.5.6 Thermal Conductivity - The thermal conductivity shall be not exceed the values specified in table of para 6.14.3 when tested accordance with para 6.14.6(3)
6.14.5.7 Drying Shrinkage – the drying shrinkage shall be not more than 0 .05% for grade –1 block and 0.10% for grade-2 block when tested accordance with para 6.14.6(4) 6.14.6 Tests 1. Block Density- The block density shall be determined in the manner described in IS 6441 (part-1) -1972 2. Compressive Strength- The compressive strength of block shall be determined in accordance with IS 6441 (part-5) -1972 3. Thermal Conductivity- The thermal conductivity of block shall be determined in accordance with IS 3346 -1980 4. Drying Shrinkages-The drying shrinkage of block shall be determined in the manner described in IS 6441 (part-2) -1972
6.14.7 Sampling
6.14.7.1 Lot - In any consignment, all the blocks of the same size and from the same batch of manufacture shall be grouped together into a minimum number of groups of 10000 blocks or less. Each such group shall constitute a lot.
6.14.7.2 From each lot, a sample of 24 blocks shall be selected at random. The required numbers of Blocks shall be taken at regular intervals during the loading of the vehicle or unloading the vehicles depending on whether sample is taken before delivery or after delivery. When this is not practicable, 255 SUB HEAD 6.0 : MASONRY WORK sample shall be taken from the stack in which case the required number of blocks shall be taken at random from across the top of the stacks, the sides accessible and from the interior of the stacks by opening trenches from the top.
6.14.7.3 The sample of blocks shall be marked for future identification of the consignment it represents. The blocks shall be kept under cover and protected from extreme conditions of temperature, relative humidity and wind until they are required for test. The tests shall be undertaken as soon as practicable after the sample has been taken.
6.14.8 Number of tests
6.14.8.1 All the 24 Blocks shall be checked for dimensions and inspected for visual defects.
6.14.8.2 Out of the 24 blocks, 12 blocks shall be subjected to the test for compressive strength, 3 blocks to the test for density, 3 blocks to the test for thermal conductivity and 3 blocks to the test for drying shrinkage. The remaining 3 blocks shall be reserved for re-test for drying shrinkage if a need arises.
6.14.8.3 The samples of AAC blocks (each sample consisting of 6 specimen) shall be chosen randomly from the lot procured and tested for various parameters specified in para 6 above. One samples shall be tested for every 100 cum or part thereof. However, minimum one sample shall be tested from each lot received at site if the quantity procured in the lot is less than 100 cum. If required, Engineer-in-Charge or his authorized representative shall inspect the factory during production of the material for this work and also collect samples (of materials used for making AAC blocks and precast AAC blocks) from the factory itself. The contractor shall consider this contingency also while placing the order with one of the approved firms. Nothing extra shall be payable on this account.
6.14.9– Criteria for conformity
6.14.9.1 The number of blocks with dimensions outside the tolerance limit and or with visual defects, among those inspected, shall not be more than two.
6.14.9.2 For density, the mean value shall be within the range specified in Table of para3

6.14.9.3 For compressive strength, the mean value, say X shall be determined. The test results shall be grouped into groups of 4, individual values of ranges shall be determined, the average range a calculated from these values and shall satisfy the following condition: X- 0.6 R> minimum value specified in Table of para3.
6.14.9.4 For thermal conductivity, the mean value shall be equal to or less than the value specified in Table of para3.
6.14.9.5 For drying shrinkage, all the test specimens shall satisfy the requirements of the test. If one or more specimens fail to satisfy the requirements, the remaining 3 blocks shall be subjected to these tests. All these blocks shall satisfy the requirements.
6.14.10 Manufacturer's Certificate
6.14.10.1 The manufacturer shall satisfy himself that the masonry units conform to the requirements of this specification and, if requested, shall supply a certificate to this effect to the purchaser or his representative.
6.14.11 Independent Tests
6.14.11.1 If the purchaser or his representative requires independent tests, the samples shall be taken before or immediately after delivery, at the option of the purchaser or his representative and the tests shall be carried out in accordance with this specification.
6.14.11.2 The manufacturer shall supply free of charge the units required for testing.
6.14.12 Storage
6.14.12.1 General requirements of storage of autoclaved cellular (aerated) concrete blocks shall be as described in IS : 4082-1977*.
6.14.13 Marking
6.14.13.1 Each lot of concrete masonry units manufactured in accordance with this specification shall be suitably marked with information- (i) The identification of the manufacture (ii) The grade and block density of the unit (iii) The month and year of manufacturing Each block may also be marked with the ISI Certification mark.
6.14.14 The R.C C bend shall be provided on 150mm /230mm/300mm thick masonry to increase the strength and compatibility . The RCC bend shall be provided at sill level and at lintel level over throughout the wall. This thickness of the bend shall be approved by the Engineer in charge or as specified in drawing. The payment of RCC bend and reinforcement shall be paid separately. Autoclave Aerated Concrete Block masonry shall be provided with polymer modified adhesive mortar. The polymer modified adhesive mortar shall be provided @ 30 kg per cum or with cement mortar 1:4 (1 cement : 4 coarse sand).
6.14.15. Autoclave Aerated Concrete Block with 100 mm thick masonry shall be provided with two number 6mm dia reinforcement steel bar at every third course. The payment of reinforcement shall be paid separately.
6.14.16. Autoclaved Aerated Concrete Block confirming the IS Code – 2185 (Part-3) 1984 (Reaffirmed 2005)
6.14.17 Measurements
6.14.17.1 Autoclave Aerated Concrete Block Masonry shall be measured in cubic metres unless otherwise specified. Any extra work over the specified dimensions shall be ignored. Dimensions shall be measured correct to the nearest 0.01 metre. ie. 1 cm. Areas shall be calculated to the nearest 0.01 sqm and the cubic contents shall be worked out to the nearest 0.01 cubic metres. Note : (i) Autoclave Aerated Concrete Block work in parapet walls, mumty, lift machine room and water tanks constructed on the roof upto 1.2 m height above roof shall be measured together with the corresponding work of the floor next below.
6.14.17.2 No deductions or additions shall be done and no extra payment made for the following: Note: Where minimum area is defined for deduction of an opening, void or both, such areas shall refer only to opening or void within the space measured. (a) Ends of dissimilar materials (that is, joists, beams, lintels, posts, girders, rafters, purlins, trusses, corbels, steps etc.); up to 0.1 m2 in section; (b) Opening up to 0.1 m2 in area (see Note); (c) Wall plates, bed plates, and bearing of slabs, chajjas and the like, where thickness does not exceed 10 cm and bearing does not extend over the full thickness of wall; (d) Cement concrete blocks as for hold fasts and holding down bolts; (e) Iron fixtures, such as wall ties, pipes upto 300 mm diameter and hold fasts for doors and windows; (f) Chases of section not exceeding 50 cm in girth; and (g) Bearing portion of drip course, bearing of moulding and cornice. Note: In calculating area of an opening, any separate lintel or sills shall be included with the size of the opening but end portions of lintel shall be excluded. Extra width of rebated reveals, if any, shall also be excluded.
6.14.17.3 String courses, projecting pilasters, aprons, sills and other projections shall be fully described and measured separately in running metres stating dimensions of each projection. 6.14.17.4 Square or rectangular pillars shall be measured separately in cubic metres
6.14.17.5 Circular pillars shall be measured separately in cubic metres as per actual dimensions. 6.14.17.6 Autoclave Aerated Concrete Block work curved on plan shall be measured like the block work in straight walls and shall include all cutting and wastage of blocks, tapered vertical joints and use of extra mortar, if any. Block work curved on plan to a mean radius not exceeding six metres shall be measured separately and extra shall be payable over the rates for block work in straight walls. Nothing extra shall be payable if the mean radius of the block work curved in plan exceeds six metres.
6.14.17.7 Tapered walls shall be measured net as walls and extra payment shall be allowed for making tapered surface for block work in walls. 6.14.18 Rate The rate shall include the cost of materials and labour required for all the operations described. The rate shall also include the following: (a) Raking out joints or finishing joints flush as the work proceeds; (b) Preparing tops of existing walls and the like for raising further new block work. (c) Rough cutting and waste for forming gables, splays at eaves and the like. (d) Leaving holes for pipes upto 150 mm dia. and encasing hold fasts etc. (e) Rough cutting and waste for block work curved in plan and for backing to stone or other types off acing. (f) Embedding in ends of beams, joists, slabs, lintels, sills, trusses etc. (g) Bedding wall plates, lintels, sills, roof tiles, corrugated sheets, etc. in or on walls if not covered in respective items (h) Leaving chases of section not exceeding 50 cm in girth or 350 sq cm in cross-section; and (i) Block on edge courses, cut brick corners, splays reveals, cavity walls, brick works curved on plan to a mean radius exceeding six metres.
The Location and levels shall be followed as per boq item.

Mode of measurement &payment
The rate shall be for a unit of one cubic meter.

Item no. 73.

Masonary work using Aerated light weight concrete block having crushing strength not less than 35 kg/sqcm for super structure above plinth level laid with approved block laying polymer modified adhesive mortar all complete as per direction of engineer in charge and Technical Specification. 1st Floor

Workmanship
The relevant specifications of item No.72 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 72 shall be followed:

Item no. 74.

Masonary work using Aerated light weight concrete block having crushing strength not less than 35 kg/sqcm for super structure above plinth level laid with approved block laying polymer modified adhesive mortar all complete as per direction of engineer in charge and Technical Specification. 2nd Floor

Workmanship
The relevant specifications of item No.72 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 72 shall be followed:

Item no. 75.

Masonary work using Aerated light weight concrete block having crushing strength not less than 35 kg/sqcm for super structure above plinth level laid with approved block laying polymer modified adhesive mortar all complete as per direction of engineer in charge and Technical Specification. 3rd Floor

Workmanship
The relevant specifications of item No.72 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No.72 shall be followed:

Item no. 76.

Masonary work using Aerated light weight concrete block having crushing strength not less than 35 kg/sqcm for super structure above plinth level laid with approved block laying polymer modified adhesive mortar all complete as per direction of engineer in charge and Technical Specification. 4th Floor

Workmanship
The relevant specifications of item No.72 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 72 shall be followed:

Item no. 77.

Masonary work using Aerated light weight concrete block having crushing strength not less than 35 kg/sqcm for super structure above plinth level laid with approved block laying polymer modified adhesive mortar all complete as per direction of engineer in charge and Technical Specification. 5th Floor

Workmanship
The relevant specifications of item No.72 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 72 shall be followed:

Item no. 78.

Masonary work using Aerated light weight concrete block having crushing strength not less than 35 kg/sqcm for super structure above plinth level laid with approved block laying polymer modified adhesive mortar all complete as per direction of engineer in charge and Technical Specification. 6th Floor

Workmanship
The relevant specifications of item No.72 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No.72 shall be followed:

Item no. 79.

Masonary work using Aerated light weight concrete block having crushing strength not less than 35 kg/sqcm for super structure above plinth level laid with approved block laying polymer modified adhesive mortar all complete as per direction of engineer in charge and Technical Specification. 7th Floor

Workmanship
The relevant specifications of item No.72 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No.72 shall be followed:

Item no. 80.

Masonary work using Aerated light weight concrete block having crushing strength not less than 35 kg/sqcm for super structure above plinth level laid with approved block laying polymer modified adhesive mortar all complete as per direction of engineer in charge and Technical Specification. 8th Floor

Workmanship
The relevant specifications of item No.72 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No.72 shall be followed:

Item no. 81.

Masonary work using Aerated light weight concrete block having crushing strength not less than 35 kg/sqcm for super structure above plinth level laid with approved block laying polymer modified adhesive mortar all complete as per direction of engineer in charge and Technical Specification. 9th Floor

Workmanship
The relevant specifications of item No.72 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No.72 shall be followed:

Item no. 82.

Masonary work using Aerated light weight concrete block having crushing strength not less than 35 kg/sqcm for super structure above plinth level laid with approved block laying polymer modified adhesive mortar all complete as per direction of engineer in charge and Technical Specification. **Terrace**

Workmanship
The relevant specifications of item No.72 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No.72 shall be followed:

Item no. 83.

Provinding and fixing chicken wire mesh of gauge 0.18mm and 200 mm wide with necessary screws and nail at joints cracks of brick work R.C.C work as per drawing and specification and direction of Engineer incharge.

Workmanship
It shall be thick Gauge: 0.18 mm and width mesh 200.The mesh shall be typically made of mild steel. Necessary screws and nails suitable for the substrate (brickwork or RCC) and mesh material. the joints and cracks in the brickwork or RCC shall be clean, free from dust, loose particles.Cut the chicken wire mesh into appropriate lengths as per the dimensions specified in the drawings and as required for the joints and cracks.Place the chicken wire mesh over the joints in the brickwork or RCC where reinforcement is needed. the mesh

in place using screws or nails. And fasteners penetrate into the substrate sufficiently to provide a strong anchorage.Overlap adjoining sections of mesh shall be 150mm ,.

Mode of measurement &payment
The rate shall be for a unit of one sqm.

Item no. 84.

Providing and fixing 18mm thick gang saw cut mirror polished premoulded and prepolished) Granite of any colour and shade as per selection of client for wall lining (veneer work), /bands 200mm wide backing filled with a grout of average 12 mm thick in polymer modified adhesive mortar including secured to the backing by means of cramps, hold fastners ,copper pins 7.5 cm long 6 mm diameter for securing adjacent stones in stone wall lining in adhesive mortar including making the necessary chases complete in all respect.

WORKMANSHIP
WALL LINING/VENEER WORK.
Unless and otherwise specified in the nomenclature of the item, the marble slabs used for wall lining /veneer work shall be gang saw cut (polished & machine cut).Back shall not be polished/ cut in order to ensure a good grip with the hearting of backing. The cut slabs shall be of the thickness as specified with a tolerance permissible . The tolerance in wall lining when straight edge of 3 m length is placed should not be more than 2 mm. Laying The stone shall be wetted before laying. They shall then be fixed with **12 mm thick in polymer modified adhesive mortar including secured to the backing by means of cramps** in position without the use of chips or under pinning of any sort. Care shall be taken to match the grains of veneer work as directed by the Engineer-in-Charge. For purpose of matching the grains, the marble slabs shall be selected judiciously having uniform pattern of veins/streaks. Preferably the slabs shall be those got out of the same block from the quarry. The area to be veneered shall be reproduced on the ground and the marble slabs laid in position and arranged in the manner to give the desired matching of grains. Any adjustment needed for achieving the best results shall be then carried out by replacing or interchanging the particular slabs. Special care shall be taken to achieve the continuity of grains between the two slabs one above the other along the horizontal joints. This shall then be got approved by the Engineer-in-Charge and each marble slabs numbered properly and the same number shall be marked on a separate drawing as well as on the surface to be actually veneered, so as to ensure the fixing of the particular slabs in the correct location. For the facing of the columns also the same procedure as mentioned above shall be followed.

Where so desired, the adjoining stones shall be secured to each other by means of copper pins 75 mm long and 6 mm diameter .

The stones shall be secured to the backing by means of cramps. The material for cramps shall have high resistance to corrosion under conditions of dampness and against the chemical action of mortar or concrete in which cramps are usually embedded. Cramps shall be of 25 × 6 mm and 30 cm long in case of backing of stone masonry walls and brick masonry walls thicker than 230 mm. In case of backing with brick masonry walls 230 mm or less thick or RCC members cramps shall be of 25 × 6 mm and length as per requirement made out of gun metal. Generally the outer length of cramp in half brick work backing shall be 115 mm and in one brick work backing it shall be 150 mm. Typical shape & details of cramps for such backing. This can be modified as directed by the Engineer-in-Charge if so, required at site. Cramps shall be spaced not more 60 cm apart horizontally. Alternatively the stone may be secured to the backing by means of stone dowels 10 x 5 x 2.5 cm.

The adjoining stones shall be secured to each other by means of gun metal cramps or copper pins of the specified size. Cramps may be attached to its or top and bottom or sides, top and bottom. The general arrangement of cramps required for fixing facing unit to the wall. The actual number of cramps and their sections, however, shall be as per requirements of design to carry the loads.

Where cramps are used to hold the unit in position only, the facings shall be provided with a continuous support on which the stones rest at the ground level and other storey levels, the support being in the form of projection from or recess into the concrete floor slab, or a beam between the columns or a metal angle attached to the floor slab or beams. These supports shall preferably be at vertical intervals not more than 3.5 m apart and also over the heads of all openings. Such supports shall also be provided where there is transition from thin facing below to thick facings above.

Alternatively cramps may be used to hold the units in position and in addition to support the units thus transferring the weight of the units to the backing. Such cramps should be properly designed as per IS 4101 (Part 1).

The cramps may be of copper alloyed with zinc, tin, nickel, lead or stainless steel.

The pins, cramps and dowels shall be laid in **12 mm thick in polymer modified adhesive mortar including secured to the backing by means of cramps** and their samples got approved by the Engineer-in-Charge and kept at site.

Joints All joints shall be fill **12 mm thick in polymer modified adhesive mortar including secured to the backing by means of cramps**. Special care shall be taken to see that groundings for veneer work are full of **12 mm thick in polymer modified adhesive mortar** If any hollow groundings are detected by tapping the face stones, these shall be taken out and relaid. The thickness of the face

joints shall be uniform, straight and as fine as possible, not more than 1.5 mm and in the face joint, the top 6 mm depth shall be filled with mortar specified for the pointing.

Mortar The mortar used for jointing slabs shall be **12 mm thick in polymer modified adhesive mortar including secured to the backing by means of cramps**.

Measurements
The length and breadth shall be measured correct to a cm. In case of radially dressed or circular slabs used in the work, the dimensions of the circumscribing rectangles of the dressed stone used in the work, shall be measured & paid for. The area shall be calculated in sqm nearest to two places of decimal. Marble work in lining upto 4 cm thickness shall be paid by area under veneer work and lining of greater thickness paid by volume under plain marble work.

Rate The rate includes the cost of materials and labour required for all the operations described above except for the cost of providing and fixing of dowel and cramps which shall be paid for separately, unless otherwise stipulated in the item of work. When factory made finished slabs and tiles are used, no further finishing as mentioned in para shall be required nor anything extra shall be payable.

Mode of measurement &payment
The rate shall be for a unit of one sqm.

Item no. 85.
Providing and fixing 18mm thick gang saw cut mirror polished premoulded and prepolished) machine cut Granite of any colour and shade as per selection of client for kitchen platforms, vanity counters, window sills , facias and similar locations of required size of approved shade, colour and texture laid over 20mm thick base cement mortar 1:4 (1 cement : 4 coarse sand) with joints treated with white cement, mixed with matching pigment, epoxy touch ups, including rubbing, curing, moulding and polishing to edges to give high gloss finish, providing opening of required size & shape for wash basin/sink etc. complete at all levels.

Workmanship
The relevant specifications of item No.103 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 103 shall be followed:

Item no. 86. Design, Supply & Fixing Marble stone sculptures with Size 6ft x 3.5ft x 2ft . Providing & making individual pieces using laser cutting machine desired shape and profile. All components of origami figure to be developed in 3d model hollow from inside, thenlaser cut with proper dimensions and edges. Smoothening by using machine and tools to get edge finish. using necessary tools and machinery to get even and mirror like finishing in all respects. Designing, making and approval of shop drawings of the entire ser good to be fabricated and assembled at site. Providing and finishing the sculptural Marble stones with mirror finish and balanced flat surface to be kept at the site..Hardware items and Footing Arrangement with plinth top Granite Finishing required in proper fixing of the mural as per direction of Engineer-in-charge

- **Material Specification**
- Marble shall be **premium quality natural marble**, uniform in colour, texture and grain, free from cracks, fissures, patches, veins or any structural defects.
- Marble thickness shall be adequate to ensure strength, rigidity and durability of hollow sculptural elements.
- All stones shall be selected and approved by Engineer-in-Charge before fabrication.

- **Design & 3D Modelling**
- Contractor shall prepare **detailed 3D computer models** of the complete origami sculpture, showing:
    - Individual components
    - Hollow internal construction
    - Joint details
    - Fixing system
- **Shop drawings**, fabrication drawings and assembly drawings shall be submitted for approval prior to commencement of fabrication.
- No work shall start without written approval of drawings.
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- **Fabrication & Cutting**
- Sculpture shall be developed in **individual marble components**, fabricated using **CNC / Laser Cutting Machines** to achieve:
    - Desired origami shape
    - Accurate profiles
    - Sharp, clean and precise edges
- Cutting tolerances shall be minimal to ensure perfect alignment during assembly.

- All components shall be hollow from inside to reduce dead load without compromising strength.
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- **Edge Finishing & Surface Treatment**
- All edges shall be machine-finished using grinders, polishers and fine abrasive tools to achieve:
    - Smooth, sharp and uniform edge profile
    - No chipping, waviness or tool marks
- Entire marble surface shall be finished to **mirror polish finish**, uniform in gloss and smoothness.
- Final finish shall be blemish-free, with even reflection and perfectly flat balanced surfaces.
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- **Assembly & Trial Fit**
- All components shall be dry-assembled at workshop (trial assembly) to check:
    - Accuracy of dimensions
    - Joint alignment
    - Overall stability
- Necessary corrections shall be carried out before dispatch to site.
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- **Hardware & Fixing System**
- Sculpture shall be fixed using **SS 304 / SS 316 grade hardware**, anchors, dowels, bolts and concealed fixing systems as required.
- All fixing hardware shall be corrosion-resistant and structurally adequate.
- Fixing methodology shall be submitted for approval.
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- **Footing & Plinth**
- Providing and fixing **structural footing arrangement** suitable to sculpture load.
- **Plinth top shall be finished with Granite stone**, approved shade and finish.
- Plinth size, thickness and reinforcement (if required) shall be as per design and site conditions.
- Complete work shall be executed as per instructions of Engineer-in-Charge.
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- **Installation at Site**
- Transportation, handling and lifting of marble sculptures shall be done carefully using appropriate equipment to avoid damage.
- Final assembly and fixing shall be done at site with proper alignment, level and plumb.
- Joints shall be tight, clean and aesthetically invisible.
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- **Quality Control & Approval**
- All materials, mock-ups, finishes and installation shall be subject to approval by Engineer-in-Charge.
- Any defective workmanship or damaged component shall be replaced at contractor's cost.

- **Measurement & Rate**
- Item shall be measured **as a complete job / per sculpture**.
- Rate shall include:
    - Design & 3D modelling
    - Shop drawings
    - Marble supply
    - CNC / Laser cutting
    - Fabrication
    - Polishing & finishing
    - Hardware & fixing system
    - Plinth & granite finishing
    - Transportation & installation
    - All tools, machinery, labour and incidentals
- Nothing extra shall be paid unless specifically mentioned.

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Item no. 87. Deleted

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Item no. 88. Flush Door (Laminated) Providing and fixing of 35mm solid cored flush door with 1mm thick laminate in approved shade as per selection on both side as shown in the drg. All exposed edges covered with wooden liping of min 4mm th

duly painted and finished matching shade of laminate. Rate shall Include Frame of WPC 125x65mm size comprising of virgin PVC polymer of K value 58- 60 (Suspension Grade), , SS Handle, Lock , Door Stopper, Door Closer, S.S. heavy duty hinges etc. all materials and labour etc. complete as per detail drawing and instruction of engineer-in charge and consultant.

Flush Door shall be 35mm thick with solid core with 1mm thick on both side of door in approved shade selected by the engineer Incharge.Flush door shall be Protect exposed edges of the door with 4mm thick wooden lipping .Frame shall be material of WPC with Laminate of size 125mm x 65mm. hardware shall be Stainless Steel.

Mode of measurement &payment
The rate shall be for a unit of one sqm.

Item no. 89.

Flush Door (Laminated) Providing and fixing of 35mm solid cored flush door with 1mm thick laminate in approved shade as per selection on both side as shown in the drg. All exposed edges covered with wooden liping of min 4mm th duly painted and finished matching shade of laminate. Rate shall Include Frame of CP teak wood 127x65mm size , SS Handle, Lock , Door Stopper, Door Closer, S.S. heavy duty hinges etc. all materials and labour etc. complete as per detail drawing and instruction of engineer-in charge and consultant.

Workmanship
The relevant specifications of item No.83 shall be followed.Except Frame should be cpteak wood of size 127x65mmin this item.
Mode of Measurement &Payment
The relevant specifications of item No.83 shall be followed:

Item no. 90. Providing and fixing M.S. grill of required pattern of windows etc. with M.S. flats at required spacing and frame alround square or round headed bolts and nuts or by screws. including applying a priming coat of red lead paint and two coats of oil painting etc complete (A) Plain grill

1.0. Materials

The structural steel shall conform to M-22

2.0. Workmanship

2.1. The M.S. Grill shall be prepared as per the drawing or as directed for fixing to wooden frames of windows etc.

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

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

3.0. Mode of measurements &payment

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

3.2. The rate shall be for a unit of onekg.

Item no. 91.
Restroom Cubical: providing and installing premium Series Restroom Cubicles with all necessary tools hardware, labour, as per the company specs.Providing & Fixing Cubicle partition system for toilet by using following Materials 12mm thick compact laminate with core of phenol resin treat papers with black color top layer treated with special melamine resin. Adjustable legs with bottom cap of SS 316, door lock with, gravity hinges with cover – combination of mild steel and Nylon PA6And used following Accessories Accessories Include: 1. AlumuniumTop Rail (Stainless Steel Grade 304 with Satin Finish)2. SS Coat Hook with Door Stopper Option (Stainless Steel Grade 304 with Satin Finish)3. SS Gravity Hinges (Stainless Steel Grade 304 with Satin Finish)4. SS Latch cum Occupancy Indicator (Stainless Steel Grade 304 with Satin Finish)5. SS “U” Channel (Stainless Steel Grade 304 with Satin Finish)6. SS “F” Channel (Stainless Steel Grade 304 with Satin Finish)7. SS Palm Design Adjustable Foot (Stainless Steel Grade 304 with Satin Finish)8. SS Screws & Inserts(Stainless Steel Grade 304 with Satin Finish) 9.Rubber Lining for Door Stopper Brand.

workmanship

Restroom Cubical shall have 12mm thick compact laminate with a core of phenol resin-treated papers and Top layer treated with special melamine resin in black color. for structural support and stability for the cubicle partitions will be provide Aluminum Top Rail Stainless Steel Grade 304 with Satin Finish and for hanging items and serves as a door stopper will be provide SS Coat Hook with Door Stopper Option,for smooth opening will be provide SS Gravity Hinges, for occupied or vacant and provides secure locking will be provide SS Latch cum Occupancy Indicator. for securing , height adjustment and aligning and fixing hardware shall be the cubicle partitions SS "U" Channel, SS "F" Channel, SS Palm Design Adjustable Foot, SS Screws & Inserts, Rubber Lining for Door Stopper.Partition Installation- Assemble the 12mm thick compact laminate panels with the necessary hardware, ensuring proper alignment and fit ,Securely fix the aluminum top rail, SS coat hooks, gravity hinges, latch cum occupancy indicators, SS "U" channel, SS "F" channel, palm design adjustable foot, and other accessories using SS screws and inserts.Install adjustable legs with SS 316 bottom caps to ensure stability and accommodate variations in floor levels.Test each cubicle for proper functioning of hinges, locks, occupancy indicators, and other hardware.ensure all panels and hardware are aligned correctly and that the finish meets aesthetic standards.

Mode of measurements &payment

No payment shall be made for extra necessary required items etc. The rate shall be for a unit of per sqm

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Item no. 92.

Providing and fixing Hollow metal fire rated doors shutter with frame and hardware fittings etc complete as per specifications.Door frame shall be double rebate profile of minimum size 154mm X 77 mm made out of 1.60mm minimum thick galvanized steel sheet. The frames should be finished with Thermosetting Powder Coating in desired RAL Shade. All provision should be mortised, drilled and tapped for receiving appropriate hardware. Frames should be provided with back plate bracket and anchor fasteners for installation on a finished plastered masonry wall opening. Door leaf shall be minimum 49mm thick fully flush double skin door with or without vision lite. All doors NSD 12049 shall be factory prepped for receiving appropriate hardware and provided with necessary reinforcement for hinges, locks, and door closers. For pair of doors astragals has to be provided on the meeting stile for both active and inactive leaf.

Door Shutter shall be Hollow metal construction for fire resistance, minimum thickness of the door leaf should be 49mm, Fully flush double-skin door configuration. Door frame shall be Double rebate profile made of minimum 1.60mm thick galvanized steel sheet, Frame size: Minimum 154mm x 77mm, Finished with Thermosetting Powder Coating in desired RAL shade for durability and aesthetics, Mortised, drilled, and tapped to receive hardware fittings and shall be provision with back plate bracket and anchor fasteners for installation on finished plastered masonry wall openings and Hardware Accessories shall be Factory prepped to receive appropriate hardware as following hinges, locks, door closers. Shall be Verify dimensions and conditions of the wall openings where the fire-rated doors will be installed and Install the galvanized steel frames using back plate brackets and anchor fasteners. Ensure frames are plumb, level, and securely anchored to the masonry wall openings and Hang the hollow metal door shutters onto the installed frames, ensuring proper alignment and smooth operation after that Install hinges, locks, door closers, and any other specified hardware fittings according to manufacturer instructions and fire safety regulations make necessary adjustments to ensure doors close properly and lock securely.

Mode of measurements &payment

No payment shall be made for extra necessary required items etc. The rate shall be for a unit of per sqm

Item no. 93.

Providing and fixing of 6mm thick decorative compact HPL laminate as per EN 438-6Type EDS (Exterior Durable Standard)/ EGS(External General Standard) external wall cladding using specially treated acrylic resins under high pressure and temperature and hardened into sheets, thus providing all weather protection and UV resistance on an aluminium powder coated sub structure of aluminium cube channel having thickness 50x25x1.6mm at corner and 75x25x1.6mm at junction of two panels complete as per manufacturers specifications and direction of engineer in charge.

HPL Laminate shall be 6mm thick with meet the standard of EN 438-6 Type EDS (Exterior Durable Standard) or EGS (External General Standard). Powder coated Aluminium frame channel shall be 50mm x 25mm x 1.6mm for corner, 75mm x 25mm x 1.6mm for junctions of two panels. fixing the aluminium cube channels at corners and junctions of panels using appropriate fasteners and anchor bolts. Ensure the channels are securely fixed to the building structure after that Cut the HPL laminate panels to required dimensions as per drawings. Shall be fix HPL laminate panels with aluminium cube channels. Ensure panels are aligned properly and securely fastened. Seal joints between panels using weather-resistant sealants or gaskets to prevent water ingress and ensure weather proofing.

Mode of measurements &payment

No payment shall be made for extra necessary required items etc. The rate shall be for a unit of per sqm

Item no. 94.

Providing and fixing of approximately 8.0mm thick Laminated wooden flooring, classification of use 31/23 with a surface abrasion resistance of class AC3 (average 3800 cycles), impact resistance of 7.7 mm,resistance to cigarette burn with a rating of 4(EN 438-2:05), swelling after 24 hrs in water of 8.22%, Modulus of rupture of 53.3 newton/mm2, Internal bond 1.78 newton/mm2, surface soundness 2.62 newton/mm2(EN 13329:2000) with a 0.2 mm thick wear layer on top of a High Density Fiber substrate core (density ~ 948.3 Kgs/M3) of plank size 1285/1215 mm X 191/192 mm having locking arrangement (lock strength > 670 lbs/ft) with an underlayment made of natural colour foam , with accessories like End profile, Transition profile, reducer, Stair nosing etc. complete.

2. Material Specifications

a) Laminate Flooring Panels:

- **Thickness:** Approximately 8.0 mm
- **Classification of Use:** 31/23 as per EN 13329:2000 (suitable for moderate commercial and heavy domestic use)
- **Surface Abrasion Resistance:** Class AC3 (average 3800 cycles)
- **Impact Resistance:** 7.7 mm
- **Resistance to Cigarette Burn:** Rating 4 (as per EN 438-2:05)
- **Swelling after 24 hrs in Water:** 8.22%
- **Modulus of Rupture:** 53.3 N/mm²
- **Internal Bond Strength:** 1.78 N/mm²
- **Surface Soundness:** 2.62 N/mm²
- **Core Material:** High Density Fiberboard (HDF) with density approximately 948.3 kg/m³
- **Wear Layer:** 0.2 mm thick melamine-based surface layer with decorative paper finish
- **Plank Size:** 1285/1215 mm (length) x 191/192 mm (width)

b) Locking System:

- Type: Mechanical interlocking system with **lock strength > 670 lbs/ft**, ensuring tight joints without the use of adhesives.

c) Underlayment:

- Material: Natural colour polyethylene or foam underlayment of suitable thickness (2–3 mm).
- Function: Provides moisture barrier, acoustic insulation, and subfloor levelling.

d) Accessories:

- End profiles, transition profiles, reducers, and stair nosing — made of matching laminate/aluminium finish as per site requirements.

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3. Workmanship & Installation

- The subfloor shall be clean, level, and dry prior to installation.
- The flooring shall be laid in staggered pattern using the manufacturer's approved locking system.
- Expansion gaps (8–10 mm) shall be provided at wall junctions and around fixed columns or door frames.
- Underlayment shall be laid continuously below the laminate panels, joints sealed with approved tape.
- Profiles and skirtings shall be fixed neatly and firmly after flooring completion.
- The finished surface shall be smooth, even, and free from gaps, ridges, or uneven joints.

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4. Standards & Testing

All materials shall conform to relevant **EN standards (EN 13329:2000, EN 438-2:05)** and manufacturer's quality certifications. Tests may be conducted randomly at site or at an approved laboratory to verify compliance with the specified parameters.

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5. Measurement & Payment

- Measurement shall be in **square metres (m²)** of actual area covered with laminated flooring, excluding skirting and profiles.
- Rate shall include cost of materials, underlayment, profiles, accessories, wastage, labour, installation, and all incidentals for a complete finished work.

Item no. 95.

Providing and fixing GI Gyp steel ultra frame work for wall panelling as per design drawing consisting of floor channel of size 50x32x32 x0.5mm thick at bottom and top fixed with 35 mm nylon sleeves and 35 mm screw. Further fixing GI stud 48x34x36x0.5 mm thick @600mm C/C vertically. The framework to be filled with 50mm 1000GSM non-woven thermal bonded polyester wadding (Make Dupont/ mikasha/vibrant) held in position with 18 mm GI checken mesh of 24SWG with drive all screws and oversize washers. Finally fixing over it horizontally 80x26x51x0.5 mm thick G.I. Gyp ceiling section placed @600mm C/C or wherever required as per design drawings. The frame to be fixed to the walls by means of angle holdfasts or cleats of required size complete with expandable anchor fasteners of 65x10mm dia fixed on each vertical member @1000mm C/C .The work shall be executed as per drawings ,specifications & instructions of engineer in charge.

2. Material Specifications

a) Floor & Ceiling Channels:

- **Size:** 50 × 32 × 32 mm
- **Thickness:** 0.5 mm
- **Material:** Galvanized Iron sheet confirming to IS 277 with zinc coating not less than 120 g/m².
- **Fixing:** Channels shall be fixed to the floor and ceiling using nylon sleeves (35 mm long) and 35 mm long self-tapping screws at 450 mm centre-to-centre or as directed.

b) Vertical Studs:

- **Size:** 48 × 34 × 36 mm
- **Thickness:** 0.5 mm
- **Spacing:** 600 mm centre-to-centre (C/C) or as per drawing.
- **Fixing:** Studs shall be inserted into floor and ceiling channels, plumbed and aligned properly.
- **Material:** G.I. sheet confirming to IS 277, zinc coating minimum 120 g/m².

c) Insulation Layer:

- **Material:** 50 mm thick, 1000 GSM non-woven thermal bonded polyester wadding.
- **Make:** Dupont / Mikasha / Vibrant or equivalent.
- **Fixing:** The insulation shall be securely held in position between studs using 18 mm mesh and fixing accessories.

d) Reinforcing Mesh:

- **Type:** Galvanized iron chicken mesh of 24 SWG wire thickness.
- **Fixing:** Fixed over the insulation layer using drive-all screws and oversized washers ensuring taut and uniform placement.

e) Horizontal Ceiling Sections:

- **Size:** 80 × 26 × 51 mm
- **Thickness:** 0.5 mm
- **Placement:** Fixed horizontally at 600 mm C/C or as per design drawing.
- **Purpose:** To provide structural rigidity and fixing support for outer panelling boards (to be provided separately).

f) Anchoring Arrangement:

- The frame shall be securely anchored to walls using **angle cleats or holdfasts** of suitable size, fixed with **expandable anchor fasteners (65 mm long, 10 mm dia)** on each vertical member at intervals not exceeding **1000 mm C/C**.

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3. Workmanship & Installation

- All G.I. sections shall be cut to required length and installed as per approved drawings and alignment.
- All members shall be properly aligned, levelled, and plumbed before fixing.
- All fixings shall be tight and firm, ensuring no vibrations or movement.
- Any sharp edges or burrs shall be removed prior to insulation and mesh fixing.
- Care shall be taken to avoid damage to insulation material and mesh during installation.
- Work shall be completed as per manufacturer's recommendations and Engineer's instructions.

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4. Standards & Testing

All materials shall conform to relevant IS/EN standards and manufacturer's technical specifications. Random testing of G.I. sections and insulation material may be carried out as directed by the Engineer-in-Charge to ensure conformity.

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5. Measurement & Payment

- The measurement shall be made in **square metres (m²)** of finished wall framework surface area as per drawings.
- The rate shall include the cost of all G.I. sections, insulation, mesh, anchor fasteners, cleats, screws, labour, scaffolding, and all incidental works necessary for a complete installation.

Item no. 96.

Providing & fixing at all heights on walls Wood based slats laminated panels having NRC upto 0.75 with lineal perforations . The size of lineal panels is 2400 x 128x 16mm with a pitch of 16 mm. The slats to have a groove of 2mm. The back panels to have circular perforations (8-10mm) dia randomly with a non wooven fabric covering of 0.2mm. The lineal panels to have tounge & groove joints and fixing arrangements for seamless continuity . The panels to be fixed on the GI framework with impalers as per manufacturers recommendations (The GI framework to be paid separately). The work to be done complete a per specifications & instructions of engineer in charge.

2. Material Specifications

a) Acoustic Panels:

- **Type:** Wood-based slats laminated acoustic panels with linear perforations.
- **Make:** Armstrong / Decosonic / Himalaya or equivalent approved brand.
- **Panel Size:** 2400 mm (L) × 128 mm (W) × 16 mm (T).

- **Pitch:** 16 mm.
- **Groove:** 2 mm wide groove between slats.
- **Surface Finish:** Decorative laminate finish in approved shade and texture.
- **Base Material:** Medium Density Fibreboard (MDF) or equivalent engineered wood panel of fire-retardant grade.
- **NRC (Noise Reduction Coefficient):** Up to 0.75 (tested as per ASTM C423 or equivalent standard).

b) Back Perforations and Acoustic Backing:

- **Back Surface:** Circular perforations of 8–10 mm dia (random pattern) for sound absorption.
- **Acoustic Backing:** Non-woven acoustically transparent black fabric of 0.2 mm thickness securely bonded to the rear face of the panel.

c) Edge Profile & Joints:

- **Joint Type:** Tongue and groove arrangement on longitudinal edges for tight and seamless jointing between adjacent panels.
- **Panel Alignment:** All panels shall be aligned perfectly with no visible gaps at joints.

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3. Fixing & Installation Details

- Panels shall be fixed on a **pre-installed G.I. framework (payable under separate item)** using **impalers and fasteners** as per manufacturer's recommendations.
- Impalers shall be of G.I. or aluminium, designed to hold panels firmly and allow easy removal/replacement if required.
- All fasteners shall be corrosion-resistant, and fixing shall ensure a firm and level surface across the entire wall plane.
- All joints, edges, and cut-outs (for switches, outlets, etc.) shall be finished neatly to match the adjoining panel surface.
- Installation shall be carried out by trained personnel in accordance with the manufacturer's specifications and approved shop drawings.

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4. Workmanship

- The wall surface and G.I. framework shall be checked for alignment and level before fixing panels.
- Panels shall be handled carefully to avoid chipping, scratching, or edge damage.
- Proper acoustic continuity shall be maintained by ensuring complete backing coverage and tight fixing of panels.
- Work shall be completed in a clean, uniform, and visually appealing finish.

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5. Standards & Performance Requirements

- **NRC Value:** Minimum 0.70–0.75 (tested as per ASTM C423).
- **Fire Performance:** Base MDF shall conform to IS 12406 (or equivalent fire-retardant MDF standard).
- **Environmental Performance:** Panels shall be low VOC emitting and conform to indoor air quality standards.

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6. Measurement & Payment

- Measurement shall be made in **square metres (m²)** of the visible finished area of panels fixed on walls.
- The rate shall include cost of all materials, impalers, fixing accessories, labour, scaffolding, edge finishing, cutting, and wastage necessary for complete installation.
- The **G.I. supporting framework** shall be paid separately under relevant BOQ item.

Item no. 97.

Providing and fixing 12 mm thick frameless toughened glass door shutter of approved brand and manufacture, including providing and fixing top & bottom pivot & spring type fixing arrangement and making necessary holes etc. for fixing required door fittings, all complete as per direction of Engineer-in-charge (Door handle, lock and stopper etc.to be paid separately).

2. Material Specifications

a) Glass:

- **Type:** Frameless toughened (tempered) clear float glass.
- **Thickness:** 12 mm.
- **Quality:** Glass shall be of approved make, free from bubbles, waves, scratches, and other defects.
- **Tolerance:** As per IS 2835 and IS 2553 (Part 1) – latest.
- **Manufacture & Standard:** Conforming to **IS 2553 (Part 1): 2018** — Safety glass, tempered type.
- **Edges:** Machine polished with smooth arrises, free from chipping.
- **Make:** Saint-Gobain / Modi Guard / Asahi / Gujarat Guardian / equivalent approved brand.

b) Fittings:

- **Top and Bottom Pivot / Patch Fittings:** Made of stainless steel Grade 304 (minimum) or anodized aluminium of approved design, suitable for 12 mm toughened glass doors.
- **Floor Spring:** Heavy-duty double-action spring mechanism with hold-open option (90°/120°), adjustable speed control, and stainless steel cover plate.

- **Fixing Accessories:** Including all screws, anchor fasteners, cover plates, and other incidental hardware required for proper installation.

(Note: Door handle, lock, and stopper shall be paid separately under respective items.)

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3. Workmanship & Installation

- The size and location of the door shall be as per architectural drawings or site measurements.
- All glass panels shall be factory toughened prior to site delivery; on-site cutting or drilling shall not be permitted.
- The door shutter shall be properly aligned in both vertical and horizontal planes for smooth operation.
- Pivot and floor spring alignment shall be checked carefully to ensure self-closing operation without jerk.
- Edges of glass shall not come in direct contact with hard surfaces — suitable plastic or rubber gaskets shall be provided where required.
- All joints between glass and metal fittings shall be sealed with clear silicone sealant for dust-proof and rattle-free installation.
- The completed work shall present a neat, clean, and visually continuous appearance.

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4. Standards & Testing

- All materials shall conform to relevant Indian Standards:
  - **IS 2553 (Part 1): 2018** – Safety Glass (Tempered)
  - **IS 7177** – Specification for metal fittings for glass doors
  - **IS 1038** – Floor springs for glass doors
- Random inspection of glass and fittings may be conducted to ensure conformity to specifications.

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5. Measurement & Payment

- Measurement shall be made in **square metres (m²)** of the actual area of frameless glass shutter provided and fixed.
- The rate shall include cost of 12 mm thick toughened glass, top and bottom pivots, patch fittings, floor spring, fasteners, silicone sealant, labour, scaffolding, and all incidental works to complete the job as directed.
- Handles, locks, and door stoppers shall be measured and paid for separately under relevant BOQ items.

Item no. 98.

Providing, supplying, fixing, fabricating, erecting, aligning the structural steel like pivot ,tubular 'T','I" section, angle, plate ,beam, channel section, Bar , hollow box or Z purlins , for built up purlins, roof trusses, columns, side runners, tie beams, sag rods, base plates gusset plates, cap plates, bearing bracing, gantry girders, rails, require support, pipes, including all welded or bolted steel structures of various types with approved I.S.I. mark electrodes, bolts, anchor bolts including cost of thread, Anchor plate cleats etc. in RCC or masonry work, including cutting, bending, welding ,fixing, supplying , Fabricating Decorative fevisted section or any structured member required to complete the job for Trusses, Canopy, doors, Frame, Railing, Entrance gate, pergola, Decorative hanging light , for Electrical, water supply and HVAC structure New window, parking shed or space frame or any other required specified area as shown on drawing and detailed specification or as per design incl. three coats of approved brand primer and two coats of paints, necessary scaffolding, tools tolerance etc. complete as directed by Engineer In Charge. (Payment will be made for weight of metal used in the work) (Work for all the floors/all heights)

Materials

The structured steel work shall conform to M-22. Red lead paint shall conform to I.S : 102-1962.

Workmanship

The steel sections as specified or required, shall be cut, square and to correct lengths, as per drawings and design. The.cut ends exposed to view shall be finished smooth. No two pieces shall be welded or otherwise jointed to make up the required length of member, except as indicated in the drawing or as directed. All straightening and shaping to form shall be done by application of pressure and not by hammering. Any bending or cutting shall be carried out in suet] a manner as not to impair the strength of the metal. All operations shall be done in cold state unless other wise directed/permitted.

Steel welding or bolted in built up sections, framework.

The steel structure as shown in the drawings or as per direction of the Engineer-in-charge shall be laid out on a level platform to full scale and to full size in parts. A steel tape shall be used for measurements to ensure maximum accuracy.

Wooden templates 12 mm. to 19 mm. thick or metal sheet template shall be made to correspond to each connecting gussets plate. The templates shall be laid on the steel members and holes of the steel members shall also be marked for curing. The base of steel column and the .position of Anchor bolts shall be carefully setout

Ail stiffeners shall be formed by pressure and where practicable the metal shall not to be cut and welded in making these. In major work', or whore so specified, shop drawings giving complete details and information for the fabrication of the component parts of the structure including location, type, size, (origin and details or weld, bolts or weld shall be prepared in advance of the actual

fabrication and as distinctly marked or stenciled with paint with the identification mark as given in the stop drawings. The bars shall be thickened at the ends, so as to provide for screwed threads and gradually tapered off to meet their normalsection.
Great accuracy shall be observed in fabrication of various member, so that these can be assembled without being unduly packed, stained, or forced into position and when build up, shall be true and tree from twists, brinks, buckles, or open joints.
Before making holes in individual members for fabrication the steel work intended to be welde or bolted together shall be as ambled or clamped properly and tightly so as to ensure close abutting or lapping or the surfaces of the different members. All softeners shall bear tightly both at top and bottom without being drawn or caulked. The abutting joints shall be cut or crossed true and straight and fitted close together. Web splice plates and tillers under stiffened shall be cut to fit within 3 mm. or flange Angles Web plates of Girders shall have no cover. Plates, shall have their ends flush with the top of angles forming the flanges unless otherwise required. The web plates when spiced ^.hall have clearance of not more than 6 mm. The erection, clearance for created ends of members connecting steel shall preferably be not greater than i.5 mm. The erection clearance at the ends o' beams without web cleats shall not be more than 3 mm. at each end but where for a practical reason greater clearance is necessary, suitably designed seating shall be provided.
Pains and rollers shall be accurately tuned to gauge. These straight and smooth and free from flows. The roller bearing shall be provided with adequate arraignments fur holding the girders or truss resting on it. In columns caps and bases, the ends of shifts together with the attached gussets Angles, channels etc after weld together shah be accurately mechanized so that the parts connected Butt against each other over the entire surfaces of contact connecting angles or channels shall he fabricated and placed in position with greater accuracy so that they are nut unduly reduced in thickness by machining. The ends of bearing stiffeners shall be mechanized or ground to tit tightly both at the top and bottom, Alt holes shall generally be drilled to the required size and at required, position. Sub punching shall be permitted provided it is done 3 mm. or less in diameter and reamer thereafter to the require size. The holes for welds and bolts shall be larger by 0 4. to 6 mm. than the nominal diameter of welds or black holts depending upon me diameter of welds.
Holes shall have their axis perpendicular to the surface bored through. The drilling or remarrying shall be free

from burrs, and the holes should be clean and accurate holes for counter sunk bolts shall be made in such a mariner that their heads fit flush with the surface after fixing. The fabrication work shall be completed in workshop as far as it is practicable to do so. Site joints shall be done with welds and fitted bolts or black bolts, as shown in the drawings or as directed. Generally the following principles shall govern the use of reverts turned and fitted bolts, and block bolts.

(i) Welds and turned and fitted bolts shall be used where the connections is such that slip under load has to be avoided.

(ii) Black bolts may be used very sparingly where a force is carried through a connection without impact, vibration or reversal or stresses.

Welding:

The parts assembled for welding shall be in close contact with each other and the bearing stiffeners shall bear tightly both at top and bottom without being drawn or caulked. Members to be welded shall be properly pinned or bolted and rigidly held to gather while welding. Drifting of holes shall no! bepermitted Except to draw the parts together and the drifting tools so used shall have maximum diameter not exceeding, the nominal diameter of welds or bolls. Drifting done during assembling shall not distort the metal 01 enlarge the holes. The shanks of welds shall project beyond the plate-surface sufficiently so as to fill hole thoroughly and form the required head after welding.

The welding shall be done by hydraulic or pneumatic process. However, where such facilities air not available, hand welding may be permitted. The weld shall be heated red hot, care being taken to control the temperature of heating so as not to burn the steel. Rivers of diameter less than 10 mm. may befitted cold. Welds shall be of heat finish with heads full and of equal size. All loose, burnt or badly formed reverts with concentric or deficient heads shall be cut out and replaced. The heads of welds shall be central to shanks and shall grip the assembled member firmly. In cutting out welds, care shall be taken so as not be injure assembled members, caulking or reequipping shall not be permitted.

For testing welds, a hammer weighing approximately 0 25 kg shall be used. Both heads of the welds shall be tapped, slack welds will give a hollow sound and a jar.

All weld heads shall be painted with red lead paint within a week of their fixing.

2.0.1. All bolt heads and nuts shall be hexagonal arid of equal size unless specified otherwise. The screwed heads shall conform to I.S. 1363-1960 and the threaded surface shall not be tapered. The bolts shall be of such length so as to project two clear threads beyond the nuts when fixed in position and these shall lit in the holes without any shakes. The nut shall be fit in the threaded ends of bolts properly.

Where turned and fitted bolts are required to be used in place of welds shall be provided with washers not less than 6 mm. thick so that the nut when tightened shall not bear on the unthreaded body of the bolt Tapered washers shall be provided for all heads and nuts bearing on leveled surfaces. The threaded portion of the bolt shall not be within the thickness of the parts bolted together, the faces of the bolt heads and nuts abutting against steel members shall be machine finished. Where there is a risk of the nut being removed or becoming loose due to vibrations or reversal of stresses, these shall be secured from slackening by me use of locknuts, spring washers, cross-cutting or hammering down of threads as directed.

Bolts, nuts, and-washers shall be thoroughly cleaned and dipped m double boiled linseed oil before use. The whole steel work shall be painted with a coat of priming coat of red lead, as per relevant specification of painting.

1.1. Welding shall generally be done by electric process. Gas welding shall be resorted to, using oxyacetylene flame with specific prior approval. Gas welding shall not be permitted for structural steel work.

1.2. The work shall be done as shown in the shop drawings which should clearly indicate various details of the joints to he welded, shop and site welded as well as type of electrodes to be used, symbol for welding on plans and shop drawings shall be according to I.S. 813-1961. As far as possible every effort shall be made to limit the welding that must be done after improper welding that is likely to be done due to heights and difficult positions on scaffoldings etc. The welding work shall conform to I.S. 816-1969.

1.3. Preparation of surfaces : Surfaces which are to be welled together shall be free from loose mill scale, rust, paint, grease or other foreign matter. A coating of boiled linseed oil shall bepermitted.

1.4. Assembly for welding : Before welding is commenced, the plates shall first be brought together and firmly clamped or spot welded at specified distance. This temporary connection has to be strong enough to hold the plates accurately in place withoutdisplacement.

1.5. Precautions : All operations connected with welding and cutting equipment shall conform to safety requirement given in I.S.818-1968.

The following paints shall be borne in mind during the process of welding:

(b) Are length voltage and amperage shall be suited to the thickness of material type of groove and other circumstances of thework.

(c) The segments of welding shall be such that where possible the members which offer. the greatest resistance to compression are weldedfirst.

1.6. The defective welds which shall be considered harmful to the structural strength shall cut out andrewarded.

1.7. Finished welds and adjacent parts shall be protected with clean boiled linseed oil and after all stag has been removed. Welds and adjacent parts shall l*o painted after the same areapproved.

1.8. All the members shall be thoroughly cleaned of rust-scales, dust etc. and given a priming coat of red lead paint before fixing them inposition.

Mode of measurements & payment

The steel work shall be measured in general asunder:

(a) All work shall be measured on the basis of finished dimensions as fixed at site and measured net unless specified other wise.

(b) The weight of steel sections, steel rods, and steel strips in finished work shall be calculated Hum standard weight on the same basis on which steel is supplied to Contractor by department or those given in relevant I S : if steel is arranged by the contractor.

(c) The weight of steel plates and strips shall be taken from relevant I.S. based on 7.35 kg./ sq. meter fur every milli meter sheet thickness if steel is supplied to the contractor by department.

(d) Unless otherwise specified, weight of cleats, brackets, packing pieces, bolts, nuts, washer, distance pieces, separators, diaphragm gusset (taking overall square dimensions) fish plates etc. shall lie added to the weight of respectiveitems.

(e) In welded work allowance is to be made for weight of weld hands. No deductions shall be made for weld or bolts holes excluding holes for anchor or holding downbolts.

(f) For forged steel and steel castings, weight shall be calculated on the basis of 7850kg./cum.

(g) Unless otherwise specified, no allowance shall be made for the weld metal in case of welded steelstructure.

(i) Dimensionsotherthancrosssectionsandthicknessofplatesshallbemeasuredtonearest 0.001m

(j) Mill tolerance shall be ignored when weight is determined by calculation.

3.1. The rate includes cost of all material, labour, erection, hoisting scaffolding, protective measure, required for proper completion of the item of work. This shall also include conveyance and delivery handling, loading, unloading and storing etc. required for completing the item described above including necessary wastageinvolved.

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

Item no. 99.

Design, manufacture and installation of 12 mm dpi system, a complete assembly of extruded Multi / Micro cellular profile UV extruded/protected polycarbonate panels incorporated into a complete system. The Polycarbonate panel system consists coextruded UV protected Multi / Micro cellular structure polycarbonate panel with width of 1040 mm to ensure best performance for wind uplift, vibration, oil canning and visual appearance. Panels shall be manufactured with vertical standing seam with standing seam height of 10 - 15mm at both sides of the panel. Panels shall be fixed on Purlins with the Z - Type Stainless Steel Fastener/retention clips and connectors. Each fastener shall be min 1mm thick of SS 304 Grade and secured to supporting frame/structure with min 3 numbers of self-drilling screws so that the Pull Out Load of Fastener exceeds 7000 N (7 KN) when tested as per ISO 6892: 1998 and IS 1608: 2005. Snap-on connectors to interlock the panels shall have 2-4 teeth grip-lock locking mechanism to ensure maximum uplift capability. Panel shall be fixed with additional End cap/Aluminum U / F Profile / Glazing Bar (mill finish) for ends as required. Panel shall be fixed over structural steel / MS purlin (paid separately) by trained & factory authorised installer under direct supervision to complete entire project installation according to the detail technical specifications as per approved architectural drawings.

WORKMANSHIP

Polycarbonate panels shall be Coextruded UV protected Multi/Micro cellular structure.Panel Width shall be 1040 mm for optimal performance against wind uplift, vibration, oil canning, and visual appearance. Panels feature a vertical standing seam with a height of 10-15 mm on both sides for enhanced structural strength and aesthetic appeal. Panel shall be fastened with Z-Type Stainless Steel 304 grade 1mm thick Clips. For supporting frame/structure using a minimum of 3 self-drilling screws per fastener. Each fastener must exceed 7000 N (7 KN) as per ISO 6892:1998 and IS 1608:2005 standards. Locking with Snap-on connectors with a 2-4 teeth grip-lock locking mechanism. Used to finish ends of panels and ensure a neat, sealed appearance. Panels shall be fixed over structural steel purlins. Installation Team should be well Trained and to installation under direct supervision by engineer in charge.

Mode of measurements &payment

No payment shall be made for extra necessary required items etc. The rate shall be for a unit of per sqm

Item no. 100.

Providing and fixing stainless steel (Grade 304) railing made of Hollow tubes, channels, plates etc., including welding, grinding, buffing, polishing and making curvature (wherever required) and fitting the same with necessary stainless steel nuts and bolts complete, i/c fixing the railingwith necessary accessories & stainless steel dash fasteners , stainless steel bolts etc., of required size, on the top of the floor or the side of waist slab with suitable arrangement as per approval of Engineer-in charge, (for payment purpose only weight of stainless steel members shall be considered excluding fixing accessories such as nuts, bolts,fasteners etc.

WORKMANSHIP

STAINLESS STEEL RAILING

The stainless steel of 304 grade of as per IS 6911 : 2017 shall be used for further fabrication of railing as per Architectural Design.

(a) Stainless steel of 304 grade is most common in 300 series of Austenitic stainless steel.

(b) It is still sometimes referred to by its old name 18/8 which is derived from the nominal composition of type 304 being 18% chromium and 8% nickel.

(c) Fabrication of all stainless steel sections should be done only with tools dedicated to stainless steel materials. Tooling and work surfaces must be thoroughly cleaned before use. These precautions are necessary to avoid cross contamination of stainless steel by easily corroded metals that may discolour the surface of the fabricated product. Some specific hints are as under:

(i) Remove all moisture by blowing with dry air or heating with a torch.

(ii) Eliminate organic contaminates like oil, paints, anti-spatter compounds, grease, pencil marks, cutting compounds, adhesive from protective paper, soap used for leak testing etc.

(iii)Stainless steels cannot be flame cut with a torch. Acceptable results are achieved with an arch plasma cutter.

(iv)Be particularly careful to avoid zinc contamination. Do not use brushes or tools previously used on galvanized steel.

(v) Use only stainless steel wire brushes and use these brushes only on stainless steel.

Fixing Fixing with railing with necessary accessories & stainless steel dash fasteners, stainless steel bolts etc. of required size, on the top of the floor or the side of waist slab with suitable arrangement as per approval of Engineer-in-charge.

Measurements Only weight of stainless steel members shall be considered in kg, excluding fixing accessories such as nuts, bolts, fasteners etc.

Rate The rate shall include the cost of materials and labour involved in all the operations described above. Nothing extra shall be paid for fixing arrangements i.e. drilling, nut & bolts etc.

Mode of measurements &payment

No payment shall be made for extra necessary required items etc. The rate shall be for a unit of per KG.

Item no. 101.

Providing and laying mirror polished Kota stone slab flooring over 20mm (Average) thick base of cement mortar1:6 (1-cement:6-coarse sand)laid over and jointed with grey cement slurry mixed with pigment to match the shade of slab including rubbing and mirror polishing etc.complete.(A) 25mm thick(work for all the floors)

1.0. Materials

1.1. Water shall conform to M-1. Lime mortar shall conform to M-10. Cement mortar shall conform to M-11 Polished kota stone shall conform to M-49,

2.0. Workmanship

2.1. Each slab shall be cut to the required size and shape and fine chisel dressed at all the edges. The sides trust dressed shall have a full contract if a straight edge is laid along. The sides shall be table rubbed with coarse sand before paving. All angles and edges of the slabs shall be true square and free from chippings and giving a plane surface. The thickness shall be 25 mm. (Average) as specified in the item but not less than 20 mm. at any place of theslab.

2.2. Bedding for the Kota stone slabs shall be of cement mortar 1:6 (1cement:6coarse sand)or L.M. 1:1.5 of average thickness 20 mm given in the description of the item. Sub grade shall be cleaned, wetted and mopped Mortar of the specified mix and thickness shall then be spread on an area sufficientto

receive one kota stone slab. The slab shall be washed clean before laying. It shall be laid on top, pressed, tapped gently to bring it in level with the other slabs. If shall then be lifted and laid aside. Top surface of the mortar shall then be corrected by adding fresh mortar at hollows or depressions. The mortar shall then be allowed to harden bit. Over this surface, cement slurry of honey-like consistency shall be applied. The slab shall then be gently placed in position and tapped with wooden mallet till it isproperly padded in level with and close to the adjoining slab. The joint shall be as fine as possible. The slabs fixed in the floor adjoining, the walls shall enter not less than 10 mm. under the plaster, skirting or dedo. The junction between the wan and floor shall be finished neatly. The finished surface shall be true to levels and slopes asdirected

2.3. The floor shall be kept wet for a minimum period of 7 days so that bedding and joints set properly

2.4. Polishing shall be normally commenced after 14 days of laying the stone slab. First polishing shah be done with carborundum stones of 120 grade grit fitted in the heavy machine and then second polishing shall be done with carborundum stone of 220 to 350 grade grit fitted in heavy machine. Water shall be properly used during polishing. The stone shall then be washed clean with water When directed by the Engineer-in-charge, wax polish of approved quality shall be applied on the surface with the help of soft cloth over a clean and dry surface. Then the polishing machine fitted with bobs shall be run overit.

2.5. The holes required for Nahni traps, pipes and any other fittings shall be made, without any extracost.

3.0. Measurement &payment

3.1. The rate shall include the cost of all materials and labour involved in ail the operations described above. The kota stone flooring shall be measured in square meters correct to two places decimal, length and breadth shall be measured correct to a centimeter and between the finished face of skirting dedo plaster and no deduction shall be made nor extra paid for any opening in floor of areas up to 0 1sq

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

Item no. 102.

Providing and laying mirror polished kota stone slab 25mm thick in risers of steps,skirting Dado and pillars laid on10mm thick cement mortar 1:3 (1-Cement :3 coarses and) and jointed with gray cement slury mixed with pigment to match the shade of slab including rubbing and mirror polishing etc. complete.(work for all the floors)

Materials

Water shall conform to M-1. Cement mortar shall conform to M-11. Kota stone slab 25 mm thick shall conform to M-49.

Workmanship

2.0. The relevant specifications of item No. 112 shall be followed except that the kota stout-fixed for risers of steps, dedo or skirting in C.M. 1:3 and the polishing shall be done manually instead of machine polishing.

3.0. Mode of measurements and payment

3.1. The risers of steps, skirting or dedo shall be measured in sq. meter Length shall be measured along the finished faces of risers, skirting or dedo. Height shall be measured from finished level of treads of floor to top. Lining of pillars shall be measured under this item.

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

Item no. 103.

Providing & laying Light & Dark Colored Polisehd Granite slab (18mm thick) flooring For Staircase Tread,Landing over 20 mm (average) thick base of Cement Mortar (1-Cement : 6-Sand) using cementitious Adhesive Materials as per EIC instruction. Granite slab shall be laid and jointed with grey cement slurry. The size of granite should be in full leght of Riser and Tread as per design. Rates are including rubbing, polishing Moulding /Rounding of edges, making two lines of Grooves on each tread for antisleep, laying and removing of floor protection sheet etc. complete. (work for all the floor Staircase).

WORKMANSHIP

Granite Stone

It shall be of any colour and size as directed by Engineer-in -Charge. Granite shall be plain machine cut and mirror polished. The stone shall be smooth and of even surface without holes or pits.

SIZES AND TOLERANCES The size of marble blocks, slabs and tiles shall be as mentioned in Table

TABLE

Sl.No	Type	*Length*	*Width*	*Thickness*
1.	Blocks	30 to 250	30 to 100	30 to 90
2.	Slabs	70 to 250	30 to 100	2 to 15
3.	Tiles	10 to 60	10 to 60	0.8 to 2.4

(1)All dimensions are in centimetre.
(2) The length and width, of the blocks shall be in multiple of 30 cm.
(3) Length and width of slab shall be in multiple of 10 cm. and thickness in multiple of 1 cm.
(4) Tiles shall be square cut and linear dimensions in multiple of 10 cm.
(5) Only slabs and tiles shall be machine cut and factory made.
(6) For 8 mm thick tiles, special precautions will be required for fixing them like using special adhesive as per manufacturer's specifications. Such tiles are not suitable for outside veneering work exposed to rains/sun if used in large areas in continuous stretches. For tiles of thickness 20 mm and above cramps may be provided if approved by Engineer-inCharge.
Tolerance
The following tolerances shall be allowed in the dimension of blocks, slabs and tiles:

Type	Tolerance
Blocks	
(a) Length	+ 2 per cent
(b) Width	+ 2 per cent
(c) Thickness	+ 2 per cent
Slabs	
(a) Length	+ 2 per cent
(b) Width	+ 2 per cent
(c) Thickness	+ 3 per cent
Tiles	
(a) Linear dimension	+ 3 per cent
(b) Thickness	+ 1 per cent

The sizes other than those mentioned above may be provided as directed by the Engineer-inCharge and nothing extra shall be payble on this account.

PHYSICAL PROPERTIES
The physical properties of marble for blocks, slabs and tiles and method of tests are mentioned in Table.
TABLE

TABLE 8.2
Physical Properties of Marble & Granite

Characteristic	Marble		Granite	
(1) Moisture absorp- tion after 24 hrs immersion in cold water	Max. 0.4%	IS 1124	Max. 0.50% by weight	IS 1124
(2) Hardness	Min. 3	Mhos scale	-	-
(3) Specific Gravity	Min. 2.5	IS 1122	Min. 2.6	IS 1122

Approval of Sample Before starting the work, the contractor shall get samples of marble approved by the Engineerin-Charge. Approved samples shall be kept in the custody of the Engineer-in-Charge and the marble supplied and used on the work shall conform to samples with regard to soundness, colour, veining and general texture.

SAMPLING In any consignment all the blocks/slabs/tiles of the same group, size and finish shall be grouped together to constitute a lot. Sample shall be selected and tested separately for each lot for determining its conformity or otherwise to the requirements of the specification. The number

of blocks/slabs/tiles to be selected for the samples shall depend upon the size of the lot and shall be in accordance with the Table 8.3. TABLE 8.3

TABLE 8.3
Sample Size and Criteria for Conformity

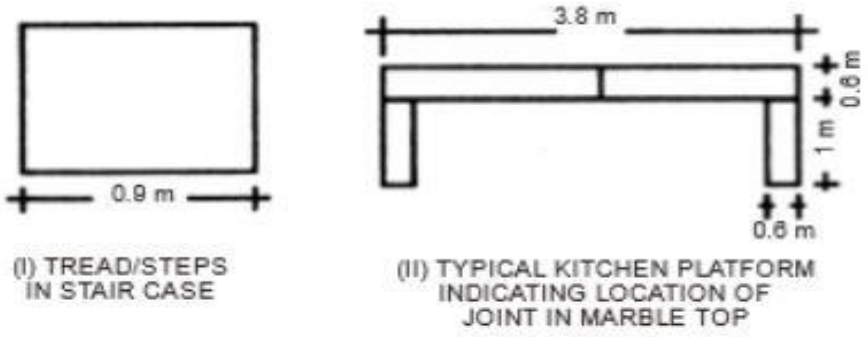
Number of Blocks slabs/Tiles in the lot	*Number of blocks slabs/ Tiles to be selected in sample*	*Permissible number of defectives*	*Sub Sample size in no.*
(1)	*(2)*	*(3)*	*(4)*
Up to 25	3	0	2
26 to 100	5	0	2
101 to 200	8	0	3
201 to 500	13	0	4
501 to 1000	20	1	5

Note: The blocks/slabs/tiles in the sample shall be taken at random and in order to ensure to randomness of selection, random tables may be used.

Explanation 1 : All the blocks/slabs/tiles, selected in the sample, shall be examined for dimensions workmanship and general requirements. Any block/slab/tile failing in any one or more of the above requirements shall be considered as defective. A lot shall be considered as conforming to these requirements if the number of defectives obtained is not more than permissible no. of defectives given in Col. 3 of table 8.3

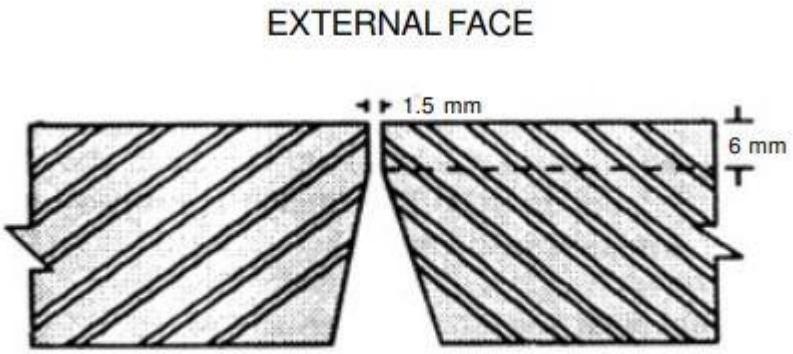
Explanation 2 : The lot having been found satisfactory with respect to dimensions, workmanship and general requirement shall be tested for physical properties of the marble. For this purpose a sub sample of the size given in Col. 4 of Table 8.3 shall be selected at random. These blocks/slabs/tiles in the sub sample shall be tested for moisture absorption, hardness and specified gravity. The lot shall be considered having satisfied the requirements of the physical properties if none of the blocks/ slabs/tiles tested for the requirements fails in any of these tests.

MARBLE WORK - TABLE RUBBED AND POLISHED (PLAIN WORK) Marble work in steps, jambs, columns and other plain work shall be as specified below: Joints in staircase treads, kitchen platforms shall be permitted only at curvature or when width/ length is more than 0.6/2 mtrs. respectively. Number of joints in each direction shall not be more than one number for every 2 mtrs. length beyond the initial 2.00 m length. Additional joints due to curvature or for providing fixture shall be provide judiciously as given in sketch 'A' below.



SKETCH (A)

Dressing, Cutting and Rubbing Every marble stone shall be gang saw/machine cut to the required size and shape, chisel dressed machine finished on all beds and joints, so as to be free from any waviness and to give truly vertical, horizontal, radial or circular joints as required. The exposed faces and sides of stones forming joints upto 6mm. from the face shall be fine tooled machine cut such that a straight edge laid along the face of the stone is in contact with every point on it. All window sills, tread of steps, counters vanities moulding edges etc. shall be machine cut & polished to give high gloss mirror finish as per direction of Engineer-in-Charge. These surfaces shall then be rubbed smooth. All visible angles and edges shall be true, square and free from chipping. Beyond the depth of 6 mm from face, the joints shall be dressed with a slight splay so that the thickness of joint increases, in an inverted V shape as shown in Fig. below. The surfaces of the stones coming in contact with backing need not be chisel dressed



INVERTED V-SHAPE JOINT

A sample of dressed and rubbed stone shall be prepared for approval and it shall be kept on worksite after being approved by the Engineer-in Charge.

Mortar The mortar used for jointing shall be as specified.

Laying All marble stones shall be wetted before placing in position. These shall then be floated on mortar and bedded properly in position with wooden mallets without the use of chips or under pinning of any sort. The walls and pillars shall be carried up truely in plumb or battered as shown in the drawings. All courses shall be laid truely horizontal and all vertical joints shall be truely vertical. In case of work without backing of brick work or coursed rubble masonry, face stone shall be laid in headers and stretchers alternatively unless otherwise directed. The headers shall be arranged to come as nearly as possible in the middle of stretchers above and below. Stone shall be laid in regular courses of not less than 15 cm in height and all courses shall be of the same height unless otherwise specified. For work facing with backing of brick work or coursed rubble masonry, face stone shall be laid in alternate courses of header and stretchers unless otherwise directed. Face stone and bond stone courses shall have break joint on the face of atleast half the height of the standard course and the bond shall be carefully maintained through out. All the connected masonry in a structure shall be carried up nearly at one uniform level throughout but where breaks are unavoidable the joints shall be made in good long steps so as to prevent cracks developing between new and old work. When necessary jib crane or other mechanical appliances shall be used to hoist the heavy pieces of stones and place these in to correct positions, care being taken that the corners of the stone are not damaged. Stone shall be covered with gunny bags, before putting chain or rope is passed over it, and it shall be handled carefully. No piece which has been damaged shall be used in work. The matching of grains shall be carried out as directed by the Engineer-in-Charge.

Bond Stone Bond or through stones running right through the thickness of walls, shall be provided in walls upto 60 cm thick and in case of wall above 60 cm thickness a set of two or more bond stones overlapping each other by atleast 15 cm shall be provided in a line from face to back. At least one bond stone or a set of bond stones shall be provided for every 0.5 sqm of the wall surface. All bond stones shall be marked suitably as directed by the Engineer-in-Charge. 8.5.5 Joints The depth of joints 6 mm from the face shall be uniform and as fine as possible but shall be not more than 1.5 mm thick on the exposed face. Beyond the depth of 6 mm from face, the thickness of joints shall increase in an inverted V shape so as to give good mortar bond between two stones. The inverted portion of the joints shall be filled with bedding mortar and the face 6 mm portion with pointing mortar.

Curing The work shall be kept constantly moist on all faces for a period of atleast seven days.

Finishing After the marble work is cured, it shall be rubbed with carborandum stone of different grades no. 60, 120 and 320 in succession or with electrical rubbing machines rubbed with carborandum items 0 to 6 nos.in succession, so as to give a plane true and highly smooth surface. It shall then be cleaned with a solution of oxalic acid, washed and finished clean.

Protection Green work shall be protected from rain by suitable coverings. The work shall also be suitably protected from damage during construction.

Scaffolding Double scaffolding having two sets of vertical supports shall be provided where necessary. The supports shall be sound and strong, tied together by horizontal pieces over which the scaffolding plank shall be fixed.

Tolerances As per para 8.2 Note: The above Para 8.5. also applies to the Ashlar masonry referred in Chapter No. 7.0 - Stone Work.

Measurements For plain work: Measurements shall be taken correct to a cm in length and breadth and correct to 0.5 cm in thickness.

In the case of radially dressed or circular stone used in the work, the dimensions of the circumscribing rectangle of the dressed stone, shall be measured correct to a centimetre and thickness, correct to 0.5 cm. The cubical contents shall be calculated in cubic decimetre nearest to two places of decimal.

The marble work in arches and domes shall be measured as for plain work, but extra shall be allowed for such work over the rate for plain work.

Fixing with Adhesive Cementitious adhesive materials as specified by the Engineer in Charge jointing with Grey cement slurry used for jointing the granite slabs.

Sunk or moulded work in marble shall be measured by volume as per plain marble work or work in arches or domes as the case may be on the basis of circumscribed rectangular block of the finished work but extra shall be paid for such work over the rate for plain work for work in arches and domes. For the purpose of extra payment, volume of every stone sunk or moulded shall be considered.

Rate The rate includes the cost of materials and labour required for all the operations i/c cutting of recesses in wall cutting moulding corners edge rounding finishing & polishing as specified

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

Item no. 104.

Providing & laying Granite slab (18mm thick - river wash) in riser of steps dedo, Skirting and pillars laid 15 mm thick Cement Mortar 1:3 (1Cement:3 Coarse Sand) using cementitious Adhesive Materials as per EIC instruction. Granite slab shall be jointed with the Grey Cement Slurry Rates are including rubbing, polishing Moulding / Rounding of edges, laying and removing of floor protection sheet etc. complete.(work for all the floors)

Workmanship

2.1. The relevant specifications of item No. 103 shall be followed except that the granite fixed for risers of steps, dedo or skirting in C.M. 1:3 and the polishing shall be done manually instead of machine polishing.

3.2. Mode of measurements and payment

3.3. The risers of steps, skirting or dedo shall be measured in sq. meter Length shall be measured along the finished faces of risers, skirting or dedo. Height shall be measured from finished level of treads of floor to top. Lining of pillars shall be measured under this item.

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

Item no. 105.

Providing and laying minimum 8-9 mm thick Double Charged Vitrified tiles Matt/Antiskid finish of size 600mmx600mm in floor / skirting (thickness to be specified by the manufacturer) with water absorption less than 0.08%and conforming to IS:15622, of approved brand & manufacturer, in all colours and shade, laid with cement based high polymer modified quick set tile adhesive (water based) conforming to IS : 15477, in average 6 mm thickness, including grouting of joints The tiles must be cut with the zero chipping diamond cutter only . Laying of tiles will be done with the notch trowel, plier, wedge, clips of required thickness, leveling system and rubber mallet for placing the tiles gently and easily.

Workmanship

2.0. Bedding :

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

2.1. The Glazzed vitrified tile shall be laid with cement based high polymer modified quick set tile adhesive (water based) conforming to IS : 15477, in average 6 mm thickness, including grouting of joints Fixing tiles.

2.2.

2.2.1. The tiles before laying shall be soaked in water for at least tow hours. The double charged vitrified tile shall be laid with cement based high polymer modified quick set tile adhesive (water based) conforming to IS : 15477, in average 6 mm thickness, including grouting of joints Fixing tiles The tiles shall be well pressed and gently tapped with a wooden mallet till they are properly bedded and in level with the adjoining tiles. There shall be. no hollows in bed or joints. The joints between the tiles shall be as thin as possible in straight line or as per pattern.

2.2.2. The tiles shall not have staggered joints. The joints shall be true to centre line both ways. The Nahni

trap coming in the flooring shall be so positioned that its grating shall replace only one tile as far as possible. Where full size tiles cannot be fixed they shall be cut (Swan) to the required size and the edges rubbed smooth to ensure straight and true joints. The joints shall be filled with cement based high polymer modified quick set tile adhesive with wire brush or trowel to a depth of 5 mm. and loose material removed. White cement shall be used for pointing the joints. After fixing the tiles finally in an even plane the flooring shall be kept wet and allowed to nature undisturbed for 7days.

2.3. Cleaning:

2.3.1. The surplus cement based high polymer modified quick set tile adhesive that may have come out of the joints shall be cleaned off before it sets. Once the floor has set, it shall be carefully washed, cleared by dilute acid and dried. Proper precautions and measures shall be taken to ensure that the tiles are not damaged in any way till the completion of the construction.

3.0. Mode of measurements &payment

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

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

Item no. 106.

Providing and laying minimum 8-9 mm thick Double charged Vitrified tiles Matt/Antiskid finish of size 800mmx800mm in floor / skirting (thickness to be specified by the manufacturer) with water absorption less than 0.08%and conforming to IS:15622, of approved brand & manufacturer, in all colours and shade, laid with cement based high polymer modified quick set tile adhesive (water based) conforming to IS : 15477, in average 6 mm thickness, including grouting of joints The tiles must be cut with the zero chipping diamond cutter only . Laying of tiles will be done with the notch trowel, plier, wedge, clips of required thickness, leveling system and rubber mallet for placing the tiles gently and easily.

Here's an expanded description tailored to the installation of 800mm x 800mm glazed vitrified tiles with a matt/antiskid finish:

Workmanship

The relevant specifications of item No. 105 shall be followed except that the glazzed vitrified tile size 800x800mm should be followed in this item

Mode of measurements and payment

.

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

Item no. 107.

Providing and laying Ceramic tiles 6mm thick in flooring treads of steps and landing laid on a bed of 12mm thick cement mortar 1:3 (1- cement : 3-coarse sand) finishing with flush pointing in white cement.

Workmanship

2.4. Bedding :

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

2.4.2. The ceramic tiles shall be laid on cement mortar bedding of 12 mm. thick in C.M. 1:3. The mortar shall have sufficient plasticity for laying and there shall be no hard lumps that would interfere with the evenness of bedding. The base shall be cleared and well wetted. The mortar shall then be spreadin thickness not less than 10 mm. at any place and average 12 mm. thickness. The proportion of the cement mortar shall be as specified in the item.

2.5. Fixing tiles:

2.5.1. The tiles before laying shall be soaked in water for at least tow hours. Neat gray cement grout at 33 kg/Cement/Sq. mt. of honey like consistency shall be spread over the mortar bedding as directed.The edges of the tiles shall be smeared with neat cement slurry. The tiles shall be well pressed andgently tapped with a wooden mallet till they are properly bedded and in level with the adjoining tiles. There shall be. no hollows in bed or joints. The joints between the tiles shall be as thin as possible in straight line or as perpattern.

2.5.2. The tiles shall not have staggered joints. The joints shall be true to centre line both ways. The Nahni trap coming in the flooring shall be so positioned that its grating shall replace only one tile as far as possible. Where full size tiles cannot be fixed they shall be cut (Swan) to the required size and the edges rubbed smooth to ensure straight and true joints. The joints shall be filled with grey cement groutwith wire brush or trowel to a depth of 5 mm. and loose material removed. White cement shall be used for pointing the joints. After fixing

the tiles finally in an even plane the flooring shall be kept wet and allowed to nature undisturbed for 7days.

2.6. Cleaning:

2.6.1. The surplus cement grout that may have come out of the joints shall be cleaned off before it sets. Once the floor has set, it shall be carefully washed, cleared by dilute acid and dried. Proper precautions and measures shall be taken to ensure that the tiles are not damaged in any way till the completion of the.construction.

3.2. Mode of measurements &payment

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

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

Item no. 108.

Providing and laying Ceramic tiles 6mm thick in skrting risers of steps and dedo on 10mm thick cement plaster 1:3 (1-cement : 3- coarse sand) and jointed with white cement slurry

Workmanship

The relevant specifications of item No. 107 shall be followed except that the ceramic tile fixed for risers of steps, dedo or skirting in C.M. 1:3 with 10mm thick cement mortor.

Mode of measurements and payment

The risers of steps, skirting or dedo shall be measured in sq. meter Length shall be measured along the finished faces of risers, skirting or dedo. Height shall be measured from finished level of treads of floor to top. Lining of pillars shall be measured under this item.

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

Item no. 109.

Cement concrete flooring 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate) finished with a floating coat of neat cement, including cement slurry, but excluding the cost of nosing of steps etc. complete. i)40 mm thick with 20 mm nominal size stone aggregate

Workmanship

The specifications of item No. 9 of ordinary concrete 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 100 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

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

Item no. 110.

Providing and laying C.C. pavement of mix M-25 with ready mixed concrete from batching plant. The ready mixed concrete shall be laid in panels and finished with screed board vibrator , vacuum dewatering process and finally finished by floating, brooming with wire brush etc. complete as per specifications and directions of Engineer-in charge.Cement content considered in this item is @ 380 kg/cum.

Workmanship

The relevant specifications of item No. 15 shall be followed except the Cement concrete to be compacted by screed board vibrator of the type approved by Engineerin-Charge and by vaccum dewatering process complete as per directions of Engineer-in-charge.

Mode of Measurement &Payment

The relevant specifications of item No. 15 shall be followed:

Item no. 111.

Providing & laying of ITF Certified Acrylic Synthetic sports surfaces including 7MM SBR with single component PU binder, manually laying on the existing concrete surface, sealer of PU material for sealing of vide in SBR layer, 2 layers of top coat ITF classified Techno Court, White Line marking

Workmanship

Acrylic Synthetic Sports Surface shall be 7mm thick SBR (Styrene-Butadiene Rubber) granules base layer and Single component PU (Polyurethane) binder for adhering the SBR granules to the concrete surface and top layer of ITF classified Techno Court system, consisting of 2 layers of acrylic top coat. PU material sealer will be used for sealing voids and ensuring a smooth surface in the SBR layer. White lines marking will be according to ITF (International Tennis Federation) standards for tennis courts or specific sports requirements. Ensure the existing concrete surface is clean, dry, and free from dust, grease, and any contaminants. Repair any cracks or defects in the concrete surface as necessary and then Apply the single component PU binder evenly over the prepared concrete surface and Manually lay the 7mm thick SBR granules onto the PU binder, ensuring uniform coverage and a consistent thickness. Apply PU material sealer over the SBR layer to seal any voids and ensure a smooth, uniform surface and after that Apply the first layer of ITF classified Techno Court acrylic top coat over the sealed SBR layer. Allow sufficient drying and curing time as per manufacturer's recommendations before applying the second layer. Ensure proper application techniques to achieve a smooth and even finish..

Mode of measurements and payment
The rate shall be for a unit of one sq.meter.

Item no. 112.

Providing and fixing Glass mossaic tiles on finished plain wall surface of size 20 mm x 20 mm x 4 mm in all colour, design , fixing in customize design as per direction of Engineer-in- Charge. The glass mosaic tiles to be fixed on the wall surface with the help of approved adhesive applied at the rate of 2.5 kg per sqm and grouting of the same. The rate is inclusive of all operation, material and required pattern approved by Engineer-in-Charge:
Here's a detailed breakdown of providing and fixing glass mosaic tiles on a finished plain wall surface as per the specifications provided:

Workmanship
Glass Mosaic Tiles shall be Size 20 mm x 20 mm x 4 mm. All colors , pattern and designs shall be finalized by as per approved samples or directions of the Engineer-in-Charge. Mosaic Tiles shall be fixed and Grout with adhesive and consumption 2.5kg per sqm by using a notched trowel. Ensure the finished plain wall surface is clean, dry, and free from dust, grease, or any contaminants.Repair any uneven areas or imperfections on the wall surface. -. Press each glass mosaic tile firmly into the adhesive,Maintain consistent spacing between tiles.

Mode of measurements and payment
The rate shall be for a unit of per court.

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Item no. 113.

Cutting holes in RCC wall , slab by diamond core cutting machine upto 150mm dia for passing drain pipes etc and repairing the hole after insertion of drain pipe etc with GP2 grout.

Workmanship
Choose the appropriate diamond core bit size (up to 150mm in this case) for the desired hole diameter.Mount the core cutting machine securely to prevent movement during operation. Ensure the machine is connected to a stable power source and all controls are functioning correctly.the core cutting machine and slowly advance the diamond core bit into the RCC wall or slab.Apply steady pressure and use water or a suitable coolant to keep the core bit and cutting area cool and to minimize dust.Once the core bit has cut through the RCC, retract the core cutting machine and remove the core from the hole.Handle the extracted core carefully to avoid any damage.Clean the hole thoroughly to remove any debris and ensure a smooth surface for the drain pipe or conduit to be inserted.Insert the pipe or conduit carefully into the hole, ensuring it fits snugly and aligns correctly with the plumbing or drainage system.Prepare GP2 grout according to manufacturer instructions, ensuring the mix is of the correct consistency.Fill the space around the inserted drain pipe or conduit with GP2 grout to secure it in place and provide structural support.Smooth out the surface of the grout to ensure it blends seamlessly with the surrounding RCC.Clean up any excess grout or debris from the work area Dispose of waste materials properly according to environmental regulations.

Mode of measurements and payment
The rate shall be for a unit of each.

Item no. 114.

Providing and fixing eco-friendly light weight calcium silicate false ceiling tiles having Tegular edge & 15 mm Thick Densified edges on the Tile Periphery for Extra Strength The Light weight calcium silicate ceiling tiles shall have , light reflection 85% non-combustible as per B.S. 476 part IV, 100% humidity resistance and also having thermalconductivity0.043° w/m KC.for the best thermal Insulation . The Light weight calcium Silicate tile shall be of approved texture Fine fissured/ Spintone /Cosmos having NRC value of 0.5 & Globe having NRC value of 0.75 NRC or equivalent of size 595 X 595 mm to be laid on true horizontal level suspended inter locking metal grid of hot dipped galvanized steelsections (galvanizing @120 grams per sqm including both side) consisting of main 'T'runner suitably spaced at joints to get required length and size of 24X38mm made from 0.30 mm thick (minimum) sheet, 1200mm centre to centre, and cross 'T' of size 24X28mm made out of 0.33mm (Minimum) sheet spaced 1200mm along space etc. An additional 4mm thick PVC strip of 40mm width is to be stuck on the interior side of the C channel using PVC solvent adhesive complete as per direction of Engineer in charge,manufactures.s at the back side so that 'L' shape outer PVC beading can be removed whenrequired for replacement of broken glass etc. complete as per direction of etc. complete as per direction of Engineer in charge and manufactuture's specification.icationntre with 25mm long dry wall screws @ 230mm interval and laying 15mm thick Densified edges light weight calcium silicate ceiling tiles of approved texture (Fine Fissured /Cosmos /Spintone) in the grid including, cutting /making opening for services like diffusers, grills, light fittings, fixtures, smoke detectors etc., wherever required, Main 'T' runners to be suspended from ceiling using G.I. slotted cleats of size 25X35X1.6mm fixed to ceiling with 12.5mm dia and 50mm long dash fasteners, 4mm G.I. adjustable rods with galvanized steel level clips of size 85X30X0.8mm, spaced at 1200mm centre to centre long main 'T'bottom exposed with 24mm of all T-sections shall be pre-painted with polyester baked paint, for all heights, as per specifications, drawings and as directed by engineer-in charge.Note:- Only calcium silicate false ceiling area will be measured from wall to wall. No deduction shall be made for exposed frames/opening (cut outs) having area less than 0.30 sqm. The calcium silicate ceiling tiles shall have NRC. Value of 0.50 (Minimum) for Fine fissured/Spintone/Cosmos and 0.75 NRC for Globe, light reflection 85% non-combustible as per B.S. 476 part IV, 100% humidity resistance and also having thermal conductivity.0.043° w/m KC.for the best thermal Insulation

Workmanship

26.16 ECO FRIENDLY LIGHT WEIGHT CALCIUM SILICATE FALSE CEILING (TEGULAR EDGED) 26.16.1 Materials
26.16.1.1 Tiles Eco friendly light weight calcium silicate tiles shall be made from Non-cementitious hydrated wet moulded calcium silicate slurry/mixture, reinforced with fibers and natural fillers. Free from formaldehyde and other harmful materials. Does not contain any toxic ingredients. Shall have appropriate recycled material contents. The Ceiling Tiles shall be of appropriate class and of finished thickness as specified in the description of the item .Only selected tiles of uniform width shall be used. Unless otherwise specified in the description of the item or shown in the drawings, the width of tiles selected for use shall not be less than 595 X 595 mm in size and shall be 15 mm thick integral densified tegular edged type, light weight wet moulded calcium silicate. Where width of room/ corridor is in multiple of standard width of tiles, same pattern shall be maintained throughout the length. Where the width of rooms/ corridor is not in multiple of standard width of tiles, borders with appropriate width and material of boards shall be provided in design approved by the Engineer-in-charge and maintained uniformly throughout of the length/ width of room/ corridor. Eco Friendly Light Weight Calcium silicate tiles shall have the following properties:
(a) Surface: All tiles are prime coated on both sides. Standard finish in two coats white dispersion type, solvent free paint.
(b) Dimensions: 595mmx595mmx15mm thick tegular edged. Size referred to are always module sizes. The nominal panel size may differ depending on the suspension system used.
(c) Thickness: 10 mm thick in the center and 15mm thick all around on edge resting portion with integral densified edge.
(d) Density of material: 350 kg per cum in the central 10 mm thick portion and 450 kg cum on the edges, (Average 370 kg per cum as per ECBC Code 2007).
(e) Relative humidity: 100% RH resistant.
(f) Fire resistance: Non-combustible as per BS:476 Part-4. Fire performance: as per BS:476 (Part-6) for fire propagation and BS 476 (Part 7) for Surface spread of flame.
(g) Thermal conductivity: 0.048 W/m- K - 0.052 W/m- K as per ECBC Code 2007 and ASTM 518-1991. (h) Recycled Content: Shall have 46-50% recycled content out of which 18-20% should be FLYASH.
(i) Acoustic control: Sound Attenuation 30-32dB Noise reduction coefficient (NRC) Plain & Designer tile: 0.10-0.15. For Pin Hole/Texture pattern tiles: 0.20-0.30. Pin hole/Texture fully perforated tile: 0.30-0.40. For 5mm fully perforated 0.40-0.50. For 5mm fully perforated with 50mm/48gsm glass wool 0.65-0.85.
(J) Light reflectance: >85%.
(k) Weight: 5 - 5.5Kg/m2 .
(l) Suspension system: Suspension system shall be made of roll-formed hot-dipped galvanized steel.

26.16.1.2 Frame
Frame is made up of interlocking metal T-grid of hot dipped galvanized steel sections of 0.33mm thick (Galvanized @ 120 gms/m2 including all sides) comprising of main T runners of size 24 x 38mm of length 3000mm, cross T of size 24 x 32 mm of length 1200mm and secondary intermediate cross T of size 24 x 32mm of length 600mm to form grid modules of size 600 x 600mm. This grid shall be suspended from ceiling using galvanized mild steel members (Galvanized @ 80 gms/m2 including all sides) i.e. 12x50mm long dash fasteners, 6mm dia fully threaded hanger rod upto 1000 mm length and L-shaped level adjuster of size 76 x 25 x 25x 1.6mm fixed with grid and Z cleat of size 25x37x25x1.6mm thick with precut hole on both 25mm flange to pierce into 12x50mm or even bigger dash fastener if require. Frame also consist of galvanized iron perimeter wall angle of size 24 x 24 x 0.40mm of length 3000mm to be fixed on periphery wall/ partition with the help of plastic rawl plugs at 450mm centre to centre and 40mm long dry wall SS screws. The bottom surface of the frame shall be checked and corrected to true plans and slopes.

26.16.2 Fixing
Outer wall angle shall be fixed accurately and truly at required height and level, parallel and close to the wall. Thereafter all the T members shall be placed and fixed carefully to form the grid. The grid comprises of main T-runners at 1200mm centres securely fixed to the structural soffit by

approved and adjustable hanger rods at 1200mm maximum centres and not more than 150mm from spliced joints of main T-runners. The last hanger at the end of each runner should not be greater than 600mm from the adjacent wall. Similarly, cross T-runners of 1200mm length shall be placed at 600mm centre to centre. 600x600mm modules to be formed by fitting 600mm long flush fitting cross Tees (secondary cross T) centrally between 1200mm cross T-runners. The tiles shall then be placed properly in the grids as per required pattern, texture and design/ drawing and as per directions of the Engineer-in-Charge. If required, level of the false ceiling grid shall be checked after placing of calcium silicate tiles and necessary adjustment shall be made wherever required through level adjuster.

26.16.3 Precaution:
(a) All wet trades such as plastering, conduting and painting etc, be completed prior to start of false ceiling works.
(b) Air conditioning duct work is to be completed preferably even before the suspension of the grid section.
(c) Electrical chasing or drawing lines & cables, etc are to be in place before start of false ceiling work.
(d) No unauthorized weight is put on false ceiling. Lighting fixtures, diffusers are to be suspended independently with proper chain/wire & dash fasteners as directed by Engineer In Charge/ manufacturer guide line.
(e) The area is dry prior to ceiling installation work.

26.16.4 Finishing
Care should be taken while placing Light Weight calcium silicate tiles into the grid so that there will be no displacement to grid and stains/ dirty marks put by the workers. (worker should preferably wear clean soft cotton gloves while placing tile).

26.16.5 Measurements
Length and breadth shall be measured correct to a cm. Areas shall be worked out to nearest 0.01sqm. The superficial area of the finished work ceiling shall be measured in square meters. No deduction in measurements shall be made for openings of areas upto0.36 Sqm. Nothing extra shall be payable either for any extra material or labour involved in forming such openings. For openings exceeding 0.36 sqm in area, deductions in measurements for the full opening in multiple of area of each tile (0.36 Sqm) will be made.

26.16.6 Rate
The rate shall include the cost of all materials and labour involved in all the operations described above. The rate shall be for a unit of sqm.

26.16.7 MTC:
Manufacturers test certificate/ report of invoice to be submitted for every delivery challan by suppliers.

Item no. 115.

Providing & fixing false ceiling at all height including providing & fixing of framework made of special section, power pressed from M.S. sheets and galvanised with zinc coating of 120 gms/ sqm (both side inclusive) as per IS : 277 and consisting of angle cleat of size 25mm wide x 1.6mm thick with flanges of 27mm and 37mm, at 1200mm c/c, one flange fixed to the ceiling with dash fastener 12.5mm dia x 50mm long with 6mm dia bolts, other flange of cleat fixed to the angle hangers of 25 x10 x0.50mm of required length with nuts & bolts of required size and other end of angle hanger fixed with intermediate G.I chanels 45 x15 x 0.90mm running at the spacing of 1200 mm c/c, to which the ceiling section 0.5mm thick bottom wedge of 80mm with tapered flanges of 26 mm each having lips of 10.5mm, at 450mm c/c, shall be fixed in a direction perpendicular to G.I intermediate channel with connecting clip made out of 2.64mm dia x 230mm long G.I wire at every junction, including fixing perimeter channels 0.50mm thick 27mm high having flanges of 20mm and 30mm long, the perimeter of ceiling fixed to wall/ partitions with the help of Rawl plugs at 450mm centre, with 25mm long dry wall screws @ 230mm interval, including fixing of Calcium Silicate Board to ceiling section and perimeter channels with the help of dry wall screws of size 3.5 x25mm at 230mm c/c, including jointing & finishing to a flush finish of tapered and square edges of the board with recommended jointing compounds, jointing tapes,finishing with jointing compounds in three layers covering up to 150mm on both sides of joints and two coats of primer suitable for boards, all as per manufacture's specification and also including the cost of making opening for light fittings, grills, diffusers, cut outs made with frame of perimeter channels suitably fixed, all complete as per drawings, specificaton and direction of the Engineer in charge but excluding the cost of painting with: 8 mm thick Calcium Silicate Board made with Calcareous & Siliceous materials reinforced with cellulose fiber

Workmanship

12.29 CALCIUM SILICATE BOARD FALSE CEILING
12.29.1 Material &Fixing :
8 mm thick Calcium Silicate Board made with Calcareous & Siliceous materials reinforced with cellulose fiber manufactured through autoclaving process shall be used. Frame work is made of special section, power pressed from M.S. sheets and galvanized with zinc coating of 120 gms/ sqm (both side inclusive) as per IS : 277 and consisting of angle cleat of size 25mm wide x 1.6mm thick with flanges of 27mm and 37mm, at 1200mm c/c, one flange fixed to the ceiling with dash fastener 12.5mm dia x 50mm long with 6mm dia bolts, other flange of cleat fixed to the angle hangers of 25 x10 x0.50mm of required length with nuts & bolts of required size and other end of angle hanger fixed with intermediate G.I chanels 45 x15 x 0.90mm running at the spacing of 1200 mm c/c, to which the ceiling section 0.5mm thick bottom wedge of 80mm with tapered flanges of 26 mm each having lips of 10.5mm, at 450mm c/c, shall be fixed in a direction perpendicular to G.I intermediate channel with connecting clip made out of 2.64mm dia x 230mm long G.I wire at every junction, including fixing perimeter channels 0.50mm thick 27mm high having flanges of 20mm and 30mm long. The perimeter of ceiling fixed to wall/ partitions with the help of rawl plugs at 450mm centre, with 25mm long dry wall screws @ 230mm interval, including fixing of Calcium Silicate Board to ceiling section and perimeter channels with the help of dry wall screws of size 3.5 x25mm at 230mm c/c, including jointing & finishing to a flush finish of tapered and square edges of the board with recommended jointing compounds, jointing tapes, finishing with jointing compounds in three layers covering up to 150mm on both sides of joints and two coats of primer suitable for boards, all as per manufacture’s specification and also including the cost of making opening for light fittings, grills, diffusers, cut outs made with frame of perimeter channels suitably fixed, all complete as per drawings, specification and direction of the Engineer in charge but excluding the cost of painting. Manufacturers test certificate/ report of invoice shall be submitted for every delivery challan by suppliers.

12.29.2 Precaution:
All wet trades such as plastering, conduting and painting etc, be completed prior to start of false ceiling works. Air conditioning duct work is to be completed preferably even before the suspension of the grid section. Electrical chasing or drawing lines & cables, etc are to be in place before start of false ceiling work. No unauthorized weight is put on false ceiling. Lighting fixtures, diffusers are to be suspended independently with proper chain/wire & dash fasteners as directed by Engineer In Charge/manufacturer guide line. The area shall be made dry prior to ceiling installation work. Care should be taken while placing Light Weight calcium silicate tiles into the grid so that there will be no displacement to grid and stains/ dirty marks put by the workers. (worker should preferably wear clean soft cotton gloves while placing tile).

12.29.3 Measurements:
Length and breadth shall be measured correct to a cm. Areas shall be calculated nearest to 0.01sqm. No deduction in measurements shall be made for openings of areas upto0.36 Sqm. Nothing extra shall be payable either for any extra material or labour involved in forming such openings. For openings exceeding 0.36 sqm in area, deductions in measurements for the full opening in multiple of area of each tile (0.36 Sqm) will be made.

12.29.4 Rate:
The rate shall include the cost of all materials and labour involved in all the operations described above. The rate shall be for a unit of sqm

Item no. 116.

Providing & fixing Armstrong Vertical Linear Baffle Ceiling made out of Aluminum Extrusion in Aluminum alloy grade 6063. The baffle blade shall be in size of 100x50mm in WHITE/BLACK/WOOD GRAIN finish – Pradoo & Cabrueava. The baffle blade shall be suspended using Slotted U-profile at on-center spacing . Longer lengths of Baffle to be connected by Baffle Joiner and the ends to be fixed with End caps.
Baffle Ceiling 200mm c/c.

Workmanship

1.Material: Aluminum shall be Extrusion of Grade 6063 aluminum alloy and Baffle Blade Size shall be 100mm x 50mm with finish WHITE, BLACK, WOOD GRAIN

2.Installation Method : Baffle blades shall be suspended in the ceiling using Slotted U-profile on center to center spacing of 200mm c/c (center to center).

3.Connection and Fixing: Longer lengths of baffle blades shall be connected using baffle joiners. Ends of the baffle blades shall be fixed with end caps for a finished appearance. Determine the layout and spacing of baffle blades according to the design requirements, ensuring even distribution and alignment. Installation Slotted U-profiles at the specified 200mm c/c spacing using appropriate fasteners and anchors suitable for the ceiling substrate.Ensure U-profiles are securely fixed and leveled to support the weight of the baffle blades. connect the baffle blades to the Slotted U-profiles and Place each baffle blade into the slotted U-profiles after that Use baffle joiners to connect longer lengths of baffle blades where necessary and now Fix end caps securely to the ends of the baffle blades to provide a neat and finished appearance. Adjust the position and alignment of the baffle blades as necessary to ensure a uniform and aesthetically pleasing installation.Adjust the position and alignment of the baffle blades as necessary to ensure a uniform and aesthetically pleasing installation.

26.22.5 Rate
The rate shall include the cost of all materials and labour involved in all the operations described above. The rate shall be for a unit of sqm.

Item no. 117.

Providing and fixing mineral fibre false ceiling tiles at all heights of size 595X595mm of approved texture, design and pattern. The tiles should have Humidity Resistance (RH) of 99%, Light Reflectance ? 85%,Thermal Conductivity k = 0.052 - 0.057 w/m K, Fire Performance as per (BS 476 pt - 6 &7)in true horizontal level suspended on interlocking T-Grid of hot dipped all round galvanized iron section of 0.33 mm thick (galvanized @120 gsm) comprising of main T runners of 15x32 mm of length 3000 mm, cross T of size 15x32mm of length 1200 mm and secondary intermediate cross T of size 15x32 mm of length 600 mm to form grid module of size 600x600 mm suspended from ceiling using galvanized mild steel item (galvanised@80gsm) 50 mm long 8mm outer diameter M-6 dash fasteners, 6 mm diameter fully threaded hanger rod up to 1000 mm length and L-shape level adjuster of size 85x25x2 mm, spaced at 1200 mm centre to centre along main 'T'. The system should rest on periphery walls /partitions with the help of GI perimeter wall angle of size24x24X3000 mm made of 0.40 mm thick sheet, to be fixed to the wall with help of plastic rawl plug at 450 mm centre to centre & 40 mm long dry wall S.S. screws. The exposed bottom portion of all T-sections used in false ceiling support system shall be pre-painted with polyester baked paint, for all heights. The work shall be carried out as per specifications, drawings and as per directions of the engineer-in-charge. With 20 mm thick beveled tegular mineral fibre false ceiling tile (NRC 0.7)

Workmanship

26.22 MINERAL FIBRE FALSE CEILING (BEVELED TEGULAR MINERAL FIBRES)
26.22.1 Materials
26.22.1.1 Tiles
Mineral Fiber Ceiling Tiles shall be made of granulated high-density Mineral Wool as the main material and top production technique which gives it superior features of fire-proofing, sound absorption, heat insulation & sag resistance. They are cost effective and are mainly used for acoustics and decoration. Tiles shall be appropriate class and of finished thickness as specified in the description of the item. Only selected tiles of uniform width shall be used. Unless otherwise specified in the description of the item or shown in the drawings, the width of tiles selected for use shall not be less than 595 x 595mm in size and of approved texture, design and patterns and patterns and shall be of 16mm/ 20mm thick Beveled Tegular edge type. Where width of room/ corridor is in multiple of standard width of tiles, same pattern shall be maintained throughout the length. Where the width of rooms/ corridor is not in multiple of standard width of tiles, borders with appropriate width and material of boards shall be provided in design approved by the Engineer-in-charge and maintained uniformly throughout of the length/ width of room/ corridor. Mineral Fibre tiles shall have the following properties:
(a) Surface: Shall be of approved texture, design and pattern.
(b) Dimensions: 595mm x 595mm x 16mm (20mm) thick Beveled Tegular edge type. Size referred to are always module sizes. The nominal panel size may differ depending on the suspension system used.
(c) Relative humidity:99% RH resistant.
(d) Fire resistance: Fire performance as per BS:476 (Part-6 & 7)
(e) Thermal conductivity: 0.052 W/m–K – 0.057 W/m–K
(f) Acoustic control: Noise reduction coefficient (NRC) = 0.50 to 0.60
(g) Light reflectance:>85%.

(h) Weight: 3.10 Kg/m2 (for 16mm thick) & 5.29 Kg/m2 (for 20mm thick)
(i) Suspension system: Suspension system shall be made of interlocking metal T-grids of hot-dipped all round galvanized steel.

26.22.1.2 Frame
Frame is made up of interlocking metal T-grids of hot dipped all round galvanized steel sections of 0.33mm thick (Galvanized @ 120 grams per sqm including both sides) comprising of main T runners of size 15 x 32mm of length 3000mm, cross T of size 15 x 32mm of length 1200mm and secondary intermediate cross T of size 15 x 32mm of length 600mm to form grid modules of size 600 x 600mm. This grid shall be suspended from ceiling using galvanized mild steel members (Galvanized @ 80 gms/m2 including all sides) i.e. 50mm long, 8mm outer diameter M-6 dash fasteners, 6mmdia fully threaded hanger rod upto 1000 mm length and L-shaped level adjuster of size 85 x 25 x 2mm. Frame also consist of galvanized iron perimeter wall angle of size 24 x 24 x 0.40mm of length 3000mm to be fixed on periphery wall/ partition with the help of plastic rawl plugs at 450mm centre to centre and 40mm long dry wall SS screws. The bottom surface of the frame shall be checked and corrected to true plans and slopes.

26.22.2 Fixing Outer wall angle shall be fixed accurately and truly at required height and level, parallel and close to the wall. Thereafter all the T members shall be placed and fixed carefully to form the grid. The grid comprises of main T-runners at 1200mm centres securely fixed to the structural soffit by approved and adjustable hanger rods at 1200mm maximum centres and not more than 150mm from spliced joints of main T-runners. The last hanger at the end of each runner should not be greater than 600mm from the adjacent wall. Similarly, cross T-runners of 1200mm length shall be placed at 600mm centre to centre. 600x600mm modules to be formed by fitting 600mm long flush fitting cross Tees (secondary cross T) centrally between 1200mm cross T-runners. The tiles shall then be placed properly in the grids as per required pattern, texture and design/ drawing and as per directions of the Engineer-in-Charge. If required, level of the false ceiling grid shall be checked after placing of calcium silicate tiles and necessary adjustment shall be made wherever required through level adjuster.

26.22.3 Finishing
Care should be taken while placing calcium silicate tiles into the grid so that there will be no displacement to grid and stains/ dirty marks put by the workers.

26.22.4 Measurements
Length and breadth shall be measured correct to a cm. Areas shall be worked out to nearest 0.01sqm. The superficial area of the finished work ceiling shall be measured in square metres. No deduction in measurements shall be made for openings of areas upto0.36 Sqm. Nothing extra shall be payable either for any extra material or labour involved in forming such openings. For openings exceeding 0.36 sqm in area, deductions in measurements for the full opening in multiple of area of each tile (0.36 Sqm) will be made.

26.22.5 Rate
The rate shall include the cost of all materials and labour involved in all the operations described above. The rate shall be for a unit of sqm

Item no. 118.

Providing 10 mm thick Cement Plaster in single coat on brick/concrete Ceiling for interior plastering finished even and smooth in(i) Cement mortar 1:3 (1-cement :3- sand) as required to receive specified architectural finish (like Grooves, pattern if any, drip mould etc.) to correct line, plumb .etc – **Basement Floor**

1.0. Materials

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

2.0. Workmanship

2.1. Scaffolding:

Wooden bullies, bamboos, planks, trestles and other scaffolding shall be sound. These shall be properly examined before erection and use. Stage scaffolding shall be provided for ceiling plaster which shall be independent of the walls.

2.2. Preparation of back-ground:

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

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

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

2.2.4. For external plaster, the pestering operation shall be started from top floor and carried downwards. For internal plaster, the plastering operations may be-started wherever the building frame and cladding work are

ready and the temporary supports of the ceiling resting on the wall of the floor have been removed. Ceiling plaster shall be completed before starting plaster towalls.

2:3. Application of plaster:

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

2.3.2. Cement plaster shall be used within half an hour after addition of water. And mortar or plaster which is partially set shall be rejected and removed forthwith from thesite.

2.3.3. In suspending the work at the end of the day, the plaster shall be left out clean to the line both horizontally and vertically, when recommencing the plaster, the edges of the old work shall be scraped clean and wetted with cement putty before plaster is applied to the adjacent areas to enable the two to properly join together. Plastering work shall be closed at the end of the day on the body of the wall and nearer than 15 cm. to any corners or arises. It shall not be closed on the body of features such as plaster bands and cornices not at the corners or arises. Horizontal joints in plaster work shall not also occur on parapet tops and copings as these invariably lead to leakage. No portion of the surface shall be left out initially to be packed up lateron.

2.3.4. Each coat shall be kept damp continuously till the next coat is applied or for a minimum period of 7 days. Moistening shall commence as soon as plaster is hardened sufficiently. Soaking of walls shall be avoided and only as much water as can be readily absorbed shall be used, excessive evaporation on the sunny or windward side of building in hot air or dry weather shall be prevented by hanging matting or gunny bags oh the outside of the plaster and keeping them wet.

3.0. Mode of measurements &payment

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

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

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

3.4. This item includes plastering up to floor twolevel.

3.5. The measurement of wall plastering shall be taken between the walls or partition (dimensions before plastering being taken) for length and from the top of floor or skirting to ceiling for height. Depth of cover of cornices if any shall bededucted.

3.6. Soffits of stairs shall be measured as plastering on ceilings, following soffits shall be measured separately.

3.7. For jambs, soffits, sills etc. for openings not exceeding 0.5 sq. met each in area for ends of joints beams, posts, girders, steps etc. not exceeding 0.5 sq. mt each in area and for openings exceeding 0.5. sq. mt and not exceeding 3.00 sq. mt. in each area deductions and additions shall be made in the followingmanners.

(a) Nodeductionsshallbemadeforendsofjoints,beams,postsetc.andopeningsnotexceeding 0.5 sq. mt each and no addition shall be made for reveals, jambs, soffits, sils etc. of these openings, for finish to plaster around ends of joints, beams posts etc.

(b) Deduction for openings exceeding 0.5 sq. mt but not exceeding 3 sq.mt. each shall be made as follows and no addition shall be made for ravels, jambs, soffits, sills etc. of these openings, (i) Whenboth faces of all wall are plastered with same plaster, deduction shall be made for one face only, (ii)When two faces of wall are plastered with different types of plasters or if one face is plastered and the other pointed, deductions shall be made from the plaster or pointing on the side of frame for door, window etc. on which width of reveals is less than that on the other side but no deductions shall be made on the other side. Where width of reveals on both faces of all are equal, deductions of 50% of area of opening on each face shall be made from areas of plaster and / or pointing as the case maybe.

3.8. For openings having door frames equal to or projecting beyond the thickness of wall, full deduction for opening shall be made from each plastered face of the wall.

The Location ,type of component of wall/ceilling and levels shall be followed as per boq item. Including Grooves, pattern if any, drip mould etc and no extra payment will be applicable.

3.9. the case of openings of area above 3 sq. mt. each, deduction shall be made for openings but jambs, soffits sand sills shall bemeasured.

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

Item no. 119.

Providing 10 mm thick Cement Plaster in single coat on brick/concrete Ceiling for interior plastering finished even and smooth in(i) Cement mortar 1:3 (1-cement :3- sand) as required to receive specified architectural finish (like Grooves, pattern if any, drip mould etc.) to correct line, plumb .etc - **Ground Floor**

1.2. Materials

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

2.3. Workmanship

2.4. Scaffolding:

Wooden bullies, bamboos, planks, trestles and other scaffolding shall be sound. These shall be properly examined before erection and use. Stage scaffolding shall be provided for ceiling plaster which shall be independent of the walls.

2.5. Preparation of back-ground:

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

2.5.2. Raking of joints in case of masonry where necessary shall be allowed to dry out for sufficient period before carrying out the plasterwork.

2.5.3. The work shall not be soaked but only damped evenly before applying the plaster. If the surface becomes dry, such area shall be moistenedagain.

2.5.4. For external plaster, the pestering operation shall be started from top floor and carried downwards. For internal plaster, the plastering operations may be-started wherever the building frame and cladding work are ready and the temporary supports of the ceiling resting on the wall of the floor have been removed. Ceiling plaster shall be completed before starting plaster towalls.

2:3. Application of plaster:

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

2.3.6. Cement plaster shall be used within half an hour after addition of water. And mortar or plaster which is partially set shall be rejected and removed forthwith from thesite.

2.3.7. In suspending the work at the end of the day, the plaster shall be left out clean to the line both horizontally and vertically, when recommencing the plaster, the edges of the old work shall be scraped clean and wetted with cement putty before plaster is applied to the adjacent areas to enable the two to properly join together. Plastering work shall be closed at the end of the day on the body of the wall and nearer than 15 cm. to any corners or arises. It shall not be closed on the body of features such as plaster bands and cornices not at the corners or arises. Horizontal joints in plaster work shall not also occur on parapet tops and copings as these invariably lead to leakage. No portion of the surface shall be left out initially to be packed up lateron.

2.3.8. Each coat shall be kept damp continuously till the next coat is applied or for a minimum period of 7 days. Moistening shall commence as soon as plaster is hardened sufficiently. Soaking of walls shall be avoided and only as much water as can be readily absorbed shall be used, excessive evaporation on the sunny or windward side of building in hot air or dry weather shall be prevented by hanging matting or gunny bags oh the outside of the plaster and keeping them wet.

3.10. Mode of measurements &payment

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

3.12. All plastering shall be measured in square meters unless otherwise specified. Length breadth or height shall be measured correct to acentimeter.

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

3.14. This item includes plastering up to floor twolevel.

3.15. The measurement of wall plastering shall be taken between the walls or partition (dimensions before plastering being taken) for length and from the top of floor or skirting to ceiling for height. Depth of cover of cornices if any shall bededucted.

3.16. Soffits of stairs shall be measured as plastering on ceilings, following soffits shall be measured separately.

3.17. For jambs, soffits, sills etc. for openings not exceeding 0.5 sq. met each in area for ends of joints beams, posts, girders, steps etc. not exceeding 0.5 sq. mt each in area and for openings exceeding 0.5. sq. mt and not exceeding 3.00 sq. mt. in each area deductions and additions shall be made in the followingmanners.

(c) Nodeductionsshallbemadeforendsofjoints,beams,postsetc.andopeningsnotexceeding 0.5 sq. mt each and no addition shall be made for reveals, jambs, soffits, sils etc. of these openings, for finish to plaster around ends of joints, beams posts etc.

(d) Deduction for openings exceeding 0.5 sq. mt but not exceeding 3 sq.mt. each shall be made as follows and no addition shall be made for ravels, jambs, soffits, sills etc. of these openings, (i) Whenboth faces of all wall are plastered with same plaster, deduction shall be made for one face only, (ii)When two faces of wall are plastered with different types of plasters or if one face is plastered and the other pointed, deductions shall be made from the plaster or pointing on the side of frame for door, window etc. on which width of reveals is less than that on the other side but no deductions shall be made on the other side. Where width of reveals on both faces of all are equal, deductions of 50% of area of opening on each face shall be made from areas of plaster and / or pointing as the case maybe.

3.18. For openings having door frames equal to or projecting beyond the thickness of wall, full deduction for opening shall be made from each plastered face of the wall.

The Location ,type of component of wall/ceilling and levels shall be followed as per boq item. Including Grooves, pattern if any, drip mould etc and no extra payment will be applicable.

3.19. the case of openings of area above 3 sq. mt. each, deduction shall be made for openings but jambs, soffits sand sills shall bemeasured.

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

Item no. 120.

Providing 10 mm thick Cement Plaster in single coat on brick/concrete Ceiling for interior plastering finished even and smooth in(i) Cement mortar 1:3 (1-cement :3- sand) as required to receive specified architectural finish (like Grooves, pattern if any, drip mould etc.) to correct line, plumb .etc - **First Floor**

Workmanship

The relevant specifications of item No.119 shall be followed.

Mode of Measurement &Payment

The relevant specifications of item No. 119 shall be followed:

Item no. 121.

Providing 10 mm thick Cement Plaster in single coat on brick/concrete Ceiling for interior plastering finished even and smooth in(i) Cement mortar 1:3 (1-cement :3- sand) as required to receive specified architectural finish (like Grooves, pattern if any, drip mould etc.) to correct line, plumb .etc - **Second Floor**

Workmanship

The relevant specifications of item No.119 shall be followed.

Mode of Measurement &Payment

The relevant specifications of item No. 119 shall be followed:

Item no. 122.

Providing 10 mm thick Cement Plaster in single coat on brick/concrete Ceiling for interior plastering finished even and smooth in(i) Cement mortar 1:3 (1-cement :3- sand) as required to receive specified architectural finish (like Grooves, pattern if any, drip mould etc.) to correct line, plumb .etc - **Third Floor**

Workmanship
The relevant specifications of item No.119 shall be followed.
Mode of Measurement &Payment
The relevant specifications of item No. 119 shall be followed:

Item no. 123.
RA
Providing 10 mm thick Cement Plaster in single coat on brick/concrete Ceiling for interior plastering finished even and smooth in(i) Cement mortar 1:3 (1-cement :3- sand) as required to receive specified architectural finish (like Grooves, pattern if any, drip mould etc.) to correct line, plumb .etc - **4th Floor**

Workmanship
The relevant specifications of item No.119 shall be followed.
Mode of Measurement &Payment
The relevant specifications of item No. 119 shall be followed:

Item no. 124.

Providing 10 mm thick Cement Plaster in single coat on brick/concrete Ceiling for interior plastering finished even and smooth in(i) Cement mortar 1:3 (1-cement :3- sand) as required to receive specified architectural finish (like Grooves, pattern if any, drip mould etc.) to correct line, plumb .etc - **5th Floor**

Workmanship
The relevant specifications of item No.119 shall be followed.
Mode of Measurement &Payment
The relevant specifications of item No. 119 shall be followed:

Item no. 125.

Providing 10 mm thick Cement Plaster in single coat on brick/concrete Ceiling for interior plastering finished even and smooth in(i) Cement mortar 1:3 (1-cement :3- sand) as required to receive specified architectural finish (like Grooves, pattern if any, drip mould etc.) to correct line, plumb .etc - **6th Floor**

Workmanship
The relevant specifications of item No.119 shall be followed.
Mode of Measurement &Payment
The relevant specifications of item No. 119 shall be followed:

Item no. 126.

Providing 10 mm thick Cement Plaster in single coat on brick/concrete Ceiling for interior plastering finished even and smooth in(i) Cement mortar 1:3 (1-cement :3- sand) as required to receive specified architectural finish (like Grooves, pattern if any, drip mould etc.) to correct line, plumb .etc - **7th Floor**

Workmanship
The relevant specifications of item No.119 shall be followed.
Mode of Measurement &Payment
The relevant specifications of item No. 119 shall be followed:

Item no. 127.

Providing 10 mm thick Cement Plaster in single coat on brick/concrete Ceiling for interior plastering finished even and smooth in(i) Cement mortar 1:3 (1-cement :3- sand) as required to receive specified architectural finish (like Grooves, pattern if any, drip mould etc.) to correct line, plumb .etc - 8th Floor

Workmanship
The relevant specifications of item No.119 shall be followed.
Mode of Measurement &Payment
The relevant specifications of item No. 119 shall be followed:

Item no. 128.

Providing 10 mm thick Cement Plaster in single coat on brick/concrete Ceiling for interior plastering finished even and smooth in(i) Cement mortar 1:3 (1-cement :3- sand) as required to receive specified architectural finish (like Grooves, pattern if any, drip mould etc.) to correct line, plumb .etc - 9th Floor

Workmanship
The relevant specifications of item No.119 shall be followed.
Mode of Measurement &Payment
The relevant specifications of item No. 119 shall be followed:

Item no. 129.

Providing 10 mm thick Cement Plaster in single coat on brick/concrete Ceiling for interior plastering finished even and smooth in(i) Cement mortar 1:3 (1-cement :3- sand) as required to receive specified architectural finish (like Grooves, pattern if any, drip mould etc.) to correct line, plumb . etc - Terrace Floor

Workmanship
The relevant specifications of item No.119 shall be followed.
Mode of Measurement &Payment
The relevant specifications of item No. 119 shall be followed.

Item no. 130.
Providing 15 mm thick Cement Plaster in single coat on brick/concrete wall/ for interior plastering finished even and smooth in(i) Cement mortar 1:4 (1-cement :4- sand) as required to receive specified architectural finish (like Grooves, pattern if any, drip mould etc.) to correct line, plumb . etc - Basement Floor

1.0. Materials & workmanship
1.1. The relevant specifications of item No. 119 shall be followed except that the proportion ofmortar is C.M. 1 :4 instead of C.M.1:3.and thickness 15mm instead of 10mm.
2.0. Mode of measurements & payment
2.1. The mode of measurements and payment shall be the same as for item No. 119
2.2. The rate shall be for a unit of One sq. meter.

Item no. 131.
Providing 15 mm thick Cement Plaster in single coat on brick/concrete wall/ for interior plastering finished even and smooth in(i) Cement mortar 1:4 (1-cement :4- sand) as required to receive specified architectural finish (like Grooves, pattern if any, drip mould etc.) to correct line, plumb .etc - Ground Floor

1.2. Materials &workmanship
1.3. The relevant specifications of item No. 130 shall be followed except that the proportion ofmortar is C.M. 1 :4 instead of C.M.1:3.and thickness 15mm instead of 10mm.
2.3. Mode of measurements &payment
2.4. The mode of measurements and payment shall be the same as for item No. 130
2.5. The rate shall be for a unit of One sq. meter.

Item no. 132.

Providing 15 mm thick Cement Plaster in single coat on brick/concrete wall/ for interior plastering finished even and smooth in(i) Cement mortar 1:4 (1-cement :4- sand) as required to receive specified architectural finish (like Grooves, pattern if any, drip mould etc.) to correct line, plumb .etc - First Floor

Workmanship
The relevant specifications of item No.130 shall be followed.
Mode of Measurement &Payment
The relevant specifications of item No. 130 shall be followed:

Item no. 133.

Providing 15 mm thick Cement Plaster in single coat on brick/concrete wall/ for interior plastering finished even and smooth in(i) Cement mortar 1:4 (1-cement :4- sand) as required to receive specified architectural finish (like Grooves, pattern if any, drip mould etc.) to correct line, plumb .etc - Second Floor

Workmanship
The relevant specifications of item No. 130 shall be followed.
Mode of Measurement &Payment

The relevant specifications of item No. 130 shall be followed:

Item no. 134.

Providing 15 mm thick Cement Plaster in single coat on brick/concrete wall/ for interior plastering finished even and smooth in(i) Cement mortar 1:4 (1-cement :4- sand) as required to receive specified architectural finish (like Grooves, pattern if any, drip mould etc.) to correct line, plumb .etc - 3rd Floor

Workmanship
The relevant specifications of item No.130 shall be followed.
Mode of Measurement &Payment
The relevant specifications of item No. 130 shall be followed:

Item no. 135.

Providing 15 mm thick Cement Plaster in single coat on brick/concrete wall/ for interior plastering finished even and smooth in(i) Cement mortar 1:4 (1-cement :4- sand) as required to receive specified architectural finish (like Grooves, pattern if any, drip mould etc.) to correct line, plumb .etc - 4th Floor

Workmanship
The relevant specifications of item No.130 shall be followed.
Mode of Measurement &Payment
The relevant specifications of item No. 130 shall be followed:

Item no. 136.
Providing 15 mm thick Cement Plaster in single coat on brick/concrete wall/ for interior plastering finished even and smooth in(i) Cement mortar 1:4 (1-cement :4- sand) as required to receive specified architectural finish (like Grooves, pattern if any, drip mould etc.) to correct line, plumb .etc - 5th Floor

Workmanship
The relevant specifications of item No.130 shall be followed.
Mode of Measurement &Payment
The relevant specifications of item No. 130 shall be followed:

Item no. 137.
Providing 15 mm thick Cement Plaster in single coat on brick/concrete wall/ for interior plastering finished even and smooth in(i) Cement mortar 1:4 (1-cement :4- sand) as required to receive specified architectural finish (like Grooves, pattern if any, drip mould etc.) to correct line, plumb .etc - 6th Floor

Workmanship
The relevant specifications of item No.130 shall be followed.
Mode of Measurement &Payment
The relevant specifications of item No. 130 shall be followed:

Item no. 138.
Providing 15 mm thick Cement Plaster in single coat on brick/concrete wall/ for interior plastering finished even and smooth in(i) Cement mortar 1:4 (1-cement :4- sand) as required to receive specified architectural finish (like Grooves, pattern if any, drip mould etc.) to correct line, plumb .etc - 7th Floor

Workmanship
The relevant specifications of item No.130 shall be followed.
Mode of Measurement &Payment
The relevant specifications of item No. 130 shall be followed:

Item no. 139.
Providing 15 mm thick Cement Plaster in single coat on brick/concrete wall/ for interior plastering finished even and smooth in(i) Cement mortar 1:4 (1-cement :4- sand) as required to receive specified architectural finish (like Grooves, pattern if any, drip mould etc.) to correct line, plumb .etc - 8th Floor

Workmanship
The relevant specifications of item No.130 shall be followed.
Mode of Measurement &Payment
The relevant specifications of item No. 130 shall be followed:

Item no. 140.

Providing 15 mm thick Cement Plaster in single coat on brick/concrete wall/ for interior plastering finished even and smooth in(i) Cement mortar 1:4 (1-cement :4- sand) as required to receive specified architectural finish (like Grooves, pattern if any, drip mould etc.) to correct line, plumb .etc - 9th Floor

Workmanship
The relevant specifications of item No.130 shall be followed.
Mode of Measurement &Payment
The relevant specifications of item No. 130 shall be followed:

Item no. 141.
Providing 15mm thick Cement Plaster in single coat on brick/concrete wall/ for interior plastering finished even and smooth in(i) Cement mortar 1:4 (1-cement :4- sand) as required to receive specified architectural finish (like Grooves, pattern if any, drip mould etc.) to correct line, plumb .etc - Terrace Floor

Workmanship
The relevant specifications of item No.130 shall be followed.
Mode of Measurement &Payment
The relevant specifications of item No. 130 shall be followed:

Item no. 142.
20mm thick Double coat Sand Faced / Mala cement plaster on Exterior walls at for various floors, levels and height as below and shown in the drawing consisting of 12mm thick backing coat of C.M. 1:3 (1-cement :3-sand) and 8mm thick finishing coat of C.M. 1:2 (1-cement :2-sand) etc. complete. as required to receive specified architectural finish like Vata, Grooves, pattern if any, drip mould etc. to correct line, level and plumb.

1.0. Materials
1.1. Water shall conform to M-1. Cement mortar shall conform toM-11.
2.0. Workmanship
2.1. The work shall be carried out in the coats. The backing coat (base coat) shall be 12 mm. thick in C.M. 1:3. The relevant specifications of item No. 130 shall be followed except that the thickness of back coat shall be 12 mm. average. Before the first coat hardens its surface shall be beaten up by edges of wooden tapers and close dents shall be made on the surface. The subsequent coat shall be applied after this coat has been allowed to set for 3 to 5 days, depending upon the weather conditions. The surface shall not be allowed to dry during this period.
2.2. The second coat shall be completed to 8 mm. thickness in C.M. 1:2 as described above, including raising sand facing by bushing. The sample of sand face shall be got approved before the workis started. The whole work shall be carried out uniformly as per sampleapproved.
2.3. Curing:
The curing shall be started overnight after finishing of plaster. The plaster shall be kept wet for a period of 7 days. During this period, it shall be protected from all damages.
3.0. Mode of measurement &payment
3.1. The relevant specifications of item No. 119 shall be followed except that the sand face plaster on outside up to 10 m. above ground level shall be measured under this item.
The rate shall be for a unit of One sq.meter.

Item no. 143.
Providing 20mm thick cement plaster in single coat on single wall for basement wall/ under plinth exterior surface in cement mortar 1:3 (1cement: 3sand) including providing and mixing water proofing material in cement mortar work in doses by weight of cement as per manufacturer specifications

1.0. Materials &workmanship
1.1. The relevant specifications of item No. 119 shall be followed except that the thickness of cement plaster shall be 20 mm. The plastering work shall be in single coat on rough side of half brick wall for interior plastering up to floor two level, finished even and smooth in C.M.1:3.
2.0. Mode of measurements &payment
2.1. The relevant specifications of item No. 119 shall be followed.
The rate shall be for a unit of One sq.meter.

Item no. 144.
Applying two coats of putty & two coats of primer of approved brand and manufacture on new wall surface to give an even shade including thoroughly brushing the surface free from mortar dropping and other foreign matter and sand papered smooth.

1.0. Materials

1.1. putty and primer shall be of approved brand and manufacture. ThePutty and primer shall conform to I.S. :428-1969.

2.0. Workmanship

2.1. Scaffolding

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

2.2. Preparation of surface:

2.2.1. The undecorated surface to be putty shall be thoroughly brushed from dust, dirt, grease, mortar dropping and other foreign matter and sand papered smooth. New plaster surface shall be allowed to dry for at least 2 months before application.

2.2.2. All unnecessary nails shall be removed. Pitting in plaster shall be made good with plaster again with a fine grade sand paper and made smooth. A coat of putty shall be applied over the patches. The surface shall be allowed to dry thoroughly before the regular coat of putty is allowed. The surface affected by moulds, moss, fungi, algae lichens, efflorescence etc. shall be treated in accordance with I.S; 2395 (Part 01) 1966. Before applying putty, any unevenness shall be made good by applying putty made of plaster of pairs mixed with water on entire surface including filling up the undulation and then sand papering the same after it is dry.

2.3. Application of putty.

2.3.1. . All loose particles shall be dusted of after rubbing. Minimum tow coats of putty shall be applied with patti s in horizontal strokes followed immediately by vertical strokes which together shall constitute one coat. The subsequent coats shall be applied after a time interval of at least 24 hours between consecutive coats to permit proper drying of the proceeding coat. The finished surface shall be even and inform without patches, brush marks,.

2.3.2. Sufficient quantity of putty shall be mixed to finish one room at a time. The application of a coat in each room shall be finished in one operation and no work shall be striated in any room which cannot be completed on the sameday.

2.3.3. Patti and troble shall be used. After day's work applicable tool and tackels shall be thoroughly washed in hot water with soap solution and hung down to dry. Old tool and tackles which are dirty and caked with putty shall not be used on the work.

2.4. Protective measurements : The surfaces of doors, windows, floors, articles of furniture etc. and such other parts of the buildings as are not to be putty shall be protected form being splashed upon. Such surfaces shall be cleaned of putty splashes if any.

2.0. Priming coat:

2.0.1. A priming coat of distemper primer of approved manufacture and shade shall be applied over the papered surface in case of new work on undecorated surface. primer is done after the wall surface dries completely, the primer shall be applied.

2.0.2. Application of primer shall be done as under: The primer shall be applied with a brush on the clean dry and smooth surface. Horizontal strokes shall be given first and vertical strokes shall be applied immediately afterwards. This entire operation will constitute on coat. The surface shall be finished as uniformly as possible leaving no brush marks. It shall be allowed to dry for at least 48 hours before oil bound distemper or paint is applied.

3.0. Mode of measurements and payment

3.1. Priming coat of r primer, scraping of surface spoiled by struck roots, removal of oil andgrease spots, treatment for infraction of effloresces., mould moss, fungi, algae and litchen and patch repairs to plaster shall be included in this item for which nothing extra shall bepaid.

3.2. All the work shall be measured net in the decimal system as in place subject to the following limits unless otherwise statedhereinafter:

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

(b) Area in individual items shall be worked out to the nearest 0.01 sq. m. All work shall be made for ends of joints, beams, posts etc., and openings, not exceeding 0.5 sq.mt. each and no addition shall be made for reveals, jambs, soffits, sills etc. of these openings not for finish around ends of joints, beams, postsetc.

3.3. Deductions of opening exceeding 0.5 sq.m. but not exceeding 3 sq. m. each shall be made as follows and net addition shall be made for reveals, jambs, soffits etc. of these openings:

(a) When both the faces of wall are provided with same finish, deductions shall be made for one faceonly.

(b) When each face of wall is provided with different finish, deduction shall be made for that side of frame for doors, windows etc. on which width of reveals is less than that of the other side but no deduction shall be made on the other side. Where the width of reveals on the both the fates of wall are equal, deduction of 50% of area of opening on each face shall be made from area offinish.

(c) When only one face of wall is treated and the other face is not treated, full deductions shall be made if the width of the reveal on treated side is less than that on untreated side but if the width of the reveal is equal or more than that on untreated side neither deductions nor additions to be made for reveals, jambs, soffits, sillsetc.

3.4. In case of opening of area exceeding 3 sq. m. each deduction shall be made for openings but jambs, sills and soffits shall bemeasured.

3.5. Mo deductions shall be made for attachments such as casings, conduits, pipes, electric wiring and thelike.

3.6. Item includes removing nails, making good holes, patches with materials similar in composition ofdistemper.

3.7. The rate includes cost of ail materials, labours, scaffolding, protective measures etc. involved inall the operations described above. This shall also include conveyance, delivery, handing , unloading, storing worketc

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

Item no. 145.

Wall painting (Three coats) with plastic emulsion paint of approved brand & manufacture on under coated wall surface to give an even shade including thoroughly brushing the surface free from mortar dropping and other foreign matter and sand papered smooth.

1.0. Materials

Water shall be conform M-1. The plastic emulsion shall conform to I.S.: 5411-1969 (part-l).

2.0. Workmanship

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

2.5. Preparation of surface:

2.5.1. The undecorated surface to be paint shall be thoroughly brushed from dust, dirt, grease, mortar dropping and other foreign matter and sand papered smooth. New plaster surface shall be allowed to dry for at least 2 months before application.

2.5.2. All unnecessary nails shall be removed. Pitting in plaster shall be made good with plaster again with a fine grade sand paper and made smooth. A coat of putty shall be applied over the patches. The surface shall be allowed to dry thoroughly before the regular coat of paint is allowed. The surface affected by moulds, moss, fungi, algae lichens, efflorescence etc. shall be treated in accordance with I.S; 2395 (Part 01) 1966. Before applying putty, any unevenness shall be made good by applying putty made of plaster of pairs mixed with water on entire surface including filling up the undulation and then sand papering the same after it is dry.

2.2. Preparation of Mix:

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

2.3. Application :

2.3.1. Before pouring into small containers for use, the paint shall be stirred thoroughly in item container. When applying also, the paint shall be continuously stirred in the smaller container, so thatits consistency is keptuniform.

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

2.3.3. The paint shall be applied with brush or rollers. For undecorated surfaces, the surface shall be treated with minimum three coats of paint. The second or subsequent coat shall notbe started until the proceeding coat as become sufficiently hard to resist marking by brushing being used.

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

2.4. Precautions :

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

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

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

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

2.5. Protective payment : The relevant specifications of item No. shall befollowed.

3.0. Mode of measurements andpayment

3.1. The relevant specifications of item No. shall befollowed.

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

Item no. 146.

Painting two coats (excluding priming coat) on new steel and other metal surface with syntheticenamel paint, brushing to give an even shade including cleaning the surface of all dirt, dust and other foreign matter.

Materials

Synthetic enamel paint shall conform to I.S. 1932-1964..

2.0. Workmanship

2.1. General : The materials required for work of painting work shall be obtained directly from approved

manufactures or approved dealer and brought to the site in maker's drums; kegs. etc. with sealunbroken.

2.1.1. All materials not in actual use shall be kept properly protected, lids of containers shall be kept closed and surface of paint in open or partially open containers covered with a thin layer of turpentine to prevent formation of skin. The materials which have become state or flat due to improper and long storage shall not be used. The paint shall be stirred thoroughly in its container before pouring into small containers. While applying also, the paint shall be continuously stirred in smaller container. No left over paint shall be put back into stock tins. When not in use the containers shall be kept properlyclosed.

2.1.2. If for any reasons, things is necessary, the brand of thinner recommended by the manufacturer shall beused.

2.1.3. The surface to be painted shall be thoroughly cleaned and dusted. All rust, dirt and grease shall be thoroughly removed before painting is started. No painting on exterior or other exposed part o thework shall be carried out in wet, damp or otherwise unfavorable weather and all the surfaces shall be thoroughly dry before painting work isstarted.

2.2. Application ofpaint:

2.2.1. Brushing operations are to be adjusted to the spreading capacity advised by the manufacture of particular paint. The paint shall be applied evenly and smoothly by means of crossing and laying off. The crossing and laying off consists of covering the area over with paint, brushing the surface hard for the first time over and then brushing alternately in opposite directions two or three times and then finally brushing lightly in a direction at right angles to the same. In this process, no brush marks shall be left after the -laying off is finished. The full process of crossing and laying off will constitute onecoat.

2.2.2. Each coat shall be allowed to dry completely and lightly rubbed with very fine grade of sand-paper and loose particles brushed off before next coat is applied. Each coat shall vary slightly in shade and shall be got approved from Engineer-in-charge before next coat isstarted.

2.2.3. Each coat the last shall be lightly rubbed down with sand paper of fine pumice stone and cleaned of dust before the next coat is applied. No hair marks from the brush of clogging of paint puddles in the corners of panels, angles of moldings etc. shall be left on thework.

2.2.4. Special care shall be taken while painting over bolts, nuts, rivets, overlaps etc. Approved best quality brushes shall beused.

3.0. The new steel and other metal surface shall be measured under thisitem.

3.1. All the work shall be measured net in the decimal system, as executed subject to the following limits unless otherwise statedhereinafter.

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

(b) Areas shall be worked out to the nearest 0.01 sq.meter.

3.2. No deductions shall be made for openings not exceeding 0.5 sq. mt. each and no addition shall be made for painting to beddings, moldings, edges, jambs, soffits, sills etc. ofsuch opening.

3.3. In case of fabricated structural steel and iron work, priming coat of paint shall be included with frabation. In case of trusses if measured in sq. m. compound girders, stanchions, lattices, grader and similar work, actual area shall be measured in sq. m. and no extra shall be paid for painting on bolts heads,

nuts, washers etc. No addition shall be made to 1 he weight calculated for the purpose of measurements of steel and iron works for paint applied on shop or atsite.

3.4. The different surfaces shall be grouped into one general item, areas of uneven surfaces being converted into equivalent plain areas in accordance with the table given as per Annexure-ll for payment.

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

Item no. 147.

Providing and applying acrylic aggregate textured non pigmented wall finish coating in 100% natural/ non pigmented Crushed Stone finish, dispersed in a pure acrylic binding medium, incorporating anti cracking, anti rusting, defoamers, antifungal compound followed by trowel/ spray gun application in approved shade and pattern or brick pattern with an average thickness of 1.75-2.0 mm, product finally sealed with protective top coat as per sample approved by Engineer-in-charge on the exterior walls of the building.

Product Description

STONE FINISH IS A COMBINATION OF 3 PACKS

PACK –A: It's a dry material aggregating natural stones/ pigmented stones(1mm-2.5mm), quartz, ceramic & dolomite (60mesh-150mesh), multicolored PU china clay chips (1.5mm-6mm) PACK-B: It's a liquid binding medium made up of silicone modified Pure Acrylic and special fungicides

PACK-C: It's a liquid and protective top coat with clear film. Its available in both water born (TC 500) and solvent born (TC1000) system.

Special Feature

Stone finish also aggregates fine filaments made up of organic polymers which gives reinforcement and forms a web like structure inside the film, thus resulting in a peel/crack resistant film with improved abrasion resistant properties.

Stone finish gives an elegant multicolored look, the same availability in many colors & combination matching to stones and appeal like granites.

Recommended use

To be used on exterior surface. It can be used on interior surfaces of cement plaster, gypsum board and woodwork.

Comments

Theoretical spreading rate – Depending on thickness applied.

Product Thickness and spreading of product

Thickness of product: 1.5-2mm Spreading(Covering of product): 100-110 sqft per bag

Physical Properties

Colour Natural Stone Color

Solids (vol %) 83% +/- 2%

Surface preparation

The surfaces must be completely dry and mature, new plaster must be mature at least 30days in order to consent the carbonization process. Clean the surfaces to be decorated and remove

loose or flaking materials. In case of new plasters, make sure the substrate is thoroughly dry. In case of restoration works Rectify large water infiltration or leaks. Allow the wall to dry, use Luxture's Cemplast for patch repairing & Luxture's Decorseal primer. Allow the primer to dry for 12 hours then apply the finishing prodcts.

Condition during Application

The atmospheric temperature should be 10°C minimum and 40°C maximum, avoid application if rain is expected within 24-48 hr's before or after application. Ensure there is no seepage on the surface, and weather must be dry during application.

Application Process :- Any Flaking, Plaster of Paris, Gypsum or other absorbent material surfaces should be brushed and removed. All undulations, broken edges, irregularities should be rectified before application of the textured. The first coat shall be of low VOC Acrylic water base primer at the rate of 0.269 ltr./sqm. The setting time of primer is 8 hrs. after that we can apply the second coat. After primer the first coat of natural stone crushed texture material shall be applied at the rate of 2.00 kg/ square meter and average 1.75-2.0 mm thickness on the exterior walls. The setting time is 12 hrs. after that we can apply second coat of natural stone crushed texture material @ of minimum 3.24 Kg / square meter . The textured layer shall be applied in single layers with special plaster spray gun with a pressure 2bhp to achieve a uniform texture. After textured the applied final coat with a clear pure acrylic transparent sealant (TC-500) with water (Ratio 1:2) shall be applied at the rate of 0.18 ltr/ square meter in two coat that incorporate hitch-tech fluorocarbon resin which acts as protective shield against ultraviolet rays, it will further enhance & protect all surface coatings as recommended by the Manufacturer and as per the direction of Engineer-in-charge. The product should have salient features anti-fungal flexibility and elasticity , Long shade life for the shades made of natural stone crush and water Repellent Properties colour scheme should match which the existing buildings. The pattern should match the architecture of the existing Brick masonry in nearby buildings. The pattern & shade of exterior texture shall be got approved by the Engineer-in-charge

Application Methods

Spray Gun

PACK-A Dry Stone Finish is to be mixed with PACK-B Bonding agent and with required quantity of drinkable water. This wet mix is then sprayed on the substrate with an average thickness of 1.5-2 mm & should be leaved for 24 hr's to get fully dried. After 24 hrs of spray TC-500/1000 Top Coat should be applied on the surface with brush/ spray.

Drying Time

Drying times are generally related to air circulation, temperature, film thickness.

- Good Ventilation (Free circulation of air)
- Typical film thickness
- One coat on top of inert substrate
- Relative humidity

1. The surface should be dry and free from any contamination prior to application of the subsequent coat.

The given data must be considered as guidelines only. The actual drying time may be shorter or longer, depending on thickness, atmosphere, humidity, underlying paint system, requirement for early handling and mechanical strength etc. A complete system can be described on a system sheet, where all parameters and special conditions could be included.

Typical Paint System

Primer 1 coat

Stone Finish 2 or more coats

Top coat 2 coats
Other systems may be specified, depending on area of us

Storage

The product must be stored in accordance with national regulations. The product must be kept in a cool and well-ventilated place, protected from heat and direct sunlight. Containers must be kept tightly closed.

Handling

Handle with care.

Packing Size

25Kgs Bag and 5Ltr Bonding Agent, 2 ltr top coat

Packing may vary from place to place according to local requirements.

Health and safety

Please observe the precautionary notices displayed on the container. Use under well ventilated conditions. Avoid skin contact. Spillage on the skin should immediately be removed with suitable cleanser, soap and water. Eyes should be well flushed with water and medical attention sought immediately.

Item no.148

.Providing and fixing of Anodised Aluminium (Matt finish) frame work as per IS 1868 (1996) (Horizontal and verticals , Styles and rails, ball bearing) for Doors/ window/ventilation/alluminum partition with required Domal sections including fixing all items and hinged / pivoted arrangements for operation of shutters and labour cost for fixing of door fittings and locks including all items and contingencies described above complete (Aluminium beadings and glazing clips & section measured under this item only) NOTE : All fitting works shall be carried out as per I.S. specifications including cost of necessary welds, screws, lugs, scaffolding, rubber gaskets etc., complete all generally as per drawings. The sizes of the components should confirm as per details in drawings. Providing and fixing at all heights / in all floors with all leads. Colour Anodised Aluminium doors / windows / partitions manufactured from best extruded Aluminium sections confirming to ISI cut to length, joints mitred and corners grinded with joints water proof the outer frame and shutter frame stiffened with corner angle and strips provided for in the frame for fixing the frame to R.C.C Columns / masonry/Granite Frame on sides, R.C.C lintels/Granite Frame on top and P.C.C sills or floor at bottom, the frame work fixed with standard approved fastenings all generally as per details shown in drawings and specification with all the sections pretreated for removal of any rust & scales and prevention of further rust/scale formation and coated with greasy materials for non-adherence of mortar or any other sticky materials and this coat to be removed after installations 1)Sheet metal screws, wool pile and aluminium angle corner cleat of required thickness and of full width, etc. for assembling the frame and shutter; 2)Glazing clips for receiving infill panel for Double Glazed Unit (DGU), any type of Glass, Compact Sheet, Louvers; 3) Best quality wool pile where ever shutter touches the frame; 4) Anchor fasteners for fixing the frame assembly to the RCC or Granite or masonry surfaces etc. complete.
Note:-As per drawings and design supplied by architect and instruction given by authority and E.I.C.

25.0 STRUCTURAL GLAZING ALUMINIUM COMPOSITE PANEL

25.1 Materials (General)

25.1.1 Materials and components used shall be of the first / superior quality and suitable for the purpose.

25.1.2All materials shall be free from any defects that may impair the strength, functioning/ performance or appearance of the curtain wall or adjacent construction.

25.1.3 Fasteners

25.1.3.1 The type, size, alloy, quantity and spacing of all anchor fasteners and/or anchorage devices shall be as required for the specified performance standards.

25.1.3.2 Bolts, anchors and other fastening devices like screws, nuts, washers etc. shall be of approved types as required for the strength of the connections, shall be self-locking, unless otherwise specified. These shall be of austenitic stainless steel of specified grade and shall be torque tightened, wherever required, to achieve the maximum torque tension relationship in the fasteners. Washers, nuts and all accessory items shall be of the same material as fasteners. The rivets/ nuts, bolts and washers for fixing insulation layer to the shadow box or with fire-stops (barriers)-cum-smoke seal shall be stainless steel of approved grade. Type of fasteners Grade of stainless steel Anchor fasteners Stainless steel grade 316 Screws, Nuts, Bolts, Washers Stainless steel grade 304 Rivets, toggles and the like Stainless steel grade 304

25.1.3.3 The anchor fasteners shall not be provided using PVC sleeves. Only expandable type self locking fasteners shall be provided.

25.1.4 Aluminium extrusions

25.1.4.1 In general aluminium alloy for extrusions shall be 6063 T5 or T6 grade as per B.S.1474. However, the grade and tempering specifications shall be as recommended by the supplier for each application.

25.1.4.2 All extruded aluminium sections shall be anodized in approved colour to a minimum thickness of 20 microns or shall be PVDF coil / spray coated in approved colour and shade with metallic colours to a minimum thickness of 35 microns. The colour and the finish shall be uniform and free of streaks. The aluminium sections, before coating, shall be suitably cleaned, rinsed, buffed properly and sealed and protected after anodizing / PVDF coating, till the completion of the work. 25.1.4.3 All surfaces of the aluminium sections designed to receive the sealants shall be finished properly to match the finish of the parent section as used for initial testing of sealant and aluminium surface adhesion. Further, it shall be ensured that the entire aluminium surface has adequate sealant contact and adhesion.

25.1.4.4 Sill sheets, plates and extrusions shall be visually flat under all lighting conditions.

25.1.4.5 The members of aluminium extruded sections for mullions, transoms, members of sub frames & sash frames shall be in single piece and not be splice jointed in the panel length and height. 25.1.5 Aluminium flashing

25.1.5.1 All flashings shall be made from 1.0 mm thick solid aluminium sheet transparent anodized to a minimum thickness of 10 microns. It shall be fixed using stainless steel screws dipped in weather silicone sealant.

25.1.6 Aluminium composite panels

25.1.6.1 The soffits of the canopies / walkways / entrance canopies etc., required as per the architectural drawings, shall be covered with aluminium composite panel material. The top of the canopies / walkways / entrance canopies shall be covered with zincalume sheets. The aluminium composite panel and zincalume sheets shall be bent to the required profile and fixed as per the approved shop drawings prepared on the basis of architectural drawings.

25.1.7 Brackets

25.1.7.1 The brackets shall be fixed with high degree of accuracy to achieve the elevation as per the architectural drawing. The brackets shall have suitable lengths and sections to align curtain glazing in one face, as required as per the architectural drawings. Nothing extra shall be payable on this account. The brackets shall be fabricated from M.S rolled sections / plates to have the design strength. The quality of the weld shall also be ensured as per the standards. These shall be provided corrosion protection treatment by Hot Dipped Galvanizing. The mass of the zinc coating to be not less than 610 gm. per sqm of steel area to be galvanized. Slots of elliptical or circular shape in the brackets shall be pre-drilled / machine punched and not flame cut and it shall be done before galvanizing. The surface of the brackets shall be serrated for additional grip before galvanizing. Washers made of serrated plates of the corresponding material shall also be provided for additional grip. The directions of the serration and the slot shall be such that they allow movements as per the design requirement and at the same time prevent any movement in the other direction. Each bracket shall be fixed to the R.C.C using anchor fasteners of suitable capacities and in numbers as required as per the design requirements. The brackets shall be fixed to the structural steel members of the building using stainless steel bolts & nuts / fasteners of required capacity and in numbers as per the design requirement. The holes of the required sizes shall be pre- drilled in RCC/ structural steel for fixing anchor fasteners/ bolts etc. Nothing extra shall be payable on this account.

25.1.8 Fittings

25.1.8.1 All hardware and fittings such as patch fittings, handles, locks, stay-arms, floor springs, friction stays etc. for doors , windows and open able panels shall be heavy duty and of approved make as specified.

25.1.8.2 Hinges for open able panels shall be heavy duty top hung stainless steel friction hinges selected for specified wind load and dead loads.

25.1.8.3 All fittings and locks shall be as specified.

25.1.8.4 Each open able panel of the Curtain glazing shall be provided with the fittings as specified in item nomenclature.

25.2 SEALANTS & GASKETS

25.2.1 Selection of sealants

25.2.1.1 The compatibility and sequence of installation for all sealants must be carefully considered in all proposals in order to ensure the required curing and performance.

25.2.1.2 Sealants must not degrade and / or fail under any or all design conditions including wind, thermal and seismic movements, exposure to water and humidity, ultraviolet exposure and / or other adverse environmental conditions.

25.2.1.3 The designations of sealant types specified herein are intended for general design guidance only.

25.2.1.4 Final selection for the sealant types shall be based on their conformity with the Performance Requirements specified herein and as per the recommendations of the sealant manufacturer. It may use sealant of equivalent grade and characteristics, manufactured by the manufacturer other than those specified herein, based on recommendations of those sealant manufacturers for specified use but with the prior approval of the Engineer-in-Charge. The contractor shall submit the documentary evidence in this regard.

25.2.1.5 All precautions shall be taken during design of structural silicone bite and also during fabrication of the curtain glazing system to prevent failure of sealant during the guarantee period of 10 years after the date of completion of work and even beyond, upto the expected service life of the curtain wall.

25.2.1.6 Sealants and gaskets shall not leach, discolour, stain or dry.

25.2.2 Structural silicone sealant

25.2.2.1 The sealant manufacturer shall design the silicone bite for the design loads as specified and likely to come during the life of the curtain glazing system for arriving at bite size of the structural silicone sealant.

25.2.2.2 The structural silicone sealant bite as designed by the sealant manufacturer and as per the approved shop drawings shall be provided.

25.2.2.3 The Structural sealant shall be two part pump-filled Silicone sealant DC 983 of Dow Corning or equivalent recommended by manufacturer. The weather silicone sealant shall be one-part Silicone sealant DC 795 of Dow Corning or equivalent of other approved brand as per the list of approved materials.

25.2.2.4 The structural sealant to be used as specified for all exposed and concealed metal to metal (including tight or butt type metal to metal assembly prior to assembly) or glass to glass shall be 2- part silicone sealant, conforming to the manufacturer's recommendations for the specific uses and performance criteria. The sealant shall be applied using two-part pump for the same. All the sealing shall be done in a clean and controlled environment as specified by the silicone sealant manufacturer.

25.2.3 Weather silicone sealant

25.2.3.1 The grade of weather silicone sealants wherever required like for concealed metal to metal, metal to glass and metal to concrete/ masonry such as embedment and lapping of flashings etc. where elements are to be installed or embedded, the weather sealant shall be of grade 795 of Dow Corning or equivalent for the other approved brand, as per the recommendations of the sealant manufacturers. Also, the gap between the aluminum sections and the glass, if so required, shall be filled with weather sealant as specified above including providing and fixing backer rod wherever required as per the approved shop drawings. The weather silicone sealant shall be of approved colour and shade. The weather silicone sealant for fixing the butt jointed glass for the fixed partitions shall be transparent in colour DC 791 of Dow Corning or equivalent of other approved brands.

25.2.4 Compatibility

25.2.4.1 All sealants must be non-staining and compatible with adjoining sealants, backup materials, substrate materials and their respective finishes and/or applied colour coatings. Care shall be taken to ensure that two different types of sealant should not come in contact with each other unless compatibility is satisfied as per manufacturer's specifications. CPWD SPECIFICATIONS 2019 1264 25.2.5 Caulking compound

25.2.5.1 Dow Corning weather silicone sealant – 795 or equivalent as approved by the Engineer-inCharge, (of approved colour and shade to match adjacent material wherever exposed and visible) for use around frame/ flashings or between frame/flashing and RCC/ masonry surface. 25.2.6 Gaskets

25.2.6.1 Gaskets and seals shall be of approved quality compatible with substrates, finishes and other components they are in contact with. All gaskets exposed directly on the exterior face shall be silicon gaskets, which are UV resistant. They shall not degenerate, discolour or leach on exposure to solar radiations/ rains/ pollutants etc.

25.2.6.2 Manufacturers' test Certificate shall be submitted as specified.

25.3 GLASS

25.3.1 General

25.3.1.1 All glass and glazing materials shall be as specified.

25.3.1.2 Vision and spandrel glass shall have characteristics as specified. The performance characteristics of glass panels, have to be ensured within the constraints of aesthetic requirements like colour, shade, reflectivity etc. And performance requirements like light transmission, U value, shading coefficient, relative heat gain etc. as specified. Minor variations in the characteristics of glass on superior side may be allowed, but without any extra cost to the Department on this account.

25.3.2 Installation

25.3.2.1 Install glass panels and carry out glazing work as indicated on the drawings and as specified herein.

25.3.2.2 All glass panels shall be of accurate sizes as required.

25.3.2.3 All glass panels shall have clear undamaged edges and surfaces, which are not disfigured.

25.3.2.4 Any glass panel that does not fit in the curtain glazing system shall be rejected. Therefore, all care and precautions shall be taken while procuring the glass panels from the manufacturer / processors of the glass. No claims of any kind or any hindrance shall be entertained from the contractor on this account.

25.3.2.5 Glass panels shall not be in direct contact with the aluminum framework. 25.3.3 Identification

25.3.3.1 Permanent identification marking on glass shall be accomplished by a technique selected by the manufacturer. The location of the marking shall be proposed by the Manufacturer and approved by the Engineer – in - Charge. All glass shall be delivered to site with the manufacturer's / processor's label of identification attached.

25.3.4 Selection of Glass

25.3.4.1 Each type of glass shall be obtained from only one manufacturer and preferably in one lot. 25.3.5 Insulated Glazed Units (IGUs) in the vision panels

25.3.5.1 Insulated glazed units shall be obtained only from approved manufacturers/ processors as per the approved list.

25.3.5.2 Insulated units shall be factory assembled, with multiple panes, hermetically sealed, separated by and sealed to spacer tubes perforated on inner exposed face forming airtight dehydrated airspace inside the insulated units. The IGUs shall be assembled (prepared) by the manufacturer/ processor of the glass as per the approved list, in their dedicated workshops/ factory.

25.3.6 Laminating units

25.3.6.1 The glasses shall be laminated with interlayer of Polyvinyl butyral (PVB) sheet of specified thickness

25.3.6.2 The interlayer material (PVB) shall be clear or as specified with no tendency to bubble, discolour or lose physical and mechanical properties after laminating glasses.

25.3.6.3 The laminated panels shall be free of foreign substances, air or glass pockets and shall not delaminate at edges.

25.3.7 Precaution in storing and handling glasses

25.3.7.1 The glass manufacturer/ processor shall take necessary precautions as stated below besides any other precautions not specifically mentioned herein:

25.3.7.1.1 The reflective/ low E coating on the glass shall be protected against scratches, surface corrosion, staining and/ or any other abrasion.

25.3.7.1.2 The glasses shall not be stored without a clean inter-leaving material. Also they should not slide against each other.

25.3.7.1.3 The glass shall be protected from weld or grinding splatter.

25.3.7.1.4 The reflective/ low E coating shall be protected against contact with acids or strong alkalies. The cleaners to be used for cleaning the surface shall be as per the manufacturer's recommendations. The glass shall be protected against moisture from humidity, which can stain glass as well as coating.

25.3.7.1.5 Reflective/ low E coating shall also be protected against splashes from paints etc.

25.4 METAL COATINGS

25.4.1 Anodizing / PVDF coating

25.4.1.1 Aluminium extruded sections shall be satin finish colour anodized to minimum 20 microns thickness, as per the approved colour and shade or PVDF coil / spray coated to approved metallic colour and shade to minimum 35 microns thickness.

25.4.2 Galvanizing

25.4.2.1 The brackets for the curtain glazing system shall be hot dipped galvanized. The mass of the zinc coating to be not less than 610 gm. per sqm of steel area to be galvanized.

25.4.3 Samples

25.4.3.1 Three samples shall be prepared, which shall define the colour and gloss of anodizing and submit them for approval.

25.4.4 Matching of finish

25.4.4.1 Wherever the same colour finish is specified for extruded aluminium sections and composite aluminium sheets. It shall be ensured that the colour of both is matched as closely as possible.

25.5 STANDARDS

25.5.1 In general, it shall be followed either of the latest Indian/ International Standards as applicable for this sub head.

25.6 DESIGN

25.6.1 Architectural drawings and specifications only indicate the required basic dimensions, and performance criteria.

25.6.2 It shall be ensured that proper structural analysis and design for various load cases and their combination. This shall include designing and proper sizing of all sections meeting structural and architectural requirements. The anchor assemblies shall meet the performance and design requirements including installation of all inserts, fasteners, clips, bracing and framework as required for the proper anchorage to the structure, unless otherwise specified.

25.6.3 Design of the curtain glazing system shall comply with all Government codes and regulations. The Contractor shall design the entire curtain glazing system for dead loads, wind loads, seismic loads, storm, air pollution, thermal stresses, building movements and consequent deflections without compromising the performance characteristic. Further, the individual members of the structural framing shall not deflect beyond permissible limits as specified. The design shall comply with the requirements of the relevant National Building Code and Indian Standard Code/ International Standards, unless specified otherwise.

25.6.4 The curtain glazing system and its elements shall not sustain permanent deformation or failure under loading equivalent to 1.5 times the design wind pressure.

25.6.5 The specified deflections must be reduced if they are in any way detrimental to curtain glazing system and building.

25.6.7 It shall be ensured that the elevations are strictly as per the architectural drawings and that the intent of the architectural design is retained. Visual appearance shall be a key consideration for acceptance of work.

25.7 SHOP DRAWINGS

25.7.1 Submittals

25.7.1.1 The contractor shall prepare shop drawings based on approved design and submit the same to the Engineer –in-charge for approval.

25.7.1.2 The review of the shop drawings shall be limited to their conformity to the architectural and structural design concept & specifications.

25.7.1.3 No fabrication shall be taken up until the shop drawings and all other related submittals, documentation, certification, samples and the mock-up for that work have been reviewed and approved by the Engineer-in-charge.

25.7.2 Scope of shop drawings

25.7.2.1 Shop drawings shall incorporate scaled and dimensioned plans, elevations, sections and complete size details for all the works.

25.7.2.2 The shop drawings shall indicate the required dimensional profiles and modules, function, design and performance standards and in general cover all dimensions and details required to fabricate and install the curtain glazing system.

25.7.2.3 The contractor shall verify and co-ordinate the shop drawings with all applicable and interrelated trades, drawings and specifications.

25.7.2.4 All dimensions / modules, etc., shall be field checked and the drawings shall be modified, if required, based on actual measurements at site.

25.7.2.5 Details shall show and specify all metal sections, types of finishes, areas to be sealed and sealant materials, gaskets, applicable construction materials including fasteners and welds, all anchorage assemblies and components, fabrication and erection tolerances for the work.

25.7.2.6 All details shall be subject to the approval of the Engineer-in-Charge, after incorporating all the modifications suggested by the Engineer-in-Charge.

25.7.3 Section profiles

25.7.3.1 Profile adjustments, if required as per the site conditions may be allowed by the Engineerin-Charge subject to meeting the architectural / performance requirements. However, this shall be carried out only with the written approval of the Engineer-in-charge provided that the general design and intent of the drawings and specifications are also maintained. Also, if any new / non-standard aluminium extruded section is required as per the site requirement and / or the architectural drawings for functional and / or aesthetic reasons, the contractor shall procure the same from the approved manufacturers for the aluminium sections, even if it entails preparing new die, etc. Nothing extra shall be payable on this account.

25.8 DOCUMENTATION AND CERTIFICATION

25.8.1 The manufacturer's certificate for compliance of the various components/ materials for the works (under this sub head) as per the manufacturer's specifications for the various characteristics. A copy of the manufacturer's test report for each lot of material procured and supplied for the work shall also be obtained from the respective manufacturers and submitted to the Engineer-in-Charge for the record.

25.8.1.1 Glass and glazing documentation

25.8.1.1.1 Before taking up the work, the glass manufacturer / processor shall submit written certification for the review of the Engineer-in-Charge and record, stating that all glass (properties as specified such as U value, shading coefficient, light transmission, solar factor, relative heat gain etc.) and glazing requirements (including heat strengthening/ toughening, reflective soft coating, low E coating, lamination, fabrication of IGUs including sealants) as per the shop drawings are recommended by them for use related to their specific applications and design parameters and that they are in conformity with the specifications.

25.8.1.1.2 Tests shall be carried out for glass, including properties after processing, for each lot supplied, by the glass manufacturer / processor in his factory /laboratory or any other accredited laboratory and the copies of the test results shall be obtained by the contractor and submitted to the Engineer-in-Charge for the record.

25.8.1.2 Sealant Documentation

25.8.1.2.1 All sealant applications must be clearly designated on shop drawings. 25.8.1.3 Quality control documentation

25.8.1.3.1 The methodology and quality assurance statement shall be submitted for quality control procedures for the review and approval of the Engineer-in-Charge before taking up the work to ensure the design integrity and performance of the curtain glazing, aluminium composite panel cladding and aluminium work (PVDF coated).

25.8.1.3.2 The Engineer-in-Charge or his authorized representatives may visit the plant / workshop / factory to inspect material, fabrication and quality assurance procedures.

25.9 SAMPLES AND MOCK-UP AT SITE

25.9.1 Submittals The samples of the following materials together with detailed technical data / catalogues shall be submitted for review and approval of the Engineer-in-Charge along with the shop drawings..

25.9.1.1 Aluminium Composite Panel : Each type and thickness 600mmx600mm

25.9.1.2 Aluminium extrusions : Each section: 500mm long.

25.9.1.3 Glass : Each type 600 mm x 600 mm.

25.9.1.4 Gaskets, separators, glass setting blocks / spacer tape, etc : Each section or unit, backer rods, 300mm long or unit.

25.9.1.5 Bracket, fasteners and Connecting devices : Each type and size.

25.9.1.6 Finish samples : After approval of the final finish coating, the Engineer-in-Charge shall be provided with three (3) approved samples.

25.9.1.7 Ironmongery and accessories, as applicable.

25.9.1.8 Finished flashing samples

25.9.1.9 Finished samples of shadow boxes, fire stop (barrier)-cum smoke seals

25.9.1.10 Structural and weather silicone sealant

25.9.2. Mock-up at site Before the fabrication and site installation is taken up and after the approval of shop drawings by the Engineer-in-Charge, a mock-up shall be prepared of his proposed curtain glazing system for a size of panel not exceeding 6 sqm. The mock-up shall be essentially put up at site for final approval of all materials and installation details by the Engineer-in-Charge. The mock up shall not form part of the work and shall not be paid for. It shall be dismantled and taken away by the contractor at his own cost, with the prior permission of the Engineer-in-Charge. Nothing extra shall be payable on this account.

25.10 STORAGE, PROTECTION AND PROGRAMME

25.10.1 A schedule of procedure shall be submitted for inspection during installation so as to control and assure quality on the job site.

25.10.2 A detailed method statement shall be submitted for the protection of the surface of the curtain glazing, aluminium composite panel cladding and aluminium work (PVDF coated), etc during delivery and erection, with description as to when the protection can be removed. The protection paper shall be kept for a period as recommended by Engineer-in-Charge and shall be replaced with the fresh protection paper, if so required. Further, it shall not have acid content, which in any manner may affect the substrate.

25.10.3 Delivery and Storage of Materials: All materials delivered to site shall be stored in allocated spaces where the stored materials shall not get exposed to rainwater, moisture or damage, and shall permit easy access to and handling of the materials. Materials shall be stored neatly and properly stacked.

25.10.3.1 Factory made glazing units and/or their components shall be transported, handled and stored in a manner to preclude damage of any nature.

25.10.3.2 Necessary materials, required for erection at the site shall be delivered in labeled containers by the manufacturer / supplier.

25.10.3.3 All units or components, which are cracked, bent, chipped, scratched or otherwise defective and unsuitable for installation shall be removed and replaced by the contractor. Nothing extra shall be payable on this account.

25.11 PERFORMANCE REQUIREMENTS All components, assemblies and completed work shall conform to the various performance standards as applicable in respect of thermal movement of the curtain glazing, allowance for vertical and horizontal expansion and building movement and related building tolerance etc. The design and installation of the curtain glazing system shall accommodate all inherent building movements and deflections and the fabrication and installation tolerances of all related work not involved in this section without the loss of, or any detrimental effect to, the performance requirements herein specified. The contractor shall verify and coordinate all such movements and tolerances with the Engineer-in-Charge before designing the components of the curtain glazing system so that movements and deflections in the structure do not at any time affect the integrity and safety of curtain glazing system and vice versa.

25.11.1 Thermal property

25.11.1.1 All insulation materials, fire-stops (barriers)-cum-smoke seal shall comply with the current requirements of the Fire Officer, MIDC and other authorities.

25.11.2 Structural properties

25.11.2.1 The curtain glazing system shall be anchored to the R.C.C floor through serrated Hot Dipped Galvanized M.S brackets. As far as possible, the contractor shall take all precautions to avoid cutting through any reinforcement bars while fixing the brackets. The cost includes provision of sleeves/ leave slots at appropriate locations during casting of the concrete itself for making provision for fixing brackets for the curtain glazing system and to avoid chipping/ dismantling of concrete. The slot shall be filled up with concrete of the same grade in a workman like manner, after fixing the brackets. Any defect in alignment/ plumb in the building face shall be rectified by chipping/ dismantling of the concrete/ masonry and repairing the same as specified to achieve the required alignment of the curtain wall as specified. Any change in lengths of bracket/s required on this account and the consequent requirement of their sections and sizes shall be carried out. Nothing extra shall be payable on this account.

25.11.2.2 No holes shall be burned, filed or drilled in any structural steel/ RCC members unless expressly approved by the Engineer – in – Charge.

25.11.2.3 Member shapes and/or profiles if schematically shown on the Architectural drawings are not necessarily the exact shapes required or best suited for the particular conditions. Final shapes and locations shall be as designed by the contractor and are subject to the review and approval of the Engineer – in – Charge.

25.11.2.4 All framing members shall be shop fabricated and finished as specified.

25.11.3 Concrete tolerances

25.11.3.1 While fixing the brackets for curtain glazing system, the contractor shall take into account the variation in the concrete and the masonry faces to which the structural framework of the curtain glazing system is to be fixed and such variations shall be adjusted in the lengths of brackets to align them in perfect plumb. The bracket shall be designed accordingly. Nothing extra shall be payable on this account.

25.11.4 Fire stops (barriers)-cum-smoke seal and interface with building

25.11.4.1 Gaps between the building face and the curtain glazing system at soffit level between the successive floors shall be closed as specified with fire-stops (barriers)-cum-smoke seal. It shall have the required fire resistance to be approved by Fire Officer. Suitable gap for accommodating deflections of the aluminium framing of curtain glazing system as per the approved shop drawings shall be maintained between the fire-stops (barriers)-cum-smoke seal and the curtain glazing system. This smoke seal shall however be provided using backer rod and weather silicone sealant as specified and as approved by the Engineer-in-Charge.

25.11.4.2 The fire-stops (barriers)-cum-smoke seal shall consist of 1 mm thick plain G.I. sheet tray with 100 mm thick layer of non inflammable heat insulating material, rock wool, having density of minimum 64 Kg. per Cum. of the make as approved by the Engineer-in-Charge. The rock wool layer shall be attached to G.I sheet using stainless steel rivets/ nuts, bolts and washers. The tray shall be fixed to the RCC / Masonry surface by using stainless steel screws dipped in weather silicone sealant as per the approved shop drawings. Screws with plastic sleeves shall not be allowed to be used for the above fixing.

25.11.4.3 An aluminium flashing of 1.0 mm thick shall be permitted transparent anodized (10 micron thickness) solid aluminium sheet of the approved design and profile at the window sill level and also fill the gap between the aluminum flashing and the curtain glazing using weather silicone sealant as specified and as approved by the Engineer-in-Charge. Also, the fasteners/ screws to be used for fixing flashing shall be dipped in weather silicone sealant before using.

25.11.5 Acoustics

25.11.5.1 Gaps between the mullions and the partitions of the cabins shall be suitably closed by double skin partition as directed by the Engineer-in-Charge including allowing for permissible deflections of mullions as per design requirements but without affecting the partitions and the curtain glazing system. The payment for this partition work shall be made under relevant item. 25.11.5.2 Provisions shall also be made to prevent metal to metal rubbing, any rattling, noise due to thermal changes and wind pressure by using Teflon separators and shims.

25.11.6 Visual appearance

25.11.6.1 It shall be ensured that the elevations are strictly as per the Architectural drawings and that the intent of the architectural design is retained. Visual appearance shall be a key consideration for acceptance of work.

25.12 CURTAIN GLAZING AND ALUMINIUM COMPOSITE PANEL CLADDING SYSTEMS

25.12.1 General

25.12.1.1 Movement of building components to which the curtain glazing system is attached including long term and short term movements due to thermal effect, structural effect, wind pressure, seismic forces, erection or dead loads, creep, column shortening, deflection, torsion and vibrations etc shall be free and noiseless. This shall be achieved without any strain or stress being transferred to the glass, without buckling of any components, without excessive stress to any members or assemblies and without compromising on any of the performance requirement of the curtain wall.

25.12.2 Waterproofing

25.12.2.1 Following precautions shall be taken by the contractor to ensure that the curtain glazing system is completely water tight during its guarantee period as well as expected service life besides any other precautions not specifically mentioned herein:

25.12.2.1.1 A drainage system must be incorporated into the curtain glazing system. The curtain glazing system shall have provision for air pressure equalization (all the internal spaces shall be vented by acceptable means to ensure air pressure equalization) so that water leakage and condensation, if any shall be drained or discharged to exterior face of the curtain glazing.

25.12.2.1.2 Care should be taken that the sections of the aluminum extrusions used for structural framing of curtain glazing provide for proper drainage of water that in-filters into the system by gravity and for this the section should have proper slope and weep holes as required. These shall be clearly indicated on the shop drawings.

25.12.2.1.3 Movement of water on exposed faces must be controlled to ensure that water is not retained and that elements will not be damaged or corroded by water and to minimize the potential for algae and fungal growth as a result of standing or trapped water.

25.12.2.1.4 EPDM gaskets of the quality as specified and of required size and thickness shall be provided at all required locations to prevent ingress of water or moisture. The same shall be indicated on the shop drawings also.

25.12.2.1.5 EPDM gaskets of the quality as specified and of required size and thickness shall be provided at all required locations to prevent ingress of water or moisture. The same shall be indicated on the shop drawings also.

25.12.2.1.6 Aluminium sheet flashing using 1.0mm thick transparent anodized (10 microns) aluminium sheet wherever required shall be provided including sealing the gap between the flashing and the other material like RCC, masonry, aluminium etc. by using weather silicone sealant as specified.

25.12.3 Mullions and transoms

25.12.3.1 The sections of mullions and transoms shall be designed to restrict deflection under dead loads, wind load, seismic loads etc. as specified and shall be rigid and stable enough to support and retain the in-fill panels in position under all conditions. The mullions and transoms shall also be designed for additional horizontal loads from the cleaning equipment and process besides horizontal live loads as specified.

25.12.4 Spandrel units

25.12.4.1 Spandrel shall be of glass having same colour matching with vision areas after using a shadow box as specified.

25.12.4.2 Structural spandrel wall, fins, slab or beam, aluminium frame work, anchor fasteners, brackets, shadow boxes, fire stop(barrier)-cum-smoke seals and other construction shall not be visible through the glass in the spandrel portion of the curtain glazing from the exterior and shall be fully concealed behind the shadow box.

25.12.4.3 A shadow box shall be provided at a distance of minimum 50 mm behind the spandrel glass panel to ensure that the insulation panel material does not come in contact with the soft coating of the spandrel glass to prevent any damage to the coating on account of any chemical reaction or otherwise. It shall consist of an approved black fibre glass non-woven tissue stuck on surface #1of 50 mm thick semi-rigid fibre glass wool insulation panel of minimum density of 48 kg per cum., and 1.5 mm thick transparent anodized (10 microns) solid aluminium sheet tray, on surface #2 by using suitable stainless steel rivets/ nuts, bolts and washers to hold the insulation panel in position. The periphery shall be properly sealed. Surface #1 shall be adequately protected against damage until spandrel glazing is done. Further, care shall be taken that the aluminium sheet backing of the shadow box does not heave or warp due to thermal stresses and/or its self-weight. Proper gaps at the edges of the tray shall be provided to accommodate movements on account of thermal stresses besides making elliptical slots if required to facilitate movements. The shadow box shall be fixed to the structural framing of the curtain glazing by using stainless steel screws. The fixing arrangement shall be as per the approved shop drawings.

25.12.5 Ventilators, open able windows and doors

25.12.5.1 Ventilators, openable windows and doors shall be provided at positions as shown on the architectural drawings. The openable panels when in closed position shall remain watertight under all weather conditions and pass the water tightness tests as specified. Besides, the openable panels shall appear similar to the fixed ones from outside.

25.12.5.2 All hardware and accessories shall be provided and fixed by the contractor and shall be as specified.

25.12.6 Coping and soffit trimmer

25.12.6.1 All coping and soffit panels shall have aluminium structural frame fixed rigidly to the structure.

25.12.6.2 Effective drainage system shall be provided to drain out the water that may penetrate through the joints, on to the exterior face of the curtain glazing.

25.12.6.3 Coping and soffits shall be visibly flat in all lighting conditions.

25.13 MEASUREMENTS All the aluminium sections including snap beadings fixed in place shall be measured in running meter along the outer periphery of composite section correct to a millimeter. The weight calculated on the basis of actual average (average of five samples) weight of composite section in kilogram correct to the second place of decimal shall be taken for payment (weight shall be taken after anodizing). The weight of cleat shall be added for payment. Neither any deduction nor anything extra shall be paid for skew cuts The height and width of double glazed/single glazed unit (the area of glass unit outside the snap beading shall only be measured) as fixed in place shall be measured correct to one centimeter and area calculated in sqm. correct to second place of decimal shall be taken for payment.

25.14. RATE

25.14.1. Rate shall includes cost of all inputs of labour, materials including wastages, T &P, equipments, other enabling temporary structures and services and all other incidental charges, if any, not specifically mentioned here, but as required for complete design, proof checking, engineering, fabrication, assembling, delivery, anchorage, installation, protection of curtain glazing, aluminium composite panel cladding and aluminium work (PVDF coated), etc. and making the system water tight (wherever specified), all complete, all in accordance with the true intent and meaning of the specifications and the drawings taken together, regardless of whether the same may or may not be particularly shown on the drawings and / or described in the specifications , provided that the same can be reasonably inferred there from. The curtain glazing, aluminium composite panel cladding and aluminium work (PVDF coated) shall have framing which shall be structurally and mechanically designed to achieve the architectural elevations as well as performance parameters specified herein. Anchorage shall include all supporting brackets & anchor fasteners, as required to rigidly secure the structural framing to the RCC / Masonry / structural steel members of the building.

25.14.2. The curtain glazing, aluminium composite panel cladding and aluminium work (PVDF coated), etc. work shall include but will not necessarily be limited to the following:

25.14.2.1 Frames, fixed glazed / vision panels, spandrels, hard wares, open able panels, as in the drawings inclusive of all accessories and fittings. Glass wool Insulation panel (shadow box), fire stop(barrier) - cum - smoke seals, splice plates, connectors, sleeves, anti-buckling clips etc.

25.14.2.2 Anodized aluminium work for framing of curtain glazing as well as other aluminium work PVDF coated) for trellis, louvers, fins, box sections, capping, strip etc wherever indicated in the schedule of quantities and drawings. Glazes doors.

25.14.2.3 Structural, weather and other silicone sealants within and all round the perimeter of all the work under this sub head for fabricating IGUs, holding the glass to the aluminium & glass to glass and to provide water tightness to the curtain glazing.

25.14.2.4 EPDM / silicone gaskets, trims, shims, setting blocks, double sided spacer tape, spacer blocks, weathering strips etc.

25.14.2.5 All sealing and flashings including sealing at junctions with the building members.

25.14.2.6 All brackets, anchor fasteners, screws, inserts, nuts, bolts & washers, and attachments required for complete installation and fixing to the RCC, masonry and/or the structural steel members of the building.

25.14.2.7 All accessories, fasteners, screws, nuts and bolts, toggles, rivets etc. and other items implied in the drawings and the specifications though are not specifically indicated.

25.14.2.8 Isolation of all dissimilar metal surfaces as well as moving surfaces by use of TEFLON (PTFE) separators.

25.14.2.9 Engineering proposals, design, drawings and Architectural data.

25.14.2.10 Shop drawings, engineering data and structural calculations (analysis & design) of all systems including aluminium structural framing, fasteners, sealants etc.

25.14.2.11 Scheduling and monitoring of the work.

25.14.2.12 Cost of all samples of the individual components, mock-ups at site and field tests.

25.14.2.13 Coordination with work of other agencies.

25.14.2.14 Protection during storage and construction until handing over the building for occupation etc.

25.14.2.15 All final exterior and interior cleaning of the curtain glazing, aluminium composite panel cladding and aluminium work (PVDF coated) etc. Before handing over the building for occupation.

25.14.2.16 Hoisting, staging, scaffolding and temporary enabling structural work/services, cranes and cradles etc.

25.14.2.17 Specified tests, inclusive of necessary records, reports, logbook etc.

25.14.2.18 Design and performance guarantee in the enclosed format.

25.14.2.19 Construction monitoring for regular quality control and technical inspection to ensure the work conforms to the approved shop drawings and details (including any modifications made after field testing) and acceptable standards of quality including monitoring the progress of the work.

The rate shall be for a unit of One sq.kg .

Item no. 149

Providing and fixing double glazed hermetically sealed glazing in aluminium windows, ventilators and partition etc. with 6 mm thick clear float glass both side, having 12 mm air gap, including providing EPDM gasket, perforated aluminium spacers, desiccants, sealant (Both primary and secondary sealant) etc. as per specifications, drawings and direction of Engineer-in-charge complete.

1. Material Specifications

a) Double Glazed Unit (DGU):

- Glass Composition:
    - Outer pane – 6 mm thick clear float glass.
    - Inner pane – 6 mm thick clear float glass.
    - Air Gap: 12 mm ± 1 mm, uniformly maintained throughout.
- Overall Unit Thickness: 24 mm nominal (6 + 12 + 6 mm).
- Glass Quality:
    - Clear float glass conforming to IS 14900:2018 and IS 2553 (Part 1).
    - Free from bubbles, waves, scratches, and optical distortions.
- Spacer:
    - Material: Aluminium spacer tube, 6–8 mm wide, continuous and perforated along both sides.
    - Function: To maintain uniform air gap and house desiccant.
- Desiccant:
    - Moisture-absorbing material (molecular sieve type) filled uniformly in spacer tubes to prevent condensation.
- Sealants:
    - Primary Sealant: Polyisobutylene (PIB) for moisture barrier and adhesion between glass and spacer.

- Secondary Sealant: Structural silicone (neutral cure type) or polysulphide sealant to provide structural strength and weatherproofing.

- Edge Seal Integrity:
  - Units shall be hermetically sealed to prevent ingress of moisture and air, ensuring long-term durability.

b) Gaskets & Accessories:

- EPDM Gasket: Extruded ethylene propylene diene monomer (EPDM) rubber gasket used for glazing — conforming to ASTM C864.
- Fixing Accessories: Stainless steel / aluminium pressure plates, glazing clips, and neoprene packing, as required.

c) Fabrication:

- DGU units shall be fabricated in a factory-controlled environment using automatic edge sealing and gas-filling machinery to ensure uniform seal quality and performance.
- Each unit shall bear a manufacturer's identification mark and batch number for traceability.

3. Workmanship & Installation

- The aluminium framing system shall be prepared in advance with proper rebates, grooves, and gasket seats for double glazing.
- DGU panels shall be installed using EPDM gaskets and aluminium pressure plates to ensure uniform pressure and water-tight joints.
- Joints between aluminium and glass shall be sealed with neutral cure silicone sealant to ensure perfect air and water tightness.
- Care shall be taken to prevent edge damage during handling and fixing.
- Installation shall conform to the manufacturer's recommendations and approved shop drawings.

4. Performance Requirements

- Air Infiltration: As per ASTM E283 – not more than 1.5 L/s/m² at 75 Pa pressure.
- Water Penetration Resistance: As per ASTM E331 – no leakage up to 300 Pa pressure.
- Thermal Insulation: Overall U-value not more than 2.8 W/m²K for clear DGU.
- Sound Insulation: Minimum STC (Sound Transmission Class) rating of 32 dB.
- Durability: Minimum service life of 10 years for sealed units.

5. Measurement & Payment

- Measurement shall be in square metres (m²) of actual visible glass area fixed in position.

- Rate shall include cost of both panes of glass, spacer, desiccant, sealants, EPDM gaskets, labour, scaffolding, wastage, and all incidentals to complete the installation as specified.

- Aluminium framing, beading, and glazing clips shall be paid separately under relevant items.

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Item no. 150.

Providing and fixing fly proof stainless steel grade 304 wire gauge, to windows and clerestory windows using wire gauge with average width of aperture 1.4 mm in both directions with wire of dia. 0.50 mm all complete.with Aluminium beading.

FLY PROOF WIRE GAUZE Workmanship
Wire gauze/Wire Cloth which shall generally conform to IS 1568 shall be regularly woven with equally spaced galvanised mild steel wires in both warp and weft directions. The wire cloth shall be properly selvedged by one or more wires in each edge.

The following wire gauze shall be used :

(i) Galvanised mild steel wire gauze of 1.40mm average aperture width woven with 0.63mm nominal dia shall be used.

(ii) Stainless steel (Grade 304) gauze of 0.5 mm dia wire and 1.4mm aperture on both sides.

The wire gauze shall be bent at right angles in the inner face of steel frame of stiles and rails, turned back and fixed tight with blue tacks at about 75mm centres, fixed alternately in the two faces of the inner face of frame. Over this, M.S. Flat of size 15x3 mm with nuts & bolts fixed alternately in the two faces of the frame at about 75mm centres.

10.21.1 Measurement The length and breadth of finished wire gauze on inner face of frame shall be measured correct to the nearest cm and area worked out in square metres correct to two places of decimal.

10.21.2 Rates The rate includes cost of all operation described above.

The rate shall be for a unit of sq.meter

Item no.151.

Supply of Aluminium Ventilated Façade / Louver System of approved colour consisting of panel 50 mm wide x 50mm depth x 0.6mm thick panel length up to 5mtrs coil coated on a continuous paint line double baked and roll formed from enameled corrosion Resistance Aluminum Alloy AA3005 / AA5050 for higher strength and good Roll forming characteristics. Panels shall be mounted in a module of 100 mm on a mullion profile grooved (Slotted Fastening Profile) by means of Clamp, Locking Pop and Pop Weld (Gap will be 50 mm between two panels). Slotted Fastening Profile shall be fixed at 150 mm from panel ends and at a distance of maximum 1200 mm center to center across the panel span and Slotted Fastening Profile shall be fixed to a suitable sub-structure by means of Square Brackets.Paint Finish:Panel shall be stove enamelled and finished with Luxacote, a patented special three layered coating system (consisting of first a conversion layer of thickness 800-2000mg/sq mtr, a polyurethane basecoat of 16-20 microns, and a special top coat of polyamide particles of 8-12 microns thick to provide excellent abrasion and damage resistance) in a continuous coil coating process of the approved colour on the exposed side and the reverse side with epoxy.

- . Material Specification
- Panels shall be manufactured from enameled corrosion-resistant Aluminium Alloy AA3005 / AA5050, suitable for higher strength and good roll-forming characteristics.
- Panel size shall be 50 mm wide x 50 mm deep x 0.6 mm thick, with panel length up to 5.0 metres.
- Panels shall be roll-formed from aluminium coils which are coil-coated on a continuous paint line and double baked.
-
- Panel Arrangement & Module
- Panels shall be mounted in a module of 100 mm, with a clear gap of 50 mm between two adjacent panels.
- Panels shall be fixed on grooved mullion profiles (Slotted Fastening Profiles) using approved clamps, locking pops and pop rivets, complete.
-

- Slotted Fastening Profile & Sub-Structure
- Slotted Fastening Profiles shall be provided and fixed:
    - At 150 mm from panel ends, and
    - At a maximum spacing of 1200 mm centre to centre across the panel span and at any height.
- Slotted fastening profiles shall be fixed to a suitable sub-structure using square brackets of approved size and thickness.
- Entire system shall be fixed truly in line, level and plumb.
-
- Paint & Surface Finish
- Panels shall be stove enamelled and finished with Luxacote, a patented three-layered coating system, applied in a continuous coil-coating process.
- Coating system shall consist of:
    - Conversion coating of thickness 800–2000 mg/sq mtr,
    - Polyurethane base coat of thickness 16–20 microns, and
    - Special top coat containing polyamide particles of thickness 8–12 microns to provide excellent abrasion and damage resistance.
- Exposed surfaces shall be finished in approved colour, and the reverse side shall be coated with epoxy coating.
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- Installation & Workmanship
- All panels shall be handled and installed carefully to avoid dents, scratches or damage to coating.
- Fixing shall be rigid and secure, ensuring proper ventilation and uniform appearance.
- All exposed edges, joints and fasteners shall be neat and properly aligned.
-
- Quality Control & Approval
- All materials, samples, finishes and installation shall be subject to approval of the Engineer-in-Charge.
- Any damaged or defective panel or component shall be replaced at contractor's cost.
-
- Measurement & Rate
- Measurement shall be taken in square metres (sqm) of finished façade / louver area, unless otherwise specified.
- Rate shall include:
    - Supply of aluminium panels
    - Coil coating and finishing
    - Slotted fastening profiles, brackets, clamps, rivets and accessories
    - Fabrication, handling and installation
    - Labour, tools, scaffolding and all incidental works
- Nothing extra shall be paid unless specifically mentioned in the tender document.

Item no.152

Item Deleted

Item no.153

Designing, fabricating, testing, protection, installing and fixing in position semi(grid) unitized system of structural glazing with IGUs comprising of hermetically sealed 6-12-6 mm insulated glass (double Glazed) and Aluminium section complete as per specification

25.0 STRUCTURAL GLAZING ALUMINIUM COMPOSITE PANEL

25.1 Materials (General)

25.1.1 Materials and components used shall be of the first / superior quality and suitable for the purpose.

25.1.2All materials shall be free from any defects that may impair the strength, functioning/ performance or appearance of the curtain wall or adjacent construction.

25.1.3 Fasteners

25.1.3.1 The type, size, alloy, quantity and spacing of all anchor fasteners and/or anchorage devices shall be as required for the specified performance standards.

25.1.3.2 Bolts, anchors and other fastening devices like screws, nuts, washers etc. shall be of approved types as required for the strength of the connections, shall be self-locking, unless otherwise specified. These shall be of austenitic stainless steel of specified grade and shall be torque tightened, wherever required, to achieve the maximum torque tension relationship in the fasteners. Washers, nuts and all accessory items shall be of the same material as fasteners. The rivets/ nuts, bolts and washers for fixing insulation layer to the shadow box or with fire-stops (barriers)-cum-smoke seal shall be stainless steel of approved grade. Type of fasteners Grade of stainless steel Anchor fasteners Stainless steel grade 316 Screws, Nuts, Bolts, Washers Stainless steel grade 304 Rivets, toggles and the like Stainless steel grade 304

25.1.3.3 The anchor fasteners shall not be provided using PVC sleeves. Only expandable type self locking fasteners shall be provided.

25.1.4 Aluminium extrusions

25.1.4.1 In general aluminium alloy for extrusions shall be 6063 T5 or T6 grade as per B.S.1474. However, the grade and tempering specifications shall be as recommended by the supplier for each application.

25.1.4.2 All extruded aluminium sections shall be anodized in approved colour to a minimum thickness of 20 microns or shall be PVDF coil / spray coated in approved colour and shade with metallic colours to a minimum thickness of 35 microns. The colour and the finish shall be uniform and free of streaks. The aluminium sections, before coating, shall be suitably cleaned, rinsed, buffed properly and sealed and protected after anodizing / PVDF coating, till the completion of the work.

25.1.4.3 All surfaces of the aluminium sections designed to receive the sealants shall be finished properly to match the finish of the parent section as used for initial testing of sealant and aluminium surface adhesion. Further, it shall be ensured that the entire aluminium surface has adequate sealant contact and adhesion.

25.1.4.4 Sill sheets, plates and extrusions shall be visually flat under all lighting conditions.

25.1.4.5 The members of aluminium extruded sections for mullions, transoms, members of sub frames & sash frames shall be in single piece and not be splice jointed in the panel length and height. CPWD SPECIFICATIONS 2019 1262 25.1.5 Aluminium flashing

25.1.5.1 All flashings shall be made from 1.0 mm thick solid aluminium sheet transparent anodized to a minimum thickness of 10 microns. It shall be fixed using stainless steel screws dipped in weather silicone sealant. 25.1.6 Aluminium composite panels

25.1.6.1 The soffits of the canopies / walkways / entrance canopies etc., required as per the architectural drawings, shall be covered with aluminium composite panel material. The top of the canopies / walkways / entrance canopies shall be covered with zincalume sheets. The aluminium composite panel and zincalume sheets shall be bent to the required profile and fixed as per the approved shop drawings prepared on the basis of architectural drawings.

25.1.7 Brackets

25.1.7.1 The brackets shall be fixed with high degree of accuracy to achieve the elevation as per the architectural drawing. The brackets shall have suitable lengths and sections to align curtain glazing in one face, as required as per the architectural drawings. Nothing extra shall be payable on this account. The brackets shall be fabricated from M.S rolled sections / plates to have the design strength. The quality of the weld shall also be ensured as per the standards. These shall be provided corrosion protection treatment by Hot Dipped Galvanizing. The mass of the zinc coating to be not less than 610 gm. per sqm of steel area to be galvanized. Slots of elliptical or circular shape in the brackets shall be pre-drilled / machine punched and not flame cut and it shall be done before galvanizing. The surface of the brackets shall be serrated for additional grip before galvanizing. Washers made of serrated plates of the corresponding material shall also be provided for additional grip. The directions of the serration and the slot shall be such that they allow movements as per the design requirement and at the same time prevent any movement in the other direction. Each bracket shall be fixed to the R.C.C using anchor fasteners of suitable capacities and in numbers as required as per the design requirements. The brackets shall be fixed to the structural steel members of the building using stainless steel bolts & nuts / fasteners of required capacity and in numbers as per the design requirement. The holes of the required sizes shall be pre- drilled in RCC/ structural steel for fixing anchor fasteners/ bolts etc. Nothing extra shall be payable on this account.

25.1.8 Fittings

25.1.8.1 All hardware and fittings such as patch fittings, handles, locks, stay-arms, floor springs, friction stays etc. for doors , windows and open able panels shall be heavy duty and of approved make as specified. 25.1.8.2 Hinges for open able panels shall be heavy duty top hung stainless steel friction hinges selected for specified wind load and dead loads. 25.1.8.3 All fittings and locks shall be as specified. 25.1.8.4 Each open able panel of the Curtain glazing shall be provided with the fittings as specified in item nomenclature. 25.2 SEALANTS & GASKETS 25.2.1 Selection of sealants 25.2.1.1 The compatibility and sequence of installation for all sealants must be carefully considered in all proposals in order to ensure the required curing and performance. 25.2.1.2 Sealants must not degrade and / or fail under any or all design conditions including wind, thermal and seismic movements, exposure to water and humidity, ultraviolet exposure and / or other adverse environmental conditions.

25.2.1.3 The designations of sealant types specified herein are intended for general design guidance only.

25.2.1.4 Final selection for the sealant types shall be based on their conformity with the Performance Requirements specified herein and as per the recommendations of the sealant manufacturer. It may use sealant of equivalent grade and characteristics, manufactured by the manufacturer other than those specified herein, based on recommendations of those sealant manufacturers for specified use but with the prior approval of the Engineer-in-Charge. The contractor shall submit the documentary evidence in this regard.

25.2.1.5 All precautions shall be taken during design of structural silicone bite and also during fabrication of the curtain glazing system to prevent failure of sealant during the guarantee period of 10 years after the date of completion of work and even beyond, upto the expected service life of the curtain wall. 25.2.1.6 Sealants and gaskets shall not leach, discolour, stain or dry.

25.2.2 Structural silicone sealant

25.2.2.1 The sealant manufacturer shall design the silicone bite for the design loads as specified and likely to come during the life of the curtain glazing system for arriving at bite size of the structural silicone sealant.

25.2.2.2 The structural silicone sealant bite as designed by the sealant manufacturer and as per the approved shop drawings shall be provided.

25.2.2.3 The Structural sealant shall be two part pump-filled Silicone sealant DC 983 of Dow Corning or equivalent recommended by manufacturer. The weather silicone sealant shall be one-part Silicone sealant DC 795 of Dow Corning or equivalent of other approved brand as per the list of approved materials.

25.2.2.4 The structural sealant to be used as specified for all exposed and concealed metal to metal (including tight or butt type metal to metal assembly prior to assembly) or glass to glass shall be 2- part silicone sealant, conforming to the manufacturer's recommendations for the specific uses and performance criteria. The sealant shall be applied using two-part pump for the same. All the sealing shall be done in a clean and controlled environment as specified by the silicone sealant manufacturer.

25.2.3 Weather silicone sealant

25.2.3.1 The grade of weather silicone sealants wherever required like for concealed metal to metal, metal to glass and metal to concrete/ masonry such as embedment and lapping of flashings etc. where elements are to be installed or embedded, the weather sealant shall be of grade 795 of Dow Corning or equivalent for the other approved brand, as per the recommendations of the sealant

manufacturers. Also, the gap between the aluminum sections and the glass, if so required, shall be filled with weather sealant as specified above including providing and fixing backer rod wherever required as per the approved shop drawings. The weather silicone sealant shall be of approved colour and shade. The weather silicone sealant for fixing the butt jointed glass for the fixed partitions shall be transparent in colour DC 791 of Dow Corning or equivalent of other approved brands.

25.2.4 Compatibility

25.2.4.1 All sealants must be non-staining and compatible with adjoining sealants, backup materials, substrate materials and their respective finishes and/or applied colour coatings. Care shall be taken to ensure that two different types of sealant should not come in contact with each other unless compatibility is satisfied as per manufacturer's specifications.

25.2.5 Caulking compound

25.2.5.1 Dow Corning weather silicone sealant – 795 or equivalent as approved by the Engineer-inCharge, (of approved colour and shade to match adjacent material wherever exposed and visible) for use around frame/ flashings or between frame/flashing and RCC/ masonry surface.

25.2.6 Gaskets

25.2.6.1 Gaskets and seals shall be of approved quality compatible with substrates, finishes and other components they are in contact with. All gaskets exposed directly on the exterior face shall be silicon gaskets, which are UV resistant. They shall not degenerate, discolour or leach on exposure to solar radiations/ rains/ pollutants etc. 25.2.6.2 Manufacturers' test Certificate shall be submitted as specified.

25.3 GLASS

25.3.1 General 25.3.1.1 All glass and glazing materials shall be as specified.

25.3.1.2 Vision and spandrel glass shall have characteristics as specified. The performance characteristics of glass panels, have to be ensured within the constraints of aesthetic requirements like colour, shade, reflectivity etc. And performance requirements like light transmission, U value, shading coefficient, relative heat gain etc. as specified. Minor variations in the characteristics of glass on superior side may be allowed, but without any extra cost to the Department on this account. 25.3.2 Installation

25.3.2.1 Install glass panels and carry out glazing work as indicated on the drawings and as specified herein.

25.3.2.2 All glass panels shall be of accurate sizes as required.

25.3.2.3 All glass panels shall have clear undamaged edges and surfaces, which are not disfigured.

25.3.2.4 Any glass panel that does not fit in the curtain glazing system shall be rejected. Therefore, all care and precautions shall be taken while procuring the glass panels from the manufacturer / processors of the glass. No claims of any kind or any hindrance shall be entertained from the contractor on this account. 25.3.2.5 Glass panels shall not be in direct contact with the aluminum framework.

25.3.3 Identification

25.3.3.1 Permanent identification marking on glass shall be accomplished by a technique selected by the manufacturer. The location of the marking shall be proposed by the Manufacturer and approved by the Engineer – in - Charge. All glass shall be delivered to site with the manufacturer's / processor's label of identification attached.

25.3.4 Selection of Glass

25.3.4.1 Each type of glass shall be obtained from only one manufacturer and preferably in one lot.

25.3.5 Insulated Glazed Units (IGUs) in the vision panels

25.3.5.1 Insulated glazed units shall be obtained only from approved manufacturers/ processors as per the approved list.

25.3.5.2 Insulated units shall be factory assembled, with multiple panes, hermetically sealed, separated by and sealed to spacer tubes perforated on inner exposed face forming airtight dehydrated airspace inside the insulated units. The IGUs shall be assembled (prepared) by the manufacturer/ processor of the glass as per the approved list, in their dedicated workshops/ factory.

25.3.6 Laminating units

25.3.6.1 The glasses shall be laminated with interlayer of Polyvinyl butyral (PVB) sheet of specified thickness

25.3.6.2 The interlayer material (PVB) shall be clear or as specified with no tendency to bubble, discolour or lose physical and mechanical properties after laminating glasses.

25.3.6.3 The laminated panels shall be free of foreign substances, air or glass pockets and shall not delaminate at edges.

25.3.7 Precaution in storing and handling glasses

25.3.7.1 The glass manufacturer/ processor shall take necessary precautions as stated below besides any other precautions not specifically mentioned herein:

25.3.7.1.1 The reflective/ low E coating on the glass shall be protected against scratches, surface corrosion, staining and/ or any other abrasion.

25.3.7.1.2 The glasses shall not be stored without a clean inter-leaving material. Also they should not slide against each other.

25.3.7.1.3 The glass shall be protected from weld or grinding splatter.

25.3.7.1.4 The reflective/ low E coating shall be protected against contact with acids or strong alkalies. The cleaners to be used for cleaning the surface shall be as per the manufacturer's recommendations. The glass shall be protected against moisture from humidity, which can stain glass as well as coating.

25.3.7.1.5 Reflective/ low E coating shall also be protected against splashes from paints etc.

25.4 METAL COATINGS

25.4.1 Anodizing / PVDF coating

25.4.1.1 Aluminium extruded sections shall be satin finish colour anodized to minimum 20 microns thickness, as per the approved colour and shade or PVDF coil / spray coated to approved metallic colour and shade to minimum 35 microns thickness.

25.4.2 Galvanizing

25.4.2.1 The brackets for the curtain glazing system shall be hot dipped galvanized. The mass of the zinc coating to be not less than 610 gm. per sqm of steel area to be galvanized.

25.4.3 Samples 25.4.3.1 Three samples shall be prepared, which shall define the colour and gloss of anodizing and submit them for approval.

25.4.4 Matching of finish

25.4.4.1 Wherever the same colour finish is specified for extruded aluminium sections and composite aluminium sheets. It shall be ensured that the colour of both is matched as closely as possible.

25.5 STANDARDS

25.5.1 In general, it shall be followed either of the latest Indian/ International Standards as applicable for this sub head.

25.6 DESIGN

25.6.1 Architectural drawings and specifications only indicate the required basic dimensions, and performance criteria.

25.6.2 It shall be ensured that proper structural analysis and design for various load cases and their combination. This shall include designing and proper sizing of all sections meeting structural and architectural requirements. The anchor assemblies shall meet the performance and design requirements including installation of all inserts, fasteners, clips, bracing and framework as required for the proper anchorage to the structure, unless otherwise specified.

25.6.3 Design of the curtain glazing system shall comply with all Government codes and regulations. The Contractor shall design the entire curtain glazing system for dead loads, wind loads, seismic loads, storm, air pollution, thermal stresses, building movements and consequent deflections without compromising the performance characteristic. Further, the individual members of the structural framing shall not deflect beyond permissible limits as specified. The design shall comply with the requirements of the relevant National Building Code and Indian Standard Code/ International Standards, unless specified otherwise.

25.6.4 The curtain glazing system and its elements shall not sustain permanent deformation or failure under loading equivalent to 1.5 times the design wind pressure.

25.6.5 The specified deflections must be reduced if they are in any way detrimental to curtain glazing system and building.

25.6.7 It shall be ensured that the elevations are strictly as per the architectural drawings and that the intent of the architectural design is retained. Visual appearance shall be a key consideration for acceptance of work.

25.7 SHOP DRAWINGS

25.7.1 Submittals

25.7.1.1 The contractor shall prepare shop drawings based on approved design and submit the same to the Engineer –in-charge for approval.

25.7.1.2 The review of the shop drawings shall be limited to their conformity to the architectural and structural design concept & specifications.

25.7.1.3 No fabrication shall be taken up until the shop drawings and all other related submittals, documentation, certification, samples and the mock-up for that work have been reviewed and approved by the Engineer-in-charge.

25.7.2 Scope of shop drawings

25.7.2.1 Shop drawings shall incorporate scaled and dimensioned plans, elevations, sections and complete size details for all the works.

25.7.2.2 The shop drawings shall indicate the required dimensional profiles and modules, function, design and performance standards and in general cover all dimensions and details required to fabricate and install the curtain glazing system.

25.7.2.3 The contractor shall verify and co-ordinate the shop drawings with all applicable and interrelated trades, drawings and specifications.

25.7.2.4 All dimensions / modules, etc., shall be field checked and the drawings shall be modified, if required, based on actual measurements at site.

25.7.2.5 Details shall show and specify all metal sections, types of finishes, areas to be sealed and sealant materials, gaskets, applicable construction materials including fasteners and welds, all anchorage assemblies and components, fabrication and erection tolerances for the work.

25.7.2.6 All details shall be subject to the approval of the Engineer-in-Charge, after incorporating all the modifications suggested by the Engineer-in-Charge.

25.7.3 Section profiles

25.7.3.1 Profile adjustments, if required as per the site conditions may be allowed by the Engineerin-Charge subject to meeting the architectural / performance requirements. However, this shall be carried out only with the written approval of the Engineer-in-charge provided that the general design and intent of the drawings and specifications are also maintained. Also, if any new / non-standard aluminium extruded section is required as per the site requirement and / or the architectural drawings for functional and / or aesthetic

reasons, the contractor shall procure the same from the approved manufacturers for the aluminium sections, even if it entails preparing new die, etc. Nothing extra shall be payable on this account.

25.8 DOCUMENTATION AND CERTIFICATION

25.8.1 The manufacturer's certificate for compliance of the various components/ materials for the works (under this sub head) as per the manufacturer's specifications for the various characteristics. A copy of the manufacturer's test report for each lot of material procured and supplied for the work shall also be obtained from the respective manufacturers and submitted to the Engineer-in-Charge for the record.

25.8.1.1 Glass and glazing documentation

25.8.1.1.1 Before taking up the work, the glass manufacturer / processor shall submit written certification for the review of the Engineer-in-Charge and record, stating that all glass (properties as specified such as U value, shading coefficient, light transmission, solar factor, relative heat gain etc.) and glazing requirements (including heat strengthening/ toughening, reflective soft coating, low E coating, lamination, fabrication of IGUs including sealants) as per the shop drawings are recommended by them for use related to their specific applications and design parameters and that they are in conformity with the specifications.

25.8.1.1.2 Tests shall be carried out for glass, including properties after processing, for each lot supplied, by the glass manufacturer / processor in his factory /laboratory or any other accredited laboratory and the copies of the test results shall be obtained by the contractor and submitted to the Engineer-in-Charge for the record.

25.8.1.2 Sealant Documentation

25.8.1.2.1 All sealant applications must be clearly designated on shop drawings.

25.8.1.3 Quality control documentation

25.8.1.3.1 The methodology and quality assurance statement shall be submitted for quality control procedures for the review and approval of the Engineer-in-Charge before taking up the work to ensure the design integrity and performance of the curtain glazing, aluminium composite panel cladding and aluminium work (PVDF coated).

25.8.1.3.2 The Engineer-in-Charge or his authorized representatives may visit the plant / workshop / factory to inspect material, fabrication and quality assurance procedures. 25.9 SAMPLES AND MOCK-UP AT SITE

25.9.1 Submittals The samples of the following materials together with detailed technical data / catalogues shall be submitted for review and approval of the Engineer-in-Charge along with the shop drawings..

25.9.1.1 Aluminium Composite Panel : Each type and thickness 600mmx600mm

25.9.1.2 Aluminium extrusions : Each section: 500mm long.

25.9.1.3 Glass : Each type 600 mm x 600 mm.

25.9.1.4 Gaskets, separators, glass setting blocks / spacer tape, etc : Each section or unit, backer rods, 300mm long or unit.

25.9.1.5 Bracket, fasteners and Connecting devices : Each type and size.

25.9.1.6 Finish samples : After approval of the final finish coating, the Engineer-in-Charge shall be provided with three (3) approved samples.

25.9.1.7 Ironmongery and accessories, as applicable.

25.9.1.8 Finished flashing samples

25.9.1.9 Finished samples of shadow boxes, fire stop (barrier)-cum smoke seals

25.9.1.10 Structural and weather silicone sealant

25.9.2. Mock-up at site Before the fabrication and site installation is taken up and after the approval of shop drawings by the Engineer-in-Charge, a mock-up shall be prepared of his proposed curtain glazing system for a size of panel not exceeding 6 sqm. The mock-up shall be essentially put up at site for final approval of all materials and installation details by the Engineer-in-Charge. The mock up shall not form part of the work and shall not be paid for. It shall be dismantled and taken away by the contractor at his own cost, with the prior permission of the Engineer-in-Charge. Nothing extra shall be payable on this account. 25.10 STORAGE, PROTECTION AND PROGRAMME 25.10.1 A schedule of procedure shall be submitted for inspection during installation so as to control and assure quality on the job site. 25.10.2 A detailed method statement shall be submitted for the protection of the surface of the curtain glazing, aluminium composite panel cladding and aluminium work (PVDF coated), etc during delivery and erection, with description as to when the protection can be removed. The protection paper shall be kept for a period as recommended by Engineer-in-Charge and shall be replaced with the fresh protection paper, if so required. Further, it shall not have acid content, which in any manner may affect the substrate. 1269 SUB HEAD 25.0 : STRUCTURAL GLAZING ALUMINIUM COMPOSITE PANEL 25.10.3 Delivery and Storage of Materials: All materials delivered to site shall be stored in allocated spaces where the stored materials shall not get exposed to rainwater, moisture or damage, and shall permit easy access to and handling of the materials. Materials shall be stored neatly and properly stacked. 25.10.3.1 Factory made glazing units and/or their components shall be transported, handled and stored in a manner to preclude damage of any nature. 25.10.3.2 Necessary materials, required for erection at the site shall be delivered in labeled containers by the manufacturer / supplier. 25.10.3.3 All units or components, which are cracked, bent, chipped, scratched or otherwise defective and unsuitable for installation shall be removed and replaced by the contractor. Nothing extra shall be payable on this account. 25.11 PERFORMANCE REQUIREMENTS All components, assemblies and completed work shall conform to the various performance standards as applicable in respect of thermal movement of the curtain glazing, allowance for vertical and horizontal expansion and building movement and related building tolerance etc. The design and installation of the curtain glazing system shall accommodate all inherent building movements and deflections and the fabrication and installation tolerances of all related work not involved in this section without the loss of, or any detrimental effect to, the performance requirements herein specified. The contractor shall verify and coordinate all such movements and tolerances with the Engineer-in-Charge before designing the components of the curtain glazing system so that movements and deflections in the structure do not at any time affect the integrity and safety of curtain glazing system and vice versa. 25.11.1 Thermal property 25.11.1.1 All insulation materials, fire-stops (barriers)-cum-smoke seal shall comply with the current requirements of the Fire Officer, MIDC and other authorities. 25.11.2 Structural properties 25.11.2.1 The curtain glazing system shall be anchored to the R.C.C floor through serrated Hot Dipped Galvanized M.S brackets. As far as possible, the contractor shall take all precautions to avoid cutting through any reinforcement bars while fixing the brackets. The cost includes provision of sleeves/ leave slots at appropriate locations during casting of the concrete itself for making provision for fixing brackets for the curtain glazing system and to avoid chipping/ dismantling of concrete. The slot shall be filled up with concrete of the same grade in a workman like manner, after fixing the brackets. Any defect in alignment/ plumb in the building face shall be rectified by chipping/ dismantling of the concrete/ masonry and repairing the same as specified to achieve the required alignment of the curtain wall as specified. Any change in lengths of bracket/s required on this account and the consequent requirement of their sections and sizes shall be carried out. Nothing extra shall be payable on this account. 25.11.2.2 No holes shall be burned, filed or drilled in any structural steel/ RCC members unless expressly approved by the Engineer – in – Charge. 25.11.2.3 Member shapes and/or profiles if schematically shown on the Architectural drawings are not necessarily the exact shapes required or best suited for the particular conditions. Final shapes and locations shall be as designed by the contractor and are subject to the review and approval of the Engineer – in – Charge. 25.11.2.4 All framing members shall be shop fabricated and finished as specified. CPWD SPECIFICATIONS 2019 1270 25.11.3 Concrete tolerances 25.11.3.1 While fixing the brackets for curtain glazing system, the contractor shall take into account the variation in the concrete and the masonry faces to which the structural framework of the curtain glazing system is to be fixed and such variations shall be adjusted in the lengths of brackets to align them in perfect plumb. The bracket shall be designed accordingly. Nothing extra shall be payable on this account. 25.11.4 Fire stops (barriers)-cum-smoke seal and interface with building 25.11.4.1 Gaps between the building face and the curtain glazing system at soffit level between the successive floors shall be closed as specified with fire-stops (barriers)-cum-smoke seal. It shall have the required fire resistance to be approved by Fire Officer. Suitable gap for accommodating deflections of the aluminium framing of curtain glazing system as per the approved shop drawings shall be maintained between the fire-stops (barriers)-cum-smoke seal and the curtain glazing system. This smoke seal shall however be provided using backer rod and weather silicone sealant as specified and as approved by the Engineer-in-Charge. 25.11.4.2 The fire-stops (barriers)-cum-smoke seal shall consist of 1 mm thick plain G.I. sheet tray with 100 mm thick layer of non inflammable heat insulating material, rock wool, having density of minimum 64 Kg. per Cum. of the make as approved by the Engineer-in-Charge. The rock wool layer shall be attached to G.I sheet using stainless steel rivets/ nuts, bolts and washers. The tray shall be fixed to the RCC / Masonry surface by using stainless steel screws dipped in weather silicone sealant as per the approved shop drawings. Screws with plastic sleeves shall not be allowed to be used for the above fixing. 25.11.4.3 An aluminium flashing of 1.0 mm thick shall be permitted transparent anodized (10 micron thickness) solid aluminium sheet of the approved design and profile at the window sill level and also fill the gap between the aluminum flashing and the curtain glazing using weather silicone sealant as specified and as approved by the Engineer-in-Charge. Also, the fasteners/ screws to be used for fixing flashing shall be dipped in weather silicone sealant before using. 25.11.5 Acoustics 25.11.5.1 Gaps between the mullions and the partitions of the cabins shall be suitably closed by double skin partition as

directed by the Engineer-in-Charge including allowing for permissible deflections of mullions as per design requirements but without affecting the partitions and the curtain glazing system. The payment for this partition work shall be made under relevant item. 25.11.5.2 Provisions shall also be made to prevent metal to metal rubbing, any rattling, noise due to thermal changes and wind pressure by using Teflon separators and shims. 25.11.6 Visual appearance 25.11.6.1 It shall be ensured that the elevations are strictly as per the Architectural drawings and that the intent of the architectural design is retained. Visual appearance shall be a key consideration for acceptance of work. 25.12 CURTAIN GLAZING AND ALUMINIUM COMPOSITE PANEL CLADDING SYSTEMS 25.12.1 General 25.12.1.1 Movement of building components to which the curtain glazing system is attached including long term and short term movements due to thermal effect, structural effect, wind pressure, seismic forces, erection or dead loads, creep, column shortening, deflection, torsion and vibrations etc shall be free and noiseless. This shall be achieved without any strain or stress being transferred to the glass, without buckling of any components, without excessive stress to any members or assemblies and without compromising on any of the performance requirement of the curtain wall. 1271 SUB HEAD 25.0 : STRUCTURAL GLAZING ALUMINIUM COMPOSITE PANEL 25.12.2 Waterproofing 25.12.2.1 Following precautions shall be taken by the contractor to ensure that the curtain glazing system is completely water tight during its guarantee period as well as expected service life besides any other precautions not specifically mentioned herein: 25.12.2.1.1 A drainage system must be incorporated into the curtain glazing system. The curtain glazing system shall have provision for air pressure equalization (all the internal spaces shall be vented by acceptable means to ensure air pressure equalization) so that water leakage and condensation, if any shall be drained or discharged to exterior face of the curtain glazing. 25.12.2.1.2 Care should be taken that the sections of the aluminum extrusions used for structural framing of curtain glazing provide for proper drainage of water that in-filters into the system by gravity and for this the section should have proper slope and weep holes as required. These shall be clearly indicated on the shop drawings. 25.12.2.1.3 Movement of water on exposed faces must be controlled to ensure that water is not retained and that elements will not be damaged or corroded by water and to minimize the potential for algae and fungal growth as a result of standing or trapped water. 25.12.2.1.4 EPDM gaskets of the quality as specified and of required size and thickness shall be provided at all required locations to prevent ingress of water or moisture. The same shall be indicated on the shop drawings also. 25.12.2.1.5 EPDM gaskets of the quality as specified and of required size and thickness shall be provided at all required locations to prevent ingress of water or moisture. The same shall be indicated on the shop drawings also. 25.12.2.1.6 Aluminium sheet flashing using 1.0mm thick transparent anodized (10 microns) aluminium sheet wherever required shall be provided including sealing the gap between the flashing and the other material like RCC, masonry, aluminium etc. by using weather silicone sealant as specified. 25.12.3 Mullions and transoms 25.12.3.1 The sections of mullions and transoms shall be designed to restrict deflection under dead loads, wind load, seismic loads etc. as specified and shall be rigid and stable enough to support and retain the in-fill panels in position under all conditions. The mullions and transoms shall also be designed for additional horizontal loads from the cleaning equipment and process besides horizontal live loads as specified. 25.12.4 Spandrel units 25.12.4.1 Spandrel shall be of glass having same colour matching with vision areas after using a shadow box as specified. 25.12.4.2 Structural spandrel wall, fins, slab or beam, aluminium frame work, anchor fasteners, brackets, shadow boxes, fire stop(barrier)-cum-smoke seals and other construction shall not be visible through the glass in the spandrel portion of the curtain glazing from the exterior and shall be fully concealed behind the shadow box. 25.12.4.3 A shadow box shall be provided at a distance of minimum 50 mm behind the spandrel glass panel to ensure that the insulation panel material does not come in contact with the soft coating of the spandrel glass to prevent any damage to the coating on account of any chemical reaction or otherwise. It shall consist of an approved black fibre glass non-woven tissue stuck on surface #1of CPWD SPECIFICATIONS 2019 1272 50 mm thick semi-rigid fibre glass wool insulation panel of minimum density of 48 kg per cum., and 1.5 mm thick transparent anodized (10 microns) solid aluminium sheet tray, on surface #2 by using suitable stainless steel rivets/ nuts, bolts and washers to hold the insulation panel in position. The periphery shall be properly sealed. Surface #1 shall be adequately protected against damage until spandrel glazing is done. Further, care shall be taken that the aluminium sheet backing of the shadow box does not heave or warp due to thermal stresses and/or its self-weight. Proper gaps at the edges of the tray shall be provided to accommodate movements on account of thermal stresses besides making elliptical slots if required to facilitate movements. The shadow box shall be fixed to the structural framing of the curtain glazing by using stainless steel screws. The fixing arrangement shall be as per the approved shop drawings. 25.12.5 Ventilators, open able windows and doors 25.12.5.1 Ventilators, openable windows and doors shall be provided at positions as shown on the architectural drawings. The openable panels when in closed position shall remain watertight under all weather conditions and pass the water tightness tests as specified. Besides, the openable panels shall appear similar to the fixed ones from outside. 25.12.5.2 All hardware and accessories shall be provided and fixed by the contractor and shall be as specified. 25.12.6 Coping and soffit trimmer 25.12.6.1 All coping and soffit panels shall have aluminium structural frame fixed rigidly to the structure. 25.12.6.2 Effective drainage system shall be provided to drain out the water that may penetrate through the joints, on to the exterior face of the curtain glazing. 25.12.6.3 Coping and soffits shall be visibly flat in all lighting conditions. 25.13 MEASUREMENTS All the aluminium sections including snap beadings fixed in place shall be measured in running meter along the outer periphery of composite section correct to a millimeter. The weight calculated on the basis of actual average (average of five samples) weight of composite section in kilogram correct to the second place of decimal shall be taken for payment (weight shall be taken after anodizing). The weight of cleat shall be added for payment. Neither any deduction nor anything extra shall be paid for skew cuts The height and width

of double glazed/single glazed unit (the area of glass unit outside the snap beading shall only be measured) as fixed in place shall be measured correct to one centimeter and area calculated in sqm. correct to second place of decimal shall be taken for payment.

25.14. RATE

25.14.1. Rate shall includes cost of all inputs of labour, materials including wastages, T &P, equipments, other enabling temporary structures and services and all other incidental charges, if any, not specifically mentioned here, but as required for complete design, proof checking, engineering, fabrication, assembling, delivery, anchorage, installation, protection of curtain glazing, aluminium composite panel cladding and aluminium work (PVDF coated), etc. and making the system water tight (wherever specified), all complete, all in accordance with the true intent and meaning of the specifications and the drawings taken together, regardless of whether the same may or may not be particularly shown on the drawings and / or described in the specifications , provided that the same can be reasonably inferred there from. The curtain glazing, aluminium composite panel cladding and aluminium work (PVDF coated) shall have framing which shall be structurally and mechanically designed to achieve the architectural elevations as well as performance parameters specified herein. Anchorage shall include all supporting brackets & anchor fasteners, as required to rigidly secure the structural framing to the RCC / Masonry / structural steel members of the building.

25.14.2. The curtain glazing, aluminium composite panel cladding and aluminium work (PVDF coated), etc. work shall include but will not necessarily be limited to the following:

25.14.2.1 Frames, fixed glazed / vision panels, spandrels, hard wares, open able panels, as in the drawings inclusive of all accessories and fittings. Glass wool Insulation panel (shadow box), fire stop(barrier) - cum - smoke seals, splice plates, connectors, sleeves, anti-buckling clips etc. 25.14.2.2 Anodized aluminium work for framing of curtain glazing as well as other aluminium work PVDF coated) for trellis, louvers, fins, box sections, capping, strip etc wherever indicated in the schedule of quantities and drawings. Glazes doors. 25.14.2.3 Structural, weather and other silicone sealants within and all round the perimeter of all the work under this sub head for fabricating IGUs, holding the glass to the aluminium & glass to glass and to provide water tightness to the curtain glazing. 25.14.2.4 EPDM / silicone gaskets, trims, shims, setting blocks, double sided spacer tape, spacer blocks, weathering strips etc. 25.14.2.5 All sealing and flashings including sealing at junctions with the building members. 25.14.2.6 All brackets, anchor fasteners, screws, inserts, nuts, bolts & washers, and attachments required for complete installation and fixing to the RCC, masonry and/or the structural steel members of the building. 25.14.2.7 All accessories, fasteners, screws, nuts and bolts, toggles, rivets etc. and other items implied in the drawings and the specifications though are not specifically indicated. 25.14.2.8 Isolation of all dissimilar metal surfaces as well as moving surfaces by use of TEFLON (PTFE) separators. 25.14.2.9 Engineering proposals, design, drawings and Architectural data. 25.14.2.10 Shop drawings, engineering data and structural calculations (analysis & design) of all systems including aluminium structural framing, fasteners, sealants etc. 25.14.2.11 Scheduling and monitoring of the work. 25.14.2.12 Cost of all samples of the individual components, mock-ups at site and field tests. 25.14.2.13 Coordination with work of other agencies. 25.14.2.14 Protection during storage and construction until handing over the building for occupation etc. 25.14.2.15 All final exterior and interior cleaning of the curtain glazing, aluminium composite panel cladding and aluminium work (PVDF coated) etc. Before handing over the building for occupation. CPWD SPECIFICATIONS 2019 1274 25.14.2.16 Hoisting, staging, scaffolding and temporary enabling structural work/services, cranes and cradles etc. 25.14.2.17 Specified tests, inclusive of necessary records, reports, logbook etc. 25.14.2.18 Design and performance guarantee in the enclosed format. 25.14.2.19 Construction monitoring for regular quality control and technical inspection to ensure the work conforms to the approved shop drawings and details (including any modifications made after field testing) and acceptable standards of quality including monitoring the progress of the work

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Providing and laying of minimum 1.5 mm thick SBS modified self adhesive Samshield XL or equivalent waterproofing membrane topped with samshield HDPE valeron film, having tensile strength of L/T 3.5N/mm2 as per ASTM D412 and with minimum elongation L/T of 180% (as per ASTM D 412). The membrane shall have puncture resistance of >200 N (as per ASTM E154). Hydrostatic pressure > 60 m (6BAR) No leakage as per DIN 1048, including cleaning the surface,priming the surface with cold applied bituminous primer@4-6 sqmtr/litre, properly sealing the joints & maintaining 75 mm overlap between the membrane selvedge & 100 mm overlap on the end joints of the membrane over the slab etc. The system includes base preparation of cleaning, brushing and removal of flacky materials, grouting the porous area with cementitious grout, proper coving between slab and wall junctions. The waterproofing system should be applied directly by the manufacturer approved applicator with 10 years of warranty against leakage.

- **Material Specification**
- Waterproofing membrane shall be **SBS modified self-adhesive type**, minimum **1.5 mm thickness**.
- Membrane shall be topped with **HDPE Valeron protective film**.

- Physical properties of membrane shall be as follows:
    - **Tensile Strength (L/T):** Minimum **3.5 N/mm²** as per **ASTM D412**
    - **Elongation at Break (L/T):** Minimum **180%** as per **ASTM D412**
    - **Puncture Resistance:** Greater than **200 N** as per **ASTM E154**
    - **Hydrostatic Pressure Resistance:** Greater than **60 m (6 Bar)** with no leakage as per **DIN 1048**
- Product shall be of approved make and shall be got approved by Engineer-in-Charge before application.
- **Surface Preparation**
- Surface shall be thoroughly cleaned by brushing and removing dust, loose particles, laitance, oil, grease and flaky materials.
- All porous areas shall be treated and filled using **cementitious grout**.
- Proper **coving (fillet)** shall be provided at slab-to-wall junctions before application of membrane.
- **Priming**
- Surface shall be primed with **cold applied bituminous primer** at the rate of **4–6 sqm per litre**, or as recommended by the manufacturer.
- Primer shall be allowed to dry properly before laying the membrane.
- **Application of Waterproofing Membrane**
- Membrane shall be laid by peeling off the release film and firmly pressing onto the primed surface, ensuring complete adhesion without air pockets or wrinkles.
- Joints shall be properly sealed and overlapped as follows:
    - **Minimum 75 mm overlap** at membrane selvedge joints
    - **Minimum 100 mm overlap** at end joints
- All overlaps shall be properly pressed and sealed to ensure complete waterproofing.
- **Application Agency & Warranty**
- Waterproofing system shall be applied **only by manufacturer-approved applicator**.
- Contractor shall provide a **minimum 10 years warranty against leakage**, jointly backed by the manufacturer and applicator.
- **Workmanship & Quality Control**
- Application shall be carried out strictly as per manufacturer's recommendations and standard waterproofing practices.
- Any damaged or improperly applied portion shall be removed and reapplied at contractor's cost.
- **Measurement & Rate**
- Measurement shall be in **square metres (sqm)** of treated surface.
- Rate shall include:
    - Supply of waterproofing membrane

- Primer and ancillary materials
- Surface preparation including cleaning, grouting and coving
- Labour, tools and application by approved applicator
- Testing, warranty and all incidentals

- **Nothing extra shall be payable** unless specifically mentioned in the tender document

GUARANTEE FOR WATER PROOFING TREATMENT

- The contractor shall be fully responsible for and shall guarantee proper performance of the entire waterproofing system for a period of 10(Ten) years from the final completion of works. In addition, specific 10 years written guarantee (to be furnished in anon-judicial stamp paper of value not less than Rs.100/-) in approved proforma shall be submitted for the performance of the system, before final payment and shall not in anyway limit any other rights the Employer may have under the contract. Guarantee for waterproofing shall comprises of all the items described above in particular specification.

- All water-proofing work shall be carried out through approved specialist agency as per method of working approved by the Engineer-in-charge. However the Contractors shall be solely responsible for water proofing treatment until the expiry of the above guarantee period.

- Ten years guarantee in prescribed proforma attached shall be given by the contractor for the waterproofing treatment. In addition 10%(ten per cent)of the cost of these items of water proofing under this subhead shall be retained as guarantee to watch the performance of the work executed. However, half of this amount(withheld) would be released after five years from the date of completion of the work, if the performance of the water proofing works is satisfactory. The remaining with held amount shall be released after completion of ten years from the date of completion of work, if the performance of the waterproofing work is satisfactory. If any defect is noticed during the guarantee period, it should be rectified by the contractor within seven days of issuing of notice by the Engineer-in-Charge and, if not attended to, the same shall be got done through other agency at the risk and cost of the contractor and recovery shall be effected from the amount retained towards guarantee. In any case, the contractor and the specialist agency,during the guarantee period, shall inspect and examine the treatment once in every year and make good any defect observed and confirm the same in writing. The security deposit can be released in full, if bank guarantee of equivalent amount, valid for the duration of guarantee period, is produced and deposited with the Department.

Item No. 155.

Supplying and laying composite 1.5mm thick, pre-applied, fully bonded HDPE membrane with double side adhesive which results in adhesive-to-adhesive bond - Prebond Pro or equivalent over P.C.C. conforming to BS 8102 & IS 16471:2017, requirements of UG waterproofing structures, with the turnkey execution to be done by the manufacturer through its in-house subsidiary execution company and with 10 years composite warranty against leakages, to be provided by the principal manufacturer. The system should be fully bonded to the Raft and consists of highly resilient HDPE film, self-adhesive polymer layer and weather protective layer. Typical application includes surface preparation by removing loose aggregates from PCC, foreign material, cleaning the surface etc., cutting membrane to convenient length, carefully aligning the membrane over blind concrete and rolling it out with print coated side facing up, laying adjacent sheets by keeping overlap of 75 mm, end overlaps to be treated using double sided tape and sealed tape etc.The membrane shall be continued over the vertical surface upto top of the Raft and fixed to shutter using double side adhesive tape. For application on confined retaining walls membrane shall be continued over the vertical surface and fixed by PVC roundels / shot guns at selvedge portion. The membrane shall have Tensile strength > 25 Mpa as per ASTM D 412 Modified, Elongation > 500% as per ASTM D 412 Modified, Puncture resistance > 1000 N as per ASTM E 154, Hydrostatic head resistance > 70m head of water as per ASTM D 5385,Low Temperature Flexibility: -25 deg C, Lap Peel Adhesion-880 N/m as per ASTM D1876, Peel Adhesion to Concrete > 1500 N/m as per ASTM D 903 Modified, UV Exposure > 45 Days.

- **Material & Performance Requirements**
- The membrane shall meet or exceed the following properties:

- **Thickness:** Minimum 1.5 mm

- **Tensile Strength:** > 25 MPa as per **ASTM D412 (Modified)**

- **Elongation at Break:** > 500% as per **ASTM D412 (Modified)**

- **Puncture Resistance:** > 1000 N as per **ASTM E154**

- **Hydrostatic Head Resistance:** > 70 m head of water as per **ASTM D5385**
- **Low Temperature Flexibility:** Up to **–25°C**
- **Lap Peel Adhesion:** ≥ 880 N/m as per **ASTM D1876**
- **Peel Adhesion to Concrete:** > 1500 N/m as per **ASTM D903 (Modified)**
- **UV Exposure Resistance:** Minimum **45 days**

- **Surface Preparation**
- P.C.C. surface shall be cleaned thoroughly by removing loose aggregates, laitance, dust, oil, grease and other foreign materials.
- Surface shall be smooth, firm and free from sharp projections that may damage the membrane.
- **Application Procedure**
- Membrane shall be cut to convenient lengths and carefully aligned over the prepared P.C.C. surface.
- Membrane shall be rolled out with **print-coated side facing upward**.
- Adjacent sheets shall be laid with a **minimum overlap of 75 mm**.
- End overlaps shall be treated using **double-sided adhesive tape** and sealed with approved sealing tape to ensure watertight joints.
- **Vertical Surface Application**
- Membrane shall be continued over vertical surfaces up to the **top of the raft** and fixed to shuttering using **double-sided adhesive tape**.
- For confined retaining walls, membrane shall be continued over vertical surfaces and fixed using **PVC roundels / shot-gun fixing** at selvedge portions, as recommended by the manufacturer.
- **Application Agency & Warranty**
- Waterproofing system shall be executed **only by manufacturer-approved applicator**.
- Contractor shall provide a **minimum 10 years composite warranty against leakages**, issued by the principal manufacturer.
- **Workmanship & Quality Control**
- Application shall be carried out strictly as per manufacturer’s recommendations and standard underground waterproofing practices.
- Any damaged or improperly installed membrane shall be replaced or rectified at contractor’s cost.
- **Measurement & Rate**
- Measurement shall be in **square metres (sqm)** of treated area.
- Rate shall include:
    - Supply of HDPE membrane
    - Surface preparation
    - Overlaps, tapes, roundels and accessories
    - Application by manufacturer’s approved applicator

- Warranty, labour, tools and all incidental works

- **Nothing extra shall be payable** unless specifically mentioned in the tender document.

GUARANTEE FOR WATER PROOFING TREATMENT

- The contractor shall be fully responsible for and shall guarantee proper performance of the entire waterproofing system for a period of 10(Ten) years from the final completion of works. In addition, specific 10 years written guarantee (to be furnished in anon-judicial stamp paper of value not less than Rs.100/-) in approved proforma shall be submitted for the performance of the system, before final payment and shall not in anyway limit any other rights the Employer may have under the contract. Guarantee for waterproofing shall comprises of all the items described above in particular specification.

- All water-proofing work shall be carried out through approved specialist agency as per method of working approved by the Engineer-in-charge. However the Contractors shall be solely responsible for water proofing treatment until the expiry of the above guarantee period.

Ten years guarantee in prescribed proforma attached shall be given by the contractor for the waterproofing treatment. In addition 10%(ten per cent)of the cost of these items of water proofing under this subhead shall be retained as guarantee to watch the performance of the work executed. However, half of this amount(withheld) would be released after five years from the date of completion of the work, if the performance of the water proofing works is satisfactory. The remaining with held amount shall be released after completion of ten years from the date of completion of work, if the performance of the waterproofing work is satisfactory. If any defect is noticed during the guarantee period, it should be rectified by the contractor within seven days of issuing of notice by the Engineer-in-Charge and, if not attended to, the same shall be got done through other agency at the risk and cost of the contractor and recovery shall be effected from the amount retained towards guarantee. In any case, the contractor and the specialist agency,during the guarantee period, shall inspect and examine the treatment once in every year and make good any defect observed and confirm the same in writing. The security deposit can be released in full, if bank guarantee of equivalent amount, valid for the duration of guarantee period, is produced and deposited with the Department

Item no.156.

Providing and laying water proofing treatment to vertical and horizontal surfaces of depressed portions of W.C kitchen and the like consisting of : i) Ist course of appying cement slurry @ 4.4 Kg/sqm mixed with water proofing compound conforming to IS 2645in recommended proportions including rounding off junction of vertical and horizontal surface.ii) IInd course of 20 mm cement plaster 1: 3 (1 cement :3 coarse sand) mixed with water proofing compound in recommended proportion including roudnign off junction of vertical and horizontal surface. iii) IIIrd course of applying blown or residual bitument applied hot at 1.7 kg. per sqm of area.iv) IVth course of 400 micron thick PVC sheet. (Overlaps at joints of PVC sheet should be 100 mm wide and pasted to each other with bitument @ 1.7 kg/sqm.)

22.3 WATER PROOFING TREATMENT TO VERTICAL AND HORIZONTAL SURFACE OF DEPRESSED PORTION OF WC, KITCHEN AND THE LIKE

22.3.1 Before the Water Proofing Treatment Before the water proofing treatment, the internal plaster of ceiling and walls of WC block leaving the portion for dado/skirting should be completed. Grooving / chasing for doing the concealed work of GI/CI pipes/Electrical conduits should be completed. Cleaning the depressed/sunken portion of WC of all debris, extra mortar sticking to the vertical and horizontal surface etc. Necessary holes for ‘P’ trap /Nhani trap/Water escape pipe etc should be completed.

22.3.2 Preparing Surface and Fixing Pipes and Fittings Before the water proofing treatment work, proper key in the concrete surface should be provided. The depressed/sunken portion should be hacked by a hacking tool, after the concrete slab is cast and when this concrete is still green. The vertical surfaces of the depressed /sunken portion should be hacked with a hacking tool just after the shuttering is removed. In case of old work, the water proofing treatment on such surfaces shall be permitted after making proper spatter dash key. Fixing the ‘P’ trap in position and all other pipes work including the water escape pipe shall be fixed properly and the holes should be plugged carefully before taking up the water proofing work.

22.3.3 1st Course Cement duly blended with water proofing compound as explained in clause 22.1 shall be used for preparing the cement slurry. The consistency of the slurry should be such that 4.4 kg. of blended cement with water proofing compound is used per sq. metre area of surface to be treated. The slurry should be started from the vertical faces towards the bottom of the floor. Particular care should be taken to see that the slurry is applied to corners without leaving any gap.

22.3.4 2nd Course Immediately on applying the blended cement slurry on the surface to be treated cement plaster 20 mm thick in CM 1:3 (1 blended cement: 3 coarse sand) shall be applied both on vertical and horizontal surfaces taking particular care to complete the entire depressed/ sunken portion of WC within a day so that the plaster can be done without any joint. Junctions shall be properly rounded. The surfaces of the plaster

shall be left rough but finished in one plain and cured for a week. On completion of the curing period both horizontal and vertical surfaces shall be cleaned properly and gently and allowed to dry.

22.3.5 3rd Course Only after the surface is completely dried the blown or residual bitumen shall be applied @ 1.7 kg. of bitumen per sqm area.

22.3.6 4th Course PVC sheet 400 micron thick shall be spread evenly without any kink immediately, so that the PVC sheet sticks to the surface firmly. PVC sheet shall be continued to be laid over the main slab upto 100 mm. Overlapping of PVC sheet should be done with a minimum overlap of 100 mm, duly pasting the overlapped sheet with an application of bitumen @ 1.7 kg./ sqm. The projections of pipes and 'P' trap outlet etc. inside the depressed/sunken portion of WC shall also be cladded with water proofing treatment layer upto a height of 150 mm, using a coat of bitumen with PVC sheet complete. The surfaces of depressed/sunken portion of WC shall not be left without covering with specified filling material and base concrete, otherwise the PVC sheet layer may be tampered by the labour working in the vicinity. Fixing up of WC pan, filling specified material and the top base concrete should be done as early as possible and the top horizontal layer of water proofing may be taken up later i.e. just before laying the floor tiles. (10 year Warranty to be given by agency for any defects)

22.3.7 Measurement Length and breadth shall be measured along the finished surface correct to a cm. and area shall be worked out to nearest 0.01 sqm. No payment however shall be made for the 100 mm overlap of PVC Sheet over the roof slab.

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

Mode of Measurement &Payment
The rate shall be for a unit of One sq.meter

GUARANTEE FOR WATER PROOFING TREATMENT

- The contractor shall be fully responsible for and shall guarantee proper performance of the entire waterproofing system for a period of 10(Ten) years from the final completion of works. In addition, specific 10 years written guarantee (to be furnished in anon-judicial stamp paper of value not less than Rs.100/-) in approved proforma shall be submitted for the performance of the system, before final payment and shall not in anyway limit any other rights the Employer may have under the contract. Guarantee for waterproofing shall comprises of all the items described above in particular specification.

- All water-proofing work shall be carried out through approved specialist agency as per method of working approved by the Engineer-in-charge. However the Contractors shall be solely responsible for water proofing treatment until the expiry of the above guarantee period.

Ten years guarantee in prescribed proforma attached shall be given by the contractor for the waterproofing treatment. In addition 10%(ten per cent)of the cost of these items of water proofing under this subhead shall be retained as guarantee to watch the performance of the work executed. However, half of this amount(withheld) would be released after five years from the date of completion of the work, if the performance of the water proofing works is satisfactory. The remaining with held amount shall be released after completion of ten years from the date of completion of work, if the performance of the waterproofing work is satisfactory. If any defect is noticed during the guarantee period, it should be rectified by the contractor within seven days of issuing of notice by the Engineer-in-Charge and, if not attended to, the same shall be got done through other agency at the risk and cost of the contractor and recovery shall be effected from the amount retained towards guarantee. In any case, the contractor and the specialist agency,during the guarantee period, shall inspect and examine the treatment once in every year and make good any defect observed and confirm the same in writing. The security deposit can be released in full, if bank guarantee of equivalent amount, valid for the duration of guarantee period, is produced and deposited with the Department

Item no.157.

Terrace Waterproofing Works : Providing and applying single component PU based cold applied seamless waterproofing membrane over the primed surface with PU/Epoxy primer Layer on RCC mother slab, Insulation Layer: Spray applying an average minimum 65mm thick GRIHA enlisted CFC & HCFC free spray applied polyurethane foam and 2 coats of a single component PU based cold applied seamless waterproofing membrane over PU foam , 150 gsm Geotextile (non-woven polyester) over the entire membrane on horizontal areas maintaining proper overlaps and an avg of 100 mm thick M20 grade PP fiber reinforced concrete screed with Min. 75 mm thick at the rain water outlets, laid to a slope of 1 : 120, including saw cuting (approx 6mm W x 30mm D) at 3MX4M pannels within 24 hours of concrete placement and filling the groove with Expanded Polytheylene backer rod keeping the top approx 10 mm depth open and sealing the groove on the top after 28 days of concrete placement with PU sealant or equivalent, and making angle fillet of 100mmX100mm using M20 grade concrete at the corners, compaction , curing for 7 days etc complete (10 year Warranty to be given by agency for any defects)

workmanship

Terrace waterproofing with multiple layers and materials shall be PU based cold applied seamless waterproofing membrane, PU/Epoxy primer, spray applied polyurethane foam (CFC & HCFC free), geotextile (non-woven polyester), M20 grade PP fiber reinforced concrete screed, PU sealant, Expanded Polyethylene backer rod, M20 grade concrete for angle fillet.

Surface Preparation: Prepare the RCC mother slab by cleaning and priming with PU/Epoxy primer layer.

Spray apply an average minimum 65 mm thick GRIHA enlisted CFC & HCFC free spray applied polyurethane foam and fill irregularities on the substrate.

First Layer: Apply the first coat of single component PU based cold applied seamless waterproofing membrane over the primed surface.

Second Layer: Apply a second coat of the same waterproofing membrane over the PU foam layer. Ensure seamless waterproofing and protection against water ingress.

Geotextile Layer: Install 150 gsm non-woven polyester geotextile over the entire membrane on horizontal areas. Maintain proper overlaps to prevent water penetration and enhance durability.

Concrete Screed: Lay an average 100 mm thick M20 grade PP fiber reinforced concrete screed. and Lay to a slope of 1:120 towards rainwater outlets. Provide a minimum 75 mm thickness at rainwater outlets. Saw cut panels approximately 6 mm wide and 30 mm deep within 24 hours of concrete placement . Fill the saw-cut grooves with Expanded Polyethylene backer rod, leaving approximately 10 mm depth open. Seal the grooves with PU sealant or equivalent after 28 days of concrete placement.

Construct 100 mm x 100 mm angle fillet using M20 grade concrete at the corners. Provide structural support and ensure waterproofing integrity at corners.

Ensure proper compaction of all layers to achieve desired thickness and density. Cure the entire waterproofing system, including concrete screed, for a minimum of 7 days.

Mode of Measurement &Payment

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

GUARANTEE FOR WATER PROOFING TREATMENT

- The contractor shall be fully responsible for and shall guarantee proper performance of the entire waterproofing system for a period of 10(Ten) years from the final completion of works. In addition, specific 10 years written guarantee (to be furnished in anon-judicial stamp paper of value not less than Rs.100/-) in approved proforma shall be submitted for the performance of the system, before final payment and shall not in anyway limit any other rights the Employer may have under the contract. Guarantee for waterproofing shall comprises of all the items described above in particular specification.

- All water-proofing work shall be carried out through approved specialist agency as per method of working approved by the Engineer-in-charge. However the Contractors shall be solely responsible for water proofing treatment until the expiry of the above guarantee period.

Ten years guarantee in prescribed proforma attached shall be given by the contractor for the waterproofing treatment. In addition 10%(ten per cent)of the cost of these items of water proofing under this subhead shall be retained as guarantee to watch the performance of the work executed. However, half of this amount(withheld) would be released after five years from the date of completion of the work, if the performance of the water proofing works is satisfactory. The remaining with held amount shall be released after completion of ten years from the date of completion of work, if the performance of the waterproofing work is satisfactory. If any defect is noticed during the guarantee period, it should be rectified by the contractor within seven days of issuing of notice by the Engineer-in-Charge and, if not attended to, the same shall be got done through other agency at the risk and cost of the contractor and recovery shall be effected from the amount retained towards guarantee. In any case, the contractor and the specialist agency,during the guarantee period, shall inspect and examine the treatment once in every year and make good any defect observed and confirm the same in writing. The security deposit can be released in full, if bank guarantee of equivalent amount, valid for the duration of guarantee period, is produced and deposited with the Department

Item No. 158.

Preparation and consolidation of sub grade with power road roller of 8 to 12 tonne capacity after excavation earth to an average of 22.5cm depth dressing to camber and consolidating with road roller including making good the undulations etc. and re-rolling the sub grade and disposal of surplus earth lead upto any lead.

Workmanship

16.2 SUB-GRADE : PREPARATION AND CONSOLIDATION

16.2.0 In sub-grade composed of clay, fine sand or other soils that may be forced up into the coarse aggregate during rolling operation, an insulation layer of suitable thickness of granular materials or over size brick aggregate not less than 10 cm thick shall be provided for blanketting the sub-grade, which shall be paid for separately, unless otherwise specified in the agreement. In slushy soils or in areas that are water logged, special arrangements shall be made to improve the sub-grade and the total pavement thickness shall be designed after testing the properties of the sub-grade soil. Necessary provision for the special treatment required shall be made in the project and paid for separately.

16.2.1 Preparation of Sub-Grade

The surface of the formation for a width of sub-base, which shall be 15 cm more on either side of base course, shall first be cut to a depth equal to the combined depth of sub-base and surface courses below the proposed finished level (due allowance being made for consolidation). It shall then be cleaned of all foreign substances. Any ruts or soft yielding patches that appear due to improper drainage conditions, traffic hauling or from any other cause, shall be corrected and the sub-grade dressed off parallel to the finished profile.

16.2.2 Consolidation

The sub- grade shall be consolidated with a power road roller of 8 to 12 tonnes. The rollershall run over the sub grade till the soil is evenly and densely consolidated and behaves as an elastic mass (the roller shall pass a minimum of 5 runs on the sub grade). Allundulations in the surface that develop due to rolling shall be made good with material orquarry spoils as the cases may be and the sub-grade is rerolled.

16.2.3 Surface Regularity

The finished surface shall be uniform and conform to the lines, grades and typical crosssection shown in the drawings, when tested with the template and straight edge, the variation shall be within the tolerances specified in Table 16.11.

TABLE 16.11
Permissible Tolerances of Surface Evenness of Sub Grade

Longitudinal profile maximum permissible undulation when measured with a 3 metre straight edge	*Cross profile maximum permissible variation from specified profile when measured with a camber template*
24 mm	15 mm

Where the surface irregularity of the sub grade falls outside the specified tolerances, the contractor shall be liable to rectify these with fresh material or quarry spoils as the case may be, and the sub grade rerolled to the satisfaction of Engineer-in-Charge.

16.2.4 Measurements

The lengh and width shall be measured correct to a cm. The area shall be worked out in square metre, correct to two places of decimal.

16.2.5 Rate

The rate for preparation and consolidation of sub grade shall include the cost of materials and labour involved for all the operations mentioned in above unless otherwise specified.

Mode of Measurement &Payment
The rate shall be for a unit of One sq.meter

Item No. 159.

Construction of granular Sub base providing coarse graded material, spreading in uniform layers with motor grader on prepared surface mixing by mix in place method with front end loader at OMC and compacting with vibratory roller to achieve the desired density, complete as per specification and direction of engineer in charge- With material conforming to Grade - I (size range 75mm to 0.075mm) having CBR Value -30.

workmanship

16.62. GRANULAR SUB–BASE

16.62.1. Scope This work shall consist of laying and compacting well-graded material on prepared subgrade in accordance with the requirements of these Specifications. The material shall be laid in one or more layers as sub-base or lower sub-base and upper sub-base (termed as sub-base hereinafter) as necessary according to lines, grades and cross-sections shown on the drawings or as directed by the Engineer-in-charge.

16.62.2. Materials

16.62.2.1. The material to be used for the work shall be natural sand, crushed gravel, crushed stone, crushed slag or combination thereof depending upon the grading required. Use of materials like brick metal, Kankar and crushed concrete shall be permitted in the lower sub-base. The material shall be free from organic or other deleterious constituents and shall conform to the grading given in Table 16.44 and physical requirement given in Table 16.45 Gradings III and IV shall preferably be used in lower sub-base. Grading V and VI shall be used as a sub-base-cum-drainage layer. The grading to be adopted for a project shall be as specified in the Contract. Where the sub-base is laid in two layers as upper sub-base and lower sub-base, the thickness of each layer shall not be less than 150 mm.

16.62.2.2 If the water absorption of the aggregate determined as per IS : 2386 (Part 3); if this value is greater than 2 per cent, the aggregate shall be tested for Wet Aggregate Impact Value (AIV) (IS: 5640). Soft aggregates like Kankar, Brick ballast and laterite shall also be tested for Wet AIV

TABLE No. 16.44
GRADING FOR GRANULAR SUB-BASE MATERIALS

IS Sieve Designation	Percent by Weight Passing the IS Sieve					
	Grading I	Grading II	Grading III	Grading IV	Grading V	Grading VI
75.0 mm	100	--	--	--	100	--
53.0 mm	80-100	100	100	100	80-100	100
26.5 mm	55-90	70-100	55-75	50-80	55-90	75-100
9.50 mm	35-65	50-80	--	--	35-65	55-75
4.75 mm	25-55	40-65	10-30	15-35	25-50	30-55
2.36 mm	20-40	30-50	--	--	10-20	10-25
0.85 mm	--	--	--	--	2-10	--
0.425 mm	10-15	10-15	--	--	0-5	0-8
0.075 mm	<5	<5	<5	<5	--	0-3

(IS: 5640

TABLE No. 16.45
PHYSICAL REQUIREMENTS FOR MATERIALS FOR GRANULAR SUB-BASE

Aggregate Impact Value (AIV)	IS:2386 (Part 4) or IS:5640	40 Maximum
Liquid Limit	IS:2720 (Part 5)	Maximum 25
Plasticity Index	IS:2720 (Part 5)	Maximum 6
CBR at 98% dry density (at IS:2720-Part 8)	IS:2720 (Part 5)	Minimum 30 unless otherwise specified in the Contract

16.62.3 Construction Operations

16.62.3.1. Preparation of Sub-Grade: The surface of the sub grade to receive the Granular Sub-base shall be prepared to the specified lines and crossfall (Camber) as necessary and made free of dust and other extraneous materials. Any ruts or soft yielding places shall be corrected in an approved manner and rolled with 80 – 100 kN smooth wheeled roller until firm surface is obtained if necessary by sprinkling water. Weak places shall be strengthened, corrugations removed and depressions and pot holes made good with suitable materials, before spreading the aggregate for GSB. Where the existing surface over which the sub base of GSB is to be laid is black topped, to ensure effective internal drainage, furrows 50 mm x 50 mm (depth of furrows increased to reach bottom of bituminous layer where necessary) at one metre intervals shall be cut in the existing bituminous surface at 45 degrees to the central line of the carriageway at one metre intervals in the existing road before the GSB is laid.

16.62.3.2 Spreading and compacting: The sub-base material of grading specified in the Contract and water shall be mixed mechanically by a suitable mixer equipped with provision for controlled addition of water and mechanical mixing. So as to ensure homogenous and uniform mix. The required water content shall be determined in accordance with IS:2720 (Part 8). The mix shall be spread on the prepared sub-grade with the help of

a motor grader of adequate capacity, its blade having hydraulic controls suitable for initial adjustment and for maintaining the required slope and grade during the operation, or other means as approved by the Engineer-in-charge.

Moisture content of the mix shall be checked in accordance with IS:2720 (Part 2) and suitably adjusted so that, at the time of compaction, it is from 1 to 2 per cent below the optimum moisture content (OMC).

Immediately after spreading the mix, rolling shall be done by an approved roller. If the thickness of the compacted layer does not exceed 100 mm, a smooth wheeled roller of 80 to 100 kN weight may be used. For a compacted single layer upto 200 mm the compaction shall be done with the help of a vibratory roller of minimum 80 to 100 kN static weight capable of achieving the required compaction. Rolling shall commence at the lower edge and proceed towards the upper edge longitudinally for portions having unidirectional crossfall or on super elevation. For carriageway having crossfall on both sides, rolling shall commence at the edges and progress towards the crown. Each pass of the roller shall uniformly overlap not less than one third of the track made in the preceding pass. During rolling, the grade and crossfall (camber) shall be checked and any high spots or depressions, which become apparent, corrected by removing or adding fresh material. The speed of the roller shall not exceed 5 km per hour. Rolling shall be continued till the density achieved is at least 98 percent of the maximum dry density for the material determined as per IS : 2720 (Part 8). The surface of any layer of material on completion of compaction shall be well closed, free from movement under compaction equipment and from compaction planes, ridges, cracks or loose material. All loose, segregated or otherwise defective areas shall be made good to the full thickness of layer and re-compacted.

16.62.4 Measurements

Granular sub-base shall be measured as finished work in position in cubic metres. The length and breadth shall be measured to the nearest centimetre. The depth of consolidated layer shall be computed to nearest half centimetre by taking average of depths at the centre and at 30 cm from the left and right edges at a cross section taken at 100 metre interval or less as decided by the Engineer-in-Charge by making small pits. The consolidated cubical contents shall be calculated in cubic metres correct to two places of decimal. The protection of edges of granular sub-base extended over the full formation as shown in the drawing shall be considered incidental to the work of providing granular sub-base and as such no extra payment shall be made for the same.

16.62.5. Rate

The Contract unit rate for granular sub-base shall be payment in full for carrying out the required operations including all labour, tools, equipments, machinery and incidentals to complete the work to the specifications as described above

Mode of Measurement &Payment
The rate shall be for a unit of One cum.

Item No. 160.

Construction of dry lean cement concrete sub base over a prepared sub-grade with coarse and fine aggregate conforming to IS:383, the size of coarse aggregate not exceeding 25 mm, aggregate cement ratio not to exceed 15:1, aggregate gradation after blending to be as per specifications, cement content not to be less than 150 Kg/cum, optimum moisture content to be determined during trial length construction, concrete strength not to be less than 10 Mpa at 7 days, mixed in a batching plant, transported to site, for all leads & lifts, laid with a mechanical paver, compacting with 8-10 tonne vibratory roller, finishing and curing etc. complete as per direction of Engineer in- charge.

1.2. Materials
1.3. Water shall conform to M-1. Cement shall conform to M-3. Sand shall conform to M-6 stone aggregate 25 mm..
2.2. Workmanship
2.3. Relevant Specifications of item No7 shall be followed except that cement concrete shall be mixed in the preparation of 15:1 aggregate:cement ration instead of 1:3.6 by volume.and cement content will not to be less than 150kg/cum
3.2. Mode of measurement and payment
3.3. The concrete shall be measured for its length, breadth and depth, limiting dimensions to those specified on plans or as directed
The rate shall be for a unit of one cubic meter

Item no.161.

Providing and fixing pre-cast Rubber Dye/ steel Dye interlocking concrete block 60mm thick with grade of concrete M300 pnumatic compressed/ vibrated mechanically and as per approved design Confirming to IS15658:2006 including 35mm Sand layer for levelling and filling the joint with sand in proper line and level as per guidlines of IRC : SP 63-2018 etc. Complete.

workmanship

Material:

Providing and fixing pre-cast interlocking concrete blocks. Shall be Pre-cast rubber dye or steel dye interlocking concrete blocks, grade of concrete M300 Conforming to IS15658:2006 With 35mm sand layer for leveling and joint filling with sand as per IRC SP 63-2018 guidelines.

Excavate and prepare the subgrade to the required dimensions and levels.Compact the subgrade thoroughly to achieve the specified density. Spread a 35mm thick layer of sand uniformly over the prepared subgrade. Level the sand layer to provide a smooth and even base for laying the concrete blocks.Use pre-cast rubber dye or steel dye interlocking concrete blocks with a thickness of 60mm. Lay the blocks in accordance with the approved design and layout.Ensure proper interlocking of blocks to achieve structural stability.Maintain proper alignment, line, and level as per design specifications.Fill the joints between the concrete blocks with sand.Compact the sand-filled joints to ensure proper settling and stability of the blocks.Clean excess sand from the surface of the blocks after joint filling.

Mode of Measurement &Payment
The rate shall be for a unit of One sqm.

Item no.162.

Providing and fixing pre-cast concrete kerb stone of gray cement based concrete block 30cm length,30cm height and 15cm thick of M200 grade concret as per approved design and including excavation for fixing in proper line and level ,filling the joint with C:M 1:3(1cement:3 fine sand) etc complete.

workmanship

16.58 KERB STONE (PRECAST)

16.58.1 Laying

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

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

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

16.58.2 Finishing

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

16.58.3 Measurements

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

16.58.4 Rate

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

Mode of Measurement &Payment

The rate shall be for a unit of One cum.

Item no.163.

Providing and laying design mix cement concrete of M-30 grade, in roads/ taxi tracks/ runways, using cement content as per design mix, using coarse sand and graded stone aggregate of 40 mm nominal size in appropriate proportions as per approved & specified design criteria, providing dowel bars with sleeve/ tie bars wherever required,laying at site, spreading and compacting mechanically by using needle and surface vibrators, levelling to required slope/ camber finishing with required texture, including steel form work with sturdy M.S. channel sections, curing, making provision for contraction / expansion, construction & longitudinal joints (10 mm wide x 50 mm deep) by groove cutting machine, providing and filling joints with approved joint filler and sealants, complete all as per direction of Engineer-in-charge (Item of joint fillers, sealants, dowel bars with sleeve/ tie bars to be paid separately). Cement content considered in M-30 is @ 410 kg/cum. Cement concrete manufactured in automatic batching plant (RMC plant) i/c transportation to site in transit mixer.

Workmanship

16.36 CEMENT CONCRETE PAVEMENT (UNDER ORDINARY CONDITIONS)

Specifications of item below to be followed except that cement concrete of grade 1:2:4 or specified otherwise to be prepared and compacted.

16.37 CEMENT CONCRETE PAVEMENT UNDER CONTROLLED CONDITIONS

16.37.1 Materials

16.37.1.1 Cement

(a) Cement used on work shall be as per sub head cement concrete of CPWD specifications2019 (Vol. – I).

16.37.1.2 Water : Water used on work shall conform to SH: cement concrete of CPWD, Specification 2019- Vol. I.

16.37.1.3 Coarse Aggregate : These shall be crushed or broken from hard stones obtained from approved quarry. These shall be clean strong, durable of fairly cubical shape and free from soft, friable, thin elongated and laminated disintegrated pieces. These shall also be free from dirt, organic deleterious and any other foreign matter and adherent coatings and shall satisfy the physical requirements laid down in para 16.37.19 under quality control.

16.37.1.4 Fine Aggregate : This shall be coarse sand conforming to CPWD Specification 2019 Vol. I. 16.37.1.5 Grading of Mixed Aggregates : The grading of all aggregates (coarse and fine aggregates) to be used in the work shall be determined in the laboratory. The coarse and fine aggregates shall be mixed in suitable proportions so that the grading of the mixed aggregates shall be in the range indicated in Table 16.32.

5 16.37.2 Mix Design

16.37.2.1 The mix shall be approved by Engineer-in- Charge so as to obtain the following mean strength that exceeds the minimum specified flexural strength by 1.64 times the designed standard deviation. Minimum works beam flexural strength at 28 days = 300 kg/sqm. for M-30 or specified in item Designed standard deviation = 60 kg/sqm. for M-30 or for specified grade(s) Design flexural strength at 28 days = 300+60x1.64 Water cement ratio by weight = 398.4 kg/sqm. (f + 1.64 s) says 400 kg. Water cement ratio by weight = 0.5 Minimum slump not more than 25 mm

16.37.2.2 For the purpose of tendering the contractor shall base his rate on the assumption that the quantity of cement used for one cum. of finished concrete shall be 340 kg. or M - 30. If the actual quantity of cement required to be used as a result of the laboratory test is different from that assumed above, necessary adjustment in the cost due to short cement used shall be made on the basis of issue rate of cement including storage charges plus 2.5% for handling charges. However, under no circumstances the quantity of cement to be used shall either exceed 350 kg./cum or fall below 330 kg. per cum of finished concrete.

16.37.3 Statistical Field Check

16.37.3.1 Samples of concrete shall be taken at the mixer and works beams, made, cured and tested in accordance with IS 1199 and IS 516.

16.37.3.2 When a mix is used for the first time, it is important to get a large number of results, as soon as possible, in order to establish the level of control and then suitability of the mix proportions. A sample of concrete shall be taken at random on eight separate occasions during each of the first five days of using that mix. From each sample two beams shall be made one for test at 7 days and the other for test at 28 days.

16.37.3.3 The work beam results shall be examined both individually and in consecutive (but not overlapping) sets of four, for which the average and the range of each set is calculated. The mix proportions shall be modified to increase the strength, if in the first ten consecutive (but not overlapping) sets any of the following conditions are not satisfied. (I) Each sample has a test strength not less than the minimum specified strength i.e. 30 kg/sq. cm. (or otherwise specified in item). OR (II) (a) Not more than two individual results (Not more than one of first twenty) of the 40 beams tests shall fall below the minimum work beam strength but they shall not be less than 80% of the specified beam strength of 30 kg./sq. cm (or otherwise specified in item) or the minimum specified strength minus 1.35 times the standard deviation whichever is greater. (b) No value of the range in any set shall exceed 3 times the designed standard deviation. (c) The average for all samples (10 sets) shall not be less than the minimum specified strength i.e. 30 kg/sq. cm (or otherwise specified in item) plus 1.64 times the designed standard deviation 60 kg./sq.cm M-30.

16.37.3.4 If either of these conditions (16.37.3.3 I or 16.37.3.3 II) are not satisfied, the mix shall be modified and the procedure described above shall be repeated till results satisfying the above criterias are obtained.

16.37.3.5 Subsequently samples shall be taken at the rate of one for every 30 cubic metre of concrete laid. Eight beam specimen shall constitute one sample. A set of 4 specimen shall be tested after 7 days and another set of 4 specimen shall be tested after 28 days. These test results shall be checked individually and in sets of four as the work progresses. If at any stage it is found that either of conditions 16.43.4.3,I or 16.4.3,II are not satisfied, the overall average and the standard deviation of the previous consecutive 40 beam test results including the non-complying set shall be calculated. If the overall average strength minus 1.64 times the standard deviation is more than the specified beam strength (30 kgm/sq.cm) (or otherwise specified in item) the concrete shall be accepted. But if it is less than the concrete work corresponding to these 40 beams tests shall be rejected and the mix proportion shall be modified forth with for further work. The rejected work shall be replaced by the contractor immediately at his own cost and expense.

16.37.3.6 The statistical field checks described in 16.37.3.1 to 16.37.3.2 are meant to control the quality of concrete. The standard of acceptance of concrete shall be governed by the provision of para 16.37.3.3 to 16.37.3.5.

16.37.4 Slump Test The test shall be carried out as per IS 1199. A slump test shall be carried out at each mixer at least one in fifty batches mixed or more frequently if directed by the Engineer- in-Charge. Any batch from which slump test is being made shall not be transferred to the place of laying till the slump test has been completed. Not only the batch which gives a slumps in excess of that specified shall be rejected but the concrete already laid immediately preceding the batch tested upto the nearest last transverse joint may be rejected by the Engineer-in-Charge or his subordinate, if he is satisfied that such preceding batches were substandard in this respect. The decision of the Engineer-in-Charge in this respect shall be final and binding on the contractor. Such rejected concrete shall be removed by the contractor immediately and replaced with proper slump concrete at his cost and expense.

16.37.5 Steel Forms

16.37.5.1 All side forms shall be of mild steel. The steel forms shall be of M.S. Channel sections and their depth shall be equal to the thickness of the pavement.

16.37.5.2 The side forms shall have a length of at least 3.0 metres except on curves of less than 4.5 metres radius where shorter lengths may be used. When set to grade and stacked in place the maximum deviation of the top surface of any section from a straight line shall not exceed 3 mm. The method of connection between sections shall be such that the joint formed shall be free from play or movement in any direction. The use of bent, twisted or worn out forms shall not be permitted. At least three stake pockets for bracing pins or stakes shall be provided for each 3.0 M length of forms. Bracing and supports must be ample to prevent the springing of forms under pressure of concrete or weight or thrust of the machinery (like screed vibrator) operating on the forms. Support to the forms shall be sufficiently rigid to hold them in position during the entire operation of laying and compacting and finishing and that they shall not at any time deviate more than 3 mm from straight edge 3 metres in length. Forms which

show a variation from the required rigidity of the alignment and levels shown on the plans shall be reset or removed as directed. The length and number or pins or stakes shall be such as to maintain the forms at the correct line and grade.

16.37.5.3 The supply of forms shall be sufficient to permit their remaining in place for at least 12 hrs. after the concrete has been placed or longer, if in the opinion of the Engineer-in-Charge, it is necessary.

16.37.5.4 The top line of the forms is not to vary from the correct level or alignment and the levels and alignment of the forms are to be checked and corrected as necessary immediately prior to the placing of concrete. The top edges and faces of the forms are to be carefully cleaned and maintained in clean condition.

16.37.5.5 While removing the steel forms, care shall be taken to withdraw them gradually, any damage to the bull nosed edges shall be made good while the concrete is still green.

16.37.5.6 Setting of Forms (a) Setting of forms shall be according to the slab plan subject to the approval of Engineer-inCharge and concreting shall not commence until the setting of forms is approved. (b) Forms shall be set for at least 50 metres in advance of the point where the concrete is being laid and shall not be removed until at least 12 hrs. of placing of the concrete or longer if in the opinion of Engineer-in-Charge is necessary. (c) After setting, the working faces shall be thoroughly oiled by using approved oil before concrete is placed against them. (d) The pavement joints of overlay layer would overlap with the joints of underlay cement concrete. 16.37.6 Batching and Mixing As detailed in SH: 5 of reinforced cement concrete work of CPWD specifications 2019.

16.37.7 Placing of Concrete As detailed in SH: 5 of reinforced cement concrete work of CPWD specifications 2019.

16.37.8 Compaction of Concrete

16.37.8.1 Compaction shall be carried out by electrically (or) diesel operated needle and screed vibrators as stipulated hereafter. Needle vibrator should be used all over the area for obtaining initial compaction of concrete. These should be of diameter not less than 4.5 cm. If the vibrator are pneumatic the pressure must not be below 4 kg/sq.cm. If electrically operated, they should have a minimum frequency of 3500 impulses per minute.

16.37.8.2 There should be at least three needle vibrators working in any bay. A vibrating screed consisting of a steel or timber section weighing not less than 15 kg. per metre with a tamping edge of not less than 7 cm width and having a vibrator mounted thereon shall follow needle vibrators to obtain full compaction. The face of the wooden tamping edge of the screed shall be lined with M.S. Plate rigidly fixed by means of counter sunk screw. Where screed vibrators are used for compaction, a standby unit shall always be maintained ready for use, should the other one go out of order. Where electrically driven vibrators are employed, a standby diesel pneumatic unit shall be kept ready for use in case of power failure. At the discretion of the Engineer-in-Charge, for compaction at edges and joints, vibrators may be supplemented by hand tamping and rodding for securing satisfactory results. Under no circumstances, honey combing of concrete at joints or elsewhere shall be permitted.

16. 37.8.3 When using screed vibrator for compaction it should not be dragged over the concrete. During the initial passes it shall be lifted to the adjacent forward position in short steps, subsequently, it shall be slowly slided over the surface with its axis slightly tilted away from the direction of sliding and the operation repeated until a close, dense surface is obtained.

16.37.8.4 Concreting shall be carried out in one operation between the expansion joints and construction joints without any break at the dummy joints.

16.37.8.5 Concrete shall be deposited on the base as near the joints as possible without touching them. It shall then be shoveled against the sides, maintaining equal pressure and deposited approx. 50 mm higher than the depth of the joints, care being taken that it is worked well around the joints. The concrete shall not be dumped from the bucket directly upon or against the joints.

16.37.8.6 Workmen shall not be allowed to walk on freshly laid concrete and proper cat walk shall be provided with independent supports beyond concreting bays.

16.37.9 Finishing of Concrete

16.37.9.1 During compaction, any low or high spots shall be made up by adding or removing concrete. After longitudinal floating has been completed but while concrete is still plastic, the slab surface shall be tested for trueness with a 3 m straight edge. Any depressions or high spots showing departure from the true surface shall be immediately rectified. High spots shall be cut down and refinished. Depressions shall be enlarged to about 8-10 cm and filled up with fresh concrete, compacted and finished.

16.37.9.2 The straight edge testing the refloating is to continue until the entire surface: (a) is free from observable departure from the straight edge, (b) conforms to the required levels and across section, and (c) shall conform to the specified surface when the concrete has hardened. 16.37.9.3 The foregoing work is to be carried out while the concrete is still plastic and workable.

16.37.10 Belting

16.37.10.1 Just before concrete becomes non-plastic, the surface shall be belted with a two ply canvas belt not less than 20 cm wide and at least 1 metre longer than the width of the slab. Hand belts shall have suitable handles to permit controlled uniform manipulation. The belt shall be operated with short strokes transversed to the centre line of the pavement and with rapid advance parallel to the centre line.

16.37.11 Brooming

16.37.11.1 After belting and as soon as the surplus water, if any, has risen to the surface, the pavement shall be given a broom finish with an approved steel or fiber broom not less than 45 cm wide. The broom shall be pulled gently over the surface of the pavement from edge to edge. Adjacent strokes shall be slightly overlapped. Brooming shall be perpendicular to the centre line of the pavement and so executed that the corrugations formed shall be uniform in character and width and not more than 1.5 mm deep.

16.37.11.2 Brooming shall be completed before the concrete reaches such a stage that the surface is likely to be torn or unduly roughened by the operation. The broomed surface shall be free from porous or rough spots, irregularities, depressions, and small pockets such as may be caused by accidental disturbing of particles of coarse aggregates embodied near the surface. The brooming shall be of uniform pattern all through.

16. 37.11.3 Edging : After belting/brooming has been completed but before the initial setting of concrete, the edges of the slab shall be carefully finished with an edger of 6 mm radius, and the pavement edges shall be left smooth and true to line.

16.37.12 Honey Combing

16.37.12.1 The side forms shall not be removed until 12 hours or such longer period as the Engineerin-Charge may decide after the laying of concrete.

16.37.12.2 As soon as the side forms are removed, any minor honey combed area shall be filled with mortar composed of one part of cement and two parts of fine aggregate. Major honey combing areas or segregated concrete or other defective work or areas damaged by removal of the forms or concrete damaged by rain or due to any other reason whatsoever shall be considered as defective work and shall be removed and replaced by the contractor at his own expense. The total area of honey combed surface shall not exceed 4 per cent of the area of the slab side. However, no individual honeycomb patch shall exceed 0.1 sqm. Engineer-in-Charge’s decision as to whether the concrete is defective or not shall be final and binding.

16.37.13 Surface Accuracy

16. 37.13.1 After the concrete has sufficiently hardened after about 12 hours and not later than 24 hours, the surface shall be tested again for high spots. All high spots shall be marked and those exceeding 3 mm shall be ground down immediately. Care shall be taken to see that the grinding does not in any way damage the concrete surface.

16.37.13.2 The final surface finish is to be such that when tested with a profilograh/roughness indicator/or a 3 metre long straight edge or an equivalent mechanical unevenness indicator placed anywhere within the same or adjoining slab in any direction on the surface, there shall be no variation greater than 3 mm.

16.37.13.3 If the surface irregularity exceeding 3 mm still remains despite grinding as per para 16.37.13.2 the concrete shall be removed to its full depth. The area of concrete to be removed shall be complete slab between the nearest joints, where the defective slab is less than 4.5 metres from the expansion joint, the whole area upto the expansion joint shall be removed to the full depth. The concrete so removed shall not be reused in the work. Fresh concrete shall be laid in the manner already de-scribed in above paras and shall again be subject to test for surface accuracy and other quality control measures. Nothing extra shall be paid on this account.

16.37.13.4 Every slab shall bear an impression not exceeding 3 mm in depth comprising the number allotted to the slab and the date on which it is laid. This impression shall be formed by the contractor when the concrete is green so as to leave permanent mark on setting.

16.37.13.5 Initial Curing

16.37.13.5.1 Immediately after completion of the finishing operations, the surface of the pavement shall be entirely covered with wetted burlap, cotton or jute mats. The mats used shall be of such length (or width) that as laid they shall extend at least 45 cm beyond the edges of the slab. The mats shall be placed so that the entire surface and both edges of the slab are completely covered. This covering shall be placed as soon as, in the judgment of the Engineer- in-Charge the concrete has set sufficiently to prevent damage to the surface prior to being placed, the mats shall be thoroughly saturated with water and shall be placed with the wettest side down. The mats shall be so placed and weighed down as to cause them to remain in intimate contact with the surface covered, and the covering shall be maintained full wetted and in position for 24 hours after the concrete has been placed or until the concrete is sufficiently hard to be walked on without suffering damage. Water shall be gently sprayed so as to avoid damage to the fresh concrete. If it becomes necessary to remove a mat for any reason, the concrete slab shall not be exposed for a period of more than half an hour.

16.37.13.5.2 Worn burlap or burlap with holes shall not be permitted. Burlap reclaimed from previous use other than curing concrete shall be thoroughly washed prior to use for curing purposes. If burlap is obtained in strips, shall be laid to overlap by at least 150 mm.

16.37.14 Burlap shall be placed from suitable bridges. Walking on freshly laid concrete to facilitate placing burlap shall not be permitted.

16.37.15 Final Curing

16.37.15.1 Upon the removal of the burlaps, the slab shall be thoroughly wetted and then cured as follows:- All joints shall be filled with filler in order to prevent the edges of joints from getting damaged and entry of clay materials into the joints during final curing. Exposed edges of the slab shall be banked with a substantial berm of earth. Upon the slab shall then be laid a system of transverse and longitudinal dykes of clay about 50 mm high immediately covered with a blanket of sandy soil free from stones to prevent the drying up and cracking of clay. The rest of slab shall then be covered with sufficient sandy soil so as to produce a blanket of earth not less than 40 mm deep after wetting. The earth covering shall be thoroughly wetted while it is being placed on the surface and against the sides of the slab and kept thoroughly saturated with water for 21 days and thoroughly wetted down during the morning of the 22nd day and shall thereafter remain in place until the concrete has attained the required strength and permission is given by the Engineer-in-Charge. Thereafter the covering shall be removed and the pavement cleaned and swept. If the earth covering becomes displaced during the curing period, it shall be replaced to the original depth and resaturated.

16.37.15.2 Contractor shall appoint chowkidars at his expense to prevent workmen, cattle, etc., straying on the pavement concrete.

16.37.15.3 Concrete shall not be subjected to any load or weight of any plant until at least 28 days after laying.

16.37.16 Construction Joints

16.37.16.1 Construction joints shall be provided as shown in the drawing and also at places where concreting is stopped due to unforeseen circumstances. The joints shall be straight and vertical through the full thickness of the slab. While concrete in adjacent bay is still green, flats of suitable size shall be drawn along the edge and a groove of size 10 mm × 25 mm deep shall be neatly formed and finished. The edges of the groove shall be full nosed. After curing of concrete is complete, this groove shall be thoroughly cleaned of all sand dust and shall be perfectly dried and filled with hot poured sealing compound conforming to grade B of IS 1834. Before filling with sealing compound the faces of concrete of the joint shall be coated with primer of approved brand to a depth of 25 mm at the rate of 2.6 liters per 10 square meters. Bitumen emulsion shall not be used as primer. 16.37.17 Dummy Joints

16.37.17.1 The joints shall be 10 mm wide and shall extend vertically from the surface of the slab to a depth equal to 1/3rd of the thickness of the slab but not less than 4 cm in any case. The joint may be formed by depressing into the soft but compacted concrete a high tensile M.S. or other approved Tee of flat bar of depth not less than required depth of the joint plus 25 mm. The bar used for forming the groove shall be coated with soft soap or other suitable lubricant to facilitate its removal when the steel Tee or flat is removed joints shall be neatly formed with proper tools and mortar/fine material from the slab itself. No additional cement mortar (rich or otherwise) shall be used. 16.37.17.2 Cutting or sawing by a saw mounted on a movable frame and driven mechanically shall also be permitted as a method for making the joint. In this case the width may be reduced to 6 mm. any other method for making joints can be followed with the prior approval of the Engineer-in-Charge.

16.37.17.3 In all cases, except where cutting is done with saw, the joint edges shall be bullnosed. Care should be taken to see that the edges of the grooves are not damaged.

16.37.17.4 The grooves shall be filled with hot poured sealing compound conforming to Grade B of IS:1834. Prior to filling with sealing compound, the joints shall be cleaned by compressed air and primed with Shalijet primer or equivalent at the rate specified in Para 16.37.16.1

16.37.17.5 All joints shall be sealed as soon as practicable after 28 days of casting of cc pavement. Joints shall be sealed flush with the adjacent pavement surface in summer and 3-4 mm below finished concrete surface in winter. The pavement shall be opened to traffic only after joint sealing

over the entire pavement. To prevent tackiness or pickup under traffic, the exposed surfaces of the sealing compound shall be dusted with hydrated lime, if directed by Engineer-in-Charge, for which nothing extra shall be paid to the contractor.

16.37.17.6 In case of sudden rain or storm, the work can be concluded at the dummy joints but these will then be formed as construction joints.

16.37.17.7 Before sealing of joints, it may be ensured that the groove extends fully across the bay between consecutive longitudinal joints, in the case of transverse joints and is continuous in the case of longitudinal joints. Any concrete or other foreign matter must be removed from the groove.

16.37.18 Concreting during Rains

16.37.18.1 To prevent damage to freshly laid concrete during monsoon, or sudden rains, the contractor shall provide an adequate supply of tarpaulins or other water proof covering material. Any concrete damaged by rain shall be removed and replaced by the contractor at his own cost as directed by the Engineer-in-Charge.

16.37.19 Quality Control The following quality control tests shall be carried out at frequencies specified against each as in Table 16.33.

16.37.20 Equipments

16.37.20.1 Equipments as per list at Appendix C shall be provided by the contractor in the field testing laboratory. Nothing extra shall be paid to him on this account. Records as required shall be maintained at site. All tests details in support of mix design shall be maintained as part of records of the contract and shall be signed both by the contractor and the Engineer-in-Charge. The contractor shall provide all labour, materials and equipment required for all tests to be carried out at his own cost.

16.37.20.2 The Engineer-in-Charge reserves the right to test any part of concrete laid regarding quality soundness, compactness, thickness, strength and finish of the concrete, at any time before the expiry of the “Defect liability period” not withstanding that necessary tests had been carried out and found satisfactory at the time of execution. S.No Test Test Method Frequency Acceptance Criteria 1 2 3 4 5 (i) COARSE AGGREGATE (a) Flakiness index IS 2386 (Pt.1) Before approval of the quarry and at every subsequent change in the source of supply and one test per 100 cum of aggregates Not more than 15% (b) Impact value IS 2386 (Pt.4) -do- Not more than 30% (c) Los angles abrasion value. IS 2386 (Pt.4) -do- Not more than 40% (d) Deleterious materials. IS 2386 (Pt.2) Before approval of the quarry and at every subsequent change in the source of supply As per table 1 of IS 383 (e) Moisture content. IS 2386 (Pt.3) Regularly as required subject to a min. one test per day -do- (ii) FINE AGGREGATES (a) Silt content. CPWD specifications 2019, Vol. I, SH: CC One test per 15 cum Not more than 8% (b) Gradation of sand IS 2386 (Pt.1) -do- Fineness modulus between 2.5 to 3.9 (c) Deleterious materials. IS 2386 (Pt.2) Before approval of the quarry and at every subsequent change in the source of supply As per table 1 of IS 383 (d) Moisture content. IS 2386 (Pt.3) Regularly as required subject to a min. 2 test/day -do- (iii) MIXED AGGREGATES (a) Grading IS 2386 (Pt. 1) 1 test per 15 cum As per para 16.37.1.5 (iv) Slump test of concrete IS 1199 At least once in 50 batches at each mixer or more frequently if directed by the Engineer-in-Charge Not more than 25 mm (v) Flexural strength IS 516 One test of sample consisting of eight specimen for every 30 cum of concrete As per para 16.37.3.5. (vi) Surface accuracy As prescribed Regularly As per para 16.37.13 TABLE 16.33

16.37.20.3 All defective unsound sub-standard work and concrete of sub-standard strength and quality etc. as established vide paras 16.37.3 shall be rejected and shall be replaced by the contractor at his own expense in the manner as detailed in para 16.37.3. Where due to operational or any other reason such replacement does not become possible (decision of Engineer-in-Charge in this respect being final and binding on the contractor), the cost of removal and replacement of such rejected work shall be recovered from the contractor whether such rejected work is subsequently replaced by the Government or not.

6.37.22 Measurements

16.37.22.1 For the purpose of ascertaining the quantity of concrete in the pavement, thickness shall be measured by means of a scale correct to the nearest 2 mm. The thickness of the concrete pavement slabs shall be taken on either side of the pavement at each dummy joint at four corners of the slab immediately after removal of the side forms. In case the average thickness of the slab exceeds the specified thickness, payment shall be restricted to the specified thickness.

16.37.22.2 The dimensions of each slab of pavement shall be measured as follows to the nearest 5 mm. (a) Length (i) Between the end of a pavement to the centre line of the expansion joints. (ii) Between the centre lines of consecutive expansion joints. (b) Width (i) Between the edge of a pavement and the centre line of the construction joints. (ii) Between the centre lines of construction joints and expansion joints. (iii) Between the centre lines of consecutive construction joints. Note : The quantity of concrete in the pavement slab shall be worked out by multiplying the area of the slab and its average thickness or specified thickness whichever is less. No deduction shall be made for any joints in the concrete slab.

16.37.22.3 Measurements of concrete slabs shall be recorded jointly by the Engineer-in-Charge or his authorised subordinate and the contractor or his authorised agent.

16.37.23 Rate The rate of the item for concrete in pavement shall include the cost of all materials and labour including charges for machinery tools & plants required in all the operations described above. The rate also includes all cost of setting up the laboratory at site and carrying out the quality control measures/tests enumerated above by the contractor at his own cost in the presence of Engineer-inCharge or his authorized representative and submission of test results on completion of tests to the Engineer-in-Charge thereof

Mode of Measurement &Payment
The rate shall be for a unit of One cum.

Item no.164.

Parking Signs :-Providing and fixing sing boards made out of 2mm aluminium sheet; size 60 x 60cms. sequare plus 60 x 20cms rectangular additional plate as as per the design of IRC-67-1977 pre treated with phospheting process & acid etching; coated with one coat of epoxy primer and two coats of best quality epoxy paint;reflectorised with retro refiective sheeting as per latest M.O.S.T.Specifications; 3.1m long stand post and frame fabricated from suitable size iron angle of 35 x 35 x 3mm 75x75x6mm as required;painted with best quality epoxy coatings in black and white bends.the details of symbol for each board shall be as per the instruction of engineer in charge. The fixing at site shall be in 1:2:4 CC block of size 45 x 45 x 60cms. for each leg. including excavation curing etc. complete under the supervision of engineer in charge.(A) Engineer Grade(VR)

Workmanship

material

Providing and fixing parking signs made of 2mm aluminium sheet, including reflectorized retro reflective sheeting as per M.O.S.T. specifications, including suitable stand posts and frames. Shall be made with 2mm thick aluminium sheet with Square board: 60 x 60 cm with epoxy primer and paint with Rectangular additional plate: 60 x 20 cm, along with retro reflective sheeting, use iron angle for stand posts and frames fix in 1:2:4 CC blocks for foundation.IRC-67-1977 for sign board design and M.O.S.T. specifications for reflectorization.., aluminium sheet should be Pre-treated with phosphating process and acid etching and One coat of epoxy primer and Two coats of best quality epoxy paint. Apply retro reflective sheeting as per latest M.O.S.T. Angle size should be 35 x 35 x 3 mm for angles, 75 x 75 x 6 mm for bends with proper Paint with best quality epoxy coatings in black and white colors. and 3.1 meters long for stand posts.

Excavate pits for each leg of the stand post and Concrete shall be 1:2:4 CC blocks of size 45 x 45 x 60 cm for each leg. Fix the sign boards securely on the stand posts as per the instruction of the engineer-in-charge.Install under the supervision of the engineer-in-charge, ensuring proper alignment and installation quality. Cure the foundation and any concrete work as per standard curing practices.

Mode of Measurement &Payment
The rate shall be for a unit of each.

Item no. 165

Providing and fixing retro Reflective Engineering grade Board using C.R.C. (M.S.) Sheet 2mm, angle iron 75 x 75 x 6mm. Descaling and degreasing the board as per requirement using epoxyprimer epoxy paint and carrying retro reflactive process by screen painting as directed etc. complete including transporting and fixing in C.C. 1:4:8 with necessary excavation curing etc. complete as per I.R.C type design.(A) Engineer Grade

Workmanship

material

CRC (M.S.) sheet, angle iron, epoxy primer, epoxy paint, retro reflective screen paint, concrete (C.C. 1:4:8).

In Board Fabrication board shall be CRC (M.S.) sheet 2mm thick for the board with Descale and degrease the board surface as required including epoxy primer to the descaled and degreased surface and epoxy paint over the primer.Angle iron shall be size 75 x 75 x 6mm for framing the board. It will be Prepare and paint the angle iron frame with epoxy coatings.

Excavate pits for each board location. Concrete Mix shall be use C.C. 1:4:8 (cement:sand:aggregate) for the foundation and Securely fix the retro reflective engineering grade boards onto the angle iron frame and install them in the concrete foundation.

Mode of Measurement &Payment
The rate shall be for a unit of each.

Item no.166.

Facility Informatory Sign :-Providing and fixing sign boards made out of 2mm aluminium sheet / 4mm ACP (Aluminum composite Panel); size 80 x 60 cms rectangular as per design of IRC-67-2012.Pre treated with phospheting process & acid etching; coated with one coat of epoxy primer and two coats of best quality epoxy paint ;reflectorised with Micro Prismatic Grade retro refiectivesheeting of Type-11 as per ASTM D-4956 and latest M.O.S.T.Specifications; 3.6mtr long stand post of 75 x 75 x 6mm / 65NB Circular MS Pipe
as required and frame fabricated from suitable size iron angle of 35 x 35 x 3mm; painted with bestquality epoxy coatings in black and white bends. The details of symbol foreach board shall be as per theinstruction of engineer in charge. The fixing at site shall be in 1:2:4 CC blockof size 45 x 45 x 60 Cms. for each leg.including excavation, curing etc.complete under the supervision of engineer in charge. A warranty for 10 years for the Retro reflective sheeting from original manufacturer & a certified copy of 3 year outdoor exposure test report from third party test lab for the product offered shall be submitted by contractor. (A) Class-C Type-11 Retro Reflective sheeting

Workmanship

Material : Rectangular 80 x 60 cm -2mm aluminium sheet or 4mm ACP with Pre-treated with phosphating process and acid etching and one coat of epoxy primer, epoxy paint, and for Reflectorization shall be use micro prismatic grade retro reflective sheeting (Type-11 as per ASTM D-4956 and latest M.O.S.T. specifications), 75 x 75 x 6mm angle iron or 65NB circular MS pipe, 35 x 35 x 3mm angle iron, foundation concrete block shall be mix concrete 1:2:4 (1:2:4 CC block). Post shall be 3.6 meters long 75 x 75 x 6mm angle iron or 65NB circular MS pipe and size 35 x 35 x 3mm angle iron for frame fabrication with Paint angle iron components with best quality epoxy coatings in black and white colors.- Excavate pits for each leg of the stand post. Concrete Mix shall be Use 1:2:4 CC block (cement:sand:aggregate) for the foundation Securely fix the sign boards onto the stand posts and install them in the concrete foundation.

Mode of Measurement &Payment
The rate shall be for a unit of each.

Item no. 167

Painting road surface marking with adequate nos of coats to give uniform finish with ready mixed road marking paint conforming to IS : 164, on bituminous surface in white/yellow shade, including cleaning the surface of all dirt, scales, oil, grease and foreign material etc.complete. New work (Two or more coats)

1.0. Materials
1.1. Ready mixed the Japan paint shall conform to I.S.341-1952.
2.0. Workmanship
2.1. The letters and figures shall be to the heights and widths as per approved drawings or as directed. These shall be stenciled or drawn in pencil and got approved before painting. They shall be of uniform size and finished neatly. The edges shall be straight or in pleasant smooth curves,
3.0. Mode of measurements and payment
3.1. The rate shall be for a unit of sqm.

Item no.168

Earthwork for embankment including breaking clods,dressing with all lead and lift and including watering rolling and consolidation of subgrade in layers at O.M.C.to required dry density including filling the depression which occur during the process using power roller 8Tto10T. (E) From Borrow area within all lead.

1.2. General
1.3. The earth filling shall be free from all roots, grass, shrubs, rank vegetation, brushwood, tress, sapling and rubbish..

2. Embanking

Filling with earth shall be done in regular horizontal layers each not exceeding 20 cm in depth. All lumps and clods exceeding 8 cm in any direction shall be broken. Each layer shall be watered and consolidated with steel rammer or ½ tonne roller. Where specified, every third and top must layer shall also be consolidated with power roller of minimum 8 tonnes. Wherever depth of filling exceeds 1.5 metre vibratory power roller shall be used to consolidate the filing unless otherwise directed by Engineer-in-charge. The top and sides of filling shall be neatly dressed. The contractor shall make good all subsidence and shrinkage in earth fillings, embankments, traverses etc. during execution and till the completion of work unless otherwise specified.

3Mode of measurements &payment

The length and breadth of excavation or filling shall be measured with a steel tape correct to the nearest cm. The depth of cutting or height of filling shall be measured, correct to 5 mm, by recording levels before the start of the work and after the completion of the work. The cubical contents shall be worked out to the nearest two places of decimal in cubic metres..

The rate shall be for a unit of one cubic meter

Item no. 169

Supplying and stacking at site dump manure from approved source, including carriage (manure measured in stacks will be reduced by 8% for payment) : Screened through sieve of I.S. designation 20mm

1. General:
   Manure to be screened through a sieve of I.S. designation 20mm. Manure must be free from contaminants and harmful substances detrimental to plant growth. Stack the manure neatly at designated areas on-site.

2.. Measurement and Payment: Measurement based on the volume of manure stacked at the site .

The rate shall be for a unit of one cubic meter

Item No. 170

Fine dressing of the ground

"Fine dressing of the ground" typically refers to the process of preparing the ground surface to achieve a smooth and even finish. This is often done in preparation for various types of construction, landscaping, or agricultural activities. Here's a detailed outline of what it involves:

Workmanship
Clear the area of debris, vegetation, rocks, and any other obstructions. Ensure the sub-grade is properly compacted and leveled to the desired elevation. Address any soil irregularities or high spots by scraping or adding appropriate soil materials Ensure the surface is uniformly leveled to avoid any depressions or unevenness
Mode of Measurement &Payment
The rate shall be for a unit of one sqm.

Item no.171.

Spreading of sludge, dump manure and / or good earth in required thickness as per direction of Engineer -in-charge (Cost of sludge, dump manure and / or good earth to be paid separately).

Workmanship
Use dump manure screened through a sieve of I.S. designation 20mm to ensure quality and suitability for agricultural or landscaping purposes. Utilize appropriate equipment such as bulldozers, graders, or loaders for efficient spreading. Maintain a smooth and even surface by properly grading and leveling the spread material

Mode of Measurement &Payment
The rate shall be for a unit of cum.

Item no.172

Mixing earth and sludge or manure in the required proportion specified or directed by the Engineer -in-charge.

Workmanship
Use suitable equipment such as bulldozers, loaders, or hand mixers capable of handling the required volume and ensuring thorough blending. Layer earth and sludge/manure alternately in the mixing area to facilitate even distribution during mixing.

Mode of Measurement &Payment
The rate shall be for a unit of cum.

Item no.173

Grassing with selection No.1 grass including watering and maintenance of the lawn for 30 days or more till the grass forms a thick lawn, free from weeds and fit for mowing including supplying good earth, if needed -With grass Turf

Workmanship
Grassing with selection No.1 grass including watering and maintenance of the lawn for 30 days or more till the grass forms a thick lawn, free from weeds and fit for mowing including supplying good earth, if needed -With grass Turf

Mode of Measurement &Payment
The rate shall be for a unit of sqm.

Item no.174

Preparation of beds for hedging and shrubbery by excavating 60 cm deep and trenching the excavated base to a further depth of 30 cm, refilling the excavated earth after breaking clods and mixing withsludge or manure in the ratio of 8:1 (8 parts of stacked volume of earth after reduction by 20% : one part of stacked volume of sludge or manure after reduction by 8%), flooding with water, filling with earth if necessary, watering and finally fine dressing, leveling etc.including stacking and disposal of materials declared unserviceable and surplus earth by spreading and leveling as directed, within a lead of 50 m, lift up to 1.5 m complete (cost of sludge, manure or extra earth to be paid for separately).

Workmanship
Excavate the area to a depth of 60 cm using appropriate earthmoving equipment. Fill the excavated area with the earth removed, ensuring it is broken down into smaller clods for easier mixing.Mix sludge or manure in the ratio of 8:1 with the stacked volume of earth (after reduction by 20% for payment purposes). This ensures organic enrichment and fertility improvement. Flood the area with water to settle the soil and facilitate proper blending of the earth and organic materials and Water the mixed bed thoroughly to ensure moisture penetration throughout the prepared area. After watering, perform fine dressing by leveling the surface evenly to create a smooth and uniform bed. Use appropriate tools to achieve the desired slope or contour as per landscape design requirements. Dispose of any unserviceable materials such as large clods, debris, or surplus earth. Stack and spread surplus earth as directed within a lead of 50 meters and up to a lift of 1.5 meters, ensuring proper leveling and compaction.

Mode of Measurement &Payment
The rate shall be for a unit of cum.

Item no.175

Supplying & Stacking of Selection No.1 doob grass turf at site fresh & free from weeds having proper roots in green including loading, unloading, carriage and all taxes paid etc.and as per direction of Engineer - in -charge.

Workmanship
Supplying & Stacking of Selection No.1 doob grass turf at site fresh & free from weeds having proper roots in green including loading, unloading, carriage and all taxes paid etc.and as per direction of Engineer - in -charge.

Mode of Measurement &Payment
The rate shall be for a unit of sqm.

Item no.176

Demolition including stacking of serviceable materilas and disposal of unserviceable materials with all lead and lift. (i) R.C.C. work

- **Description of Work**
- Carrying out **demolition/dismantling** of existing R.C.C. members, masonry, flooring, doors, windows, steel work and other associated components by using approved tools and methods.
- **Serviceable materials** obtained from demolition shall be carefully dismantled, stacked properly and stored at designated location as directed by the Engineer-in-Charge.
- **Unserviceable materials** shall be removed from site and disposed of at approved dumping locations.
- **Handling, Lead & Lift**
- Item shall include **all leads and lifts**, loading, unloading, transportation and handling of dismantled materials.
- Necessary protection shall be provided to adjacent structures, finishes and services during demolition work.
- **Safety & Protection**
- Demolition shall be carried out in a **safe and systematic manner**, following all safety norms and regulations.
- Contractor shall take all precautions to prevent damage to nearby structures, utilities and public property.
- Necessary barricading, safety gear and warning signage shall be provided.
- **Workmanship & Quality**
- Work shall be executed neatly and efficiently to the satisfaction of the Engineer-in-Charge.
- Any damage caused to surrounding structures due to negligence shall be made good by the contractor at his own cost.
- **Measurement & Rate**
- Measurement shall be taken as per **actual demolished quantity** or as specified in BOQ.
- Rate shall include:
    - Demolition/dismantling work
    - Stacking of serviceable materials
    - Disposal of unserviceable materials
    - All leads, lifts, labour, tools and incidental works
- No extra payment shall be made for any of the above items.

Item no.177

Demolition of Brick work and stone masonry including stacking of serviceable materials and disposal of unserviceable materials with all lead and lift.(ii) In Cement Mortar.

Workmanship
The relevant specifications of item No.176 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 176 shall be followed:

Item no.178

Dismentaling tiled of stone floors laid in mortar including stacking of serviceable materilas and disposal of unserviceable materials with all lead and lift.

Workmanship
The relevant specifications of item No.176 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 176 shall be followed:

Item no.179

Dismentling steel work including distempering and stacking the materials with all lead and lift.

Workmanship
The relevant specifications of item No.176 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 176 shall be followed:

Item no.180

Dismentling doors, windows, ventilators etc. (wood or steel) shutters including chowkhats architraves, holdfasts and other attachment etc. complete and stacking them within all lead and lift.(i) Not exceeding 3 Sq.M. in area.

Workmanship
The relevant specifications of item No.176 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 176 shall be followed:

Item no.181

Dismentling doors, windows, ventilators etc. (wood or steel) shutters including chowkhats architraves, holdfasts and other attachment etc. complete and stacking them within all lead and lift.(ii) Exceeding 3 Sq.M. in area.

Workmanship
The relevant specifications of item No.176 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 176 shall be followed:

Item no.182

Carefully removing the existing interlocking paver blocks of any thickness, including stacking the serviceable paver blocks at site; disposing of unserviceable materials; preparing the sub-base including dressing, leveling, compacting, and relaying/re-fixing the paver blocks in proper line and level with required compaction; filling joints with sand; and completing the work as directed by the Engineer-in-Charge.

- **Removal of Paver Blocks:**
    - Carefully dismantling existing interlocking paver blocks without damage.
    - **Serviceable blocks** shall be stacked neatly at site at designated locations.
    - **Unserviceable blocks or debris** shall be removed and disposed at approved locations.
- **Sub-base Preparation:**

- Preparing the base/sub-base by **cleaning, dressing, leveling and compacting** to achieve required grade and stability.
- Any uneven areas, depressions or loose materials shall be corrected to ensure a firm foundation for re-laying.

- **Relaying/Re-fixing Paver Blocks:**
  - Paver blocks shall be laid/re-fixed in **proper line, level and pattern** as per original layout or as directed.
  - Required **compaction** shall be carried out after laying.
  - **Joints shall be filled with sand** and compacted to ensure stability and interlock.
- **Finishing:**
  - Surface shall be **even, uniform, and properly aligned**.
  - All work shall be completed as per the direction and satisfaction of the Engineer-in-Charge.
- **Workmanship & Quality Control**
- Work shall be carried out with care to avoid **damage to paver blocks and adjacent surfaces**.
- Any broken or damaged blocks shall be replaced at the contractor's cost.
- Finished surface shall be stable, with no loose blocks or unevenness.

- **Measurement & Rate**
- Measurement shall be taken as **per square metre (sqm)** of paver block area removed and re-laid.
- Rate shall include:
  - Dismantling/removing existing paver blocks
  - Stacking serviceable blocks
  - Disposal of unserviceable materials
  - Sub-base preparation, leveling and compaction
  - Relaying/re-fixing paver blocks
  - Joint filling with sand
  - Labour, tools, machinery and incidental works
- **No extra payment** shall be made unless specifically mentioned in the tender.

Item no.183

Shifting, dismantling, relocating and re-routing of existing building services falling within the proposed building construction area, including Diesel Generator (DG) sets, Transformers, HT/LT panels, cable trenches, electrical cables, pump room equipment, underground/overhead water supply lines, UGT/Panel rooms, and other associated MEP services; complete in all respects. The work includes safe shutdown, disconnection, dismantling, transportation, re-installation at the designated location, re-routing of cables/pipes/conduits, supply of required hardware, supports, accessories, excavation & backfilling for trenches (if required), testing and commissioning, and restoration of affected surfaces; all as per direction of the Engineer-in-Charge

- **Shutdown & Disconnection:**
    - Safe shutdown and disconnection of all affected services, ensuring no damage to adjacent equipment or utilities.
- **Dismantling & Transportation:**
    - Dismantling of equipment, panels, cables, pipes, conduits, pumps, and associated services.
    - Transportation of dismantled items to **designated relocation points** within the site.
- **Reinstallation & Re-Routing:**
    - Reinstallation of all equipment at the new locations as directed.
    - Re-routing of cables, conduits, pipelines, and ducts, including supply of necessary **hardware, supports, clamps, brackets, accessories**.
    - Excavation and backfilling for trenches if required.
- **Testing & Commissioning:**
    - Post relocation, all electrical, mechanical, and plumbing systems shall be **tested and commissioned** to confirm proper operation.
- **Restoration of Surfaces:**
    - All affected areas, including floors, walls, trenches, and pavements, shall be **restored to original condition** or as directed by the Engineer-in-Charge.
- **Workmanship & Safety**
- All work shall be carried out **safely and systematically** without damaging equipment or causing hazards.
- Contractor shall follow all **safety norms, shutdown procedures, and MEP handling guidelines**.
- Any damage during shifting, dismantling, transportation, or reinstallation shall be made good by the contractor at their cost.
- **Measurement & Rate**
- Measurement shall be **lump sum (LS) per system or per relocation package**, unless otherwise specified in BOQ.
- Rate shall include:
    - Safe shutdown and disconnection
    - Dismantling and transportation
    - Reinstallation, re-routing, hardware, supports, and accessories
    - Excavation & backfilling for trenches
    - Testing, commissioning and restoration of affected surfaces
    - Labour, tools, machinery and incidental works
- **Nothing extra shall be payable** unless specifically mentioned in the tender.

General Note :

PLUMBING & SANITARY INSTALLATIONS

1.01 Special condition for PHE work: The plumbing work shall be carried out by specialized plumbing agency who has licensed plumber and experience of similar works. For supervising the plumbing work at least one engineer who has rich experience in executing plumbing work shall be engaged full time. Approval of specialized agency shall be obtained from any Govt Agency.

1.02 The provision of adequate sanitary and safety facilities as per the norms of NBC and good engineering practice shall be compliance during construction for construction workers and staff.

1.03 The water use for construction shall be suitable for the same and should be used efficiently and checks and control valves shall be provided to avoid the wastage and leakage.

1.04 To reduce the water consumption of the building, the flushing system of water closet shall be of dual flushing cistern type and plumbing fixture shall be provided which require GRIHA compliance for low flow rate.

1.05 Lab service related to plumbing & fire fighting will be executed by specialized agency who has experience of carrying out similar work earlier. All the lab item shall be detailed out &redesign as per requirement of client ,WHO,CDC norms, items given in Tender are indicative but covered the cost as per the latest requirement of client ,WHO, CDC and required approval of client before execution.

1.06 Wall Caps

Wall caps shall be provided on all walls, floors, columns etc. wherever supply and disposal pipes pass through them. These wall caps shall be chromium plated brass snugly fittings and shall be large enough to cover the puncture properly and shall conforms toIS:4291.

1.07 Pipes, Hangers, Brackets, etc.

Sturdy hangers, bracket sand caddles of approved design shall be installed to support all pipe lengths, which are not embedded over their entire runs. The hangers and brackets shall be of adjustable height and painted with redoxide primer, and two coats of enamel paint of approved make and shade. Clamps, coils and saddles shall be provided to hold pipes with suitable gaskets of approved quality. The brackets and hangers shall be designed to carry the weights of pipes safely. Wherever required pipes may run along ceiling level in suitable gradient and supported on structural clamps. Spacing for clamps for such pipes shall be as per cpwd norms.

1.08 Pipe sleeve Adequate number of sleeves (pipe inserts) of Cast Iron or Mild Steel shall be provided where pipes cross through concrete, masonry and similar work. The pipe inserts shall be provided with removable timber plugs to keep foreign matter out till installation of the services pipe cross the sleeve. The diameter of sleeve should be one size higher than the proposed dia or as instructed by the Engineer.

1.09 Floor trap inlet

Bath room traps and connections shall ensure free and silent flow of discharging water. Where specified, contractor shall have a specialty of G.I./M.S. inlet hopper without or with one, two or three inlet sockets to receive the waste pipe. Joint between waste and hopper inlet socket shall be lead caulked/welded/threaded. Hopper shall connected to a C.I.P or Strap with at least 50mm water seal. Floor trap inlet hoppers and traps shall besetincementconcrete1:2:4blocks without any extra cost.

1.10 C.P. gratings

Floor trap and urinal traps hall be provided with110mmsquareor round C.P.
/stainless steel grating, with rim of approved design and shape. Minimum thickness shall be3mm.

1.11 Hot Water Supply

The chase will be closedincement mortar1:2(1cement:2coarsesand).Pipes shall be clamped to the wall inside the chase.

1.12 Making Connections

Contractor shall connect the new sewer line to the existing manhole by cutting the walls, benching and restoring them to the original condition.A new channel shall be cut in the benching of the existing manholes for the new connection.Contractor shall remove all sewage and water if encountered in making the connection without additional cost.

1.14 FULLWAY BALLVALVE

The valves shall be of full-bore type and of quality approved by the Engineer.The body and ball shall be of copper alloy and stem seat shall be of Teflon.

1.15 CPVC PIPES: CPVC pipes shall be used in the internal concealed water supply if specified in the Bill of Quantities (BOQ). These may required to be connected to the existing/new GIpipes. The pipe and fitting approved make solvent shall be used as per approved manufacture specification.

1.16 SAMPLE AND SHOP DRAWINGS;

All plumbing items shall be provided as per approved sample/data sheet approved by the PWD, GOVT. OF UP. Before placing the order, the contractor shall submit the shop drawings prepared based on concept drawings and specs along with samples for approval

of PWD, GOVT. OF UP. The shop drawings shall have all the details.The contractor has to obtain the approval of external plumbing drawings from complement Authority before start of work.

item no.184 Providing and fixing white vitreous china wall mounting water closet of size 64X35.5X38.5 cm of approved shape including providing & fixing cistern with dual flush fitting, of flushing capacity 2 litre/ 4 litre (adjustafle to 4 litre/8 litres), including seat cover, and cistern fittings, nuts, bolts and gasket etc complete Make -20151-Hindware.

The water closet shall be **wall mounted type**, complete with **dual flush cistern (concealed or exposed as specified)** having flushing capacity of **2 litre / 4 litre**, adjustable up to **4 litre / 8 litre**, conforming to **IS: 7231 / IS: 14716**, including all internal fittings such as inlet valve, flush valve, overflow arrangement, flush pipe and necessary accessories.

The item shall include **white colour seat cover with lid**, all **necessary fittings, brackets, nuts, bolts, screws, rubber gasket, washers**, and connection to existing soil pipe with proper **jointing, sealing and testing** complete in all respects.

The water closet shall be fixed truly vertical and level, including cutting and making good the wall/ floor surface wherever required, and testing for leakages after installation, as per the direction of Engineer-in-Charge.

Measurement

Measurement shall be made **per number (Each)** of wall mounted water closet **completely installed and accepted**, **as per BOQ** and directions of Engineer-in-Charge.

Rate

The rate shall be **as per BOQ** and shall be **inclusive of cost of all labour, materials, fittings, accessories, tools and plants**, transportation, fixing, testing and all incidental works required for **satisfactory completion of the item**.

item no.185 Providing and fixing water closet squatting Pan (Indian type W.C. Pan) size 580mm (Earthwork, bed concrete, foot reste and trap to be measured and paid for separately) (A) Vitreous China.(I) Long pattern = White colour

Providing and fixing water closet squatting pan (Indian type W.C. pan) of **long pattern**, size **580 mm**, made of **vitreous china**, conforming to **IS: 2556 (Part–III)**, of **approved shape**, in **white colour**, free from cracks, pinholes and other manufacturing defects.

The pan shall be fixed in position over proper bedding, connected with existing soil pipe/trap with proper jointing, alignment and sealing, complete in all respects, as per the direction of Engineer-in-Charge.

Earthwork, bed concrete, foot rests and trap shall be measured and paid for separately.

The squatting pan shall be fixed truly to line and level, including cutting and making good the floor wherever required, and testing for leakages after installation.

Measurement

Measurement shall be made **per number (Each)** of water closet squatting pan **completely installed and accepted**, **as per BOQ** and directions of Engineer-in-Charge.

Rate

The rate shall be **as per BOQ** and shall be **inclusive of cost of all labour, materials, fittings, accessories, tools and plants**, transportation, fixing, testing and all incidental works required for **satisfactory completion of the item**.

The rate shall be for a unit of One Number, as per BOQ.

item no.186 Providing and fixing Handicap toilet consisting of 1 no. EWC with vitreous 10 litre capacity dual flushing system cistern with 1 no. hinged rail of 76 cm, 1 no. wash basin with all fittings and bottle trap, with one pair of mounting brackets and 4 nos. grab rails, 1 no. tower ring and 1 no. paper holder all complete as per the manufacturer's specification

Providing and fixing Handicap (Accessible) Toilet complete, consisting of the following components, suitable for use by persons with disabilities, and installed as per approved drawings, manufacturer’s recommendations and directions of Engineer-in-Charge:

1. **One number European type Water Closet (EWC)** made of vitreous china, conforming to **IS: 2556 (Part–I & II)**, of approved shape and size, complete with **dual flushing cistern of 10 litre capacity** (dual flush system), including all internal fittings, flush pipe, inlet valve, flush valve, overflow arrangement and necessary accessories.
2. **One number hinged support rail** of **760 mm length**, made of stainless steel / powder coated steel of approved quality, suitable for handicap use, fixed firmly to wall with necessary brackets and fasteners.
3. **One number wash basin** made of vitreous china, conforming to **IS: 2556**, complete with **CP brass fittings**, including pillar tap/mixer (as specified), waste coupling, **bottle trap**, connection to water supply and waste pipe, including one pair of approved **mounting brackets**.
4. **Four numbers grab rails**, made of stainless steel / powder coated steel, of approved diameter and length, suitable for handicap toilets, fixed securely to wall at appropriate locations with all fixing accessories.
5. **One number towel ring** and **one number paper holder**, of approved quality and finish, fixed at suitable locations.

The entire handicap toilet installation shall be fixed truly to line, level and plumb, including cutting and making good walls/floors wherever required, proper jointing, sealing and testing for leakages, complete in all respects, as per the directions of the Engineer-in-Charge.

Measurement

Measurement shall be made **per set (Each)** of complete handicap toilet **fully installed and accepted**, **as per BOQ** and directions of Engineer-in-Charge.

Rate

The rate shall be **as per BOQ** and shall be **inclusive of cost of all labour, materials, fittings, accessories, tools and plants**, transportation, fixing, testing and all incidental works required for **satisfactory completion and proper functioning** of the item.

The rate shall be for a unit of One Number (One Set), as per BOQ.

item no.187 Providing and fixing toilet paper holder.(A) C.P. Brass

Providing and fixing toilet paper holder made of **chromium plated (C.P.) brass**, of approved shape and design, confirming to relevant **IS standards**, with uniform chrome finish, smooth edges and free from manufacturing defects.

The toilet paper holder shall be fixed at the required location using suitable screws, plugs and other fixing accessories, complete in all respects, as per the directions of the Engineer-in-Charge.

Measurement

Measurement shall be made **per number (Each)** of toilet paper holder **completely fixed and accepted**, **as per BOQ** and directions of Engineer-in-Charge.

Rate

The rate shall be **as per BOQ** and shall be **inclusive of cost of all labour, materials, fittings, accessories, tools and plants**, transportation, fixing and all incidental works required for **satisfactory completion** of the item.

The rate shall be for a unit of One Number, as per BOQ.

item no.188 Providing and fixing white vitreous china battery /Electice based infrared sensor operated urinal of approx. size 29X 32.5X 57.5 cm having pre & post flushing with water (250 ml & 500 ml consumption), having water inlet from back side, including fixing to wall with suitable brackets all as per manufacturers specification and direction of Engineer-in-charge. (cat No Hindware- 60021)

Providing and fixing white vitreous china urinal (battery/electric-based infrared sensor operated) of approximate size **29 × 32.5 × 57.5 cm**, of approved shape and design, made of **best quality vitreous china**, free from cracks, pinholes and other manufacturing defects.

The urinal shall have **pre and post flushing system** with water consumption of **approx. 250 ml (pre-flush) and 500 ml (post-flush)**, with water inlet from the back side. The urinal shall be **sensor-operated (battery/electric)**, complete with all internal components, valves, solenoid, sensor assembly, wiring (if applicable) and other necessary accessories as per manufacturer's specification.

The urinal shall be fixed **firmly to wall** with suitable brackets, screws, and fasteners, ensuring proper alignment and level. The installation shall include all **water supply connections, sealing, testing for leakages** and making good of wall surface, as per the directions of the Engineer-in-Charge.

Colour: White

Note: Model number and make are indicative; equivalent approved make is acceptable.

Measurement

Measurement shall be made **per number (Each)** of urinal **completely installed and accepted**, **as per BOQ** and directions of Engineer-in-Charge.

Rate

The rate shall be **as per BOQ** and shall be **inclusive of cost of all labour, materials, fittings, accessories, tools and plants**, transportation, fixing, testing, and all incidental works required for **satisfactory installation and functioning** of the item.

The rate shall be for a unit of One Number, as per BOQ.

item no.189 Providing and fixining frameless urinal partition with 8 mm glass , full height upto 3 feet, 1 feet deep & SS fittings approved make all complete as directed by the Engineer-in-Charge.

Providing and fixing frameless urinal partition made of **8 mm toughened/tempered glass**, full height **up to 3 feet**, depth **1 foot**, with **stainless steel (SS) fittings** of approved quality and finish, suitable for wall/ floor fixing as per site conditions.

The partition shall be **frameless**, edges polished, and fixed firmly to wall/floor using suitable SS brackets, clamps, fasteners, and other necessary accessories. All **fixtures, supports, and fixings** shall be of **approved make**, corrosion-resistant, and capable of holding the glass securely in position.

The work shall include cutting, leveling, alignment, and making good any damage to wall/ floor during installation, complete as per the **directions of the Engineer-in-Charge**.

Measurement

Measurement shall be made **per number (Each)** of frameless urinal partition **completely installed and accepted**, **as per BOQ** and directions of Engineer-in-Charge.

Rate

The rate shall be **as per BOQ** and shall be **inclusive of cost of all labour, materials, fittings, accessories, tools and plants**, transportation, fixing, and all incidental works required for **satisfactory completion** of the item.

The rate shall be for a unit of One Number, as per BOQ

item no.190 Providing and fixing white vitreous china wash basin under counter basin of size 630x450mm, with including 32 mm CP brass waste coupling, including painting of fittings and brackets, cutting and making good the walls wherever required all complete

Providing and fixing white vitreous china under-counter wash basin of **size 630 × 450 mm**, of approved shape and design, made of **best quality vitreous china**, free from cracks, pinholes, and other manufacturing defects.

The wash basin shall be fixed **under-counter**, including **32 mm C.P. brass waste coupling**, and all necessary **fittings, brackets, screws, washers, and fasteners**. Painting of fittings and brackets, if required, shall be done to match surrounding finishes.

The work shall include **cutting and making good the walls/ counter surface** wherever required for proper installation, ensuring the basin is **level, plumb, and firmly fixed**. All connections to water supply and drainage shall be properly jointed, sealed, and tested for leakages, as per the directions of the Engineer-in-Charge.

Colour: White

Measurement

Measurement shall be made **per number (Each)** of wash basin **completely installed and accepted**, **as per BOQ** and directions of Engineer-in-Charge.

Rate

The rate shall be **as per BOQ** and shall be **inclusive of cost of all labour, materials, fittings, accessories, tools and plants**, transportation, fixing, testing, painting of fittings/brackets, cutting, making good, and all incidental works required for **satisfactory completion** of the item.

The rate shall be for a unit of One Number, as per BOQ.

item no.191 Providing and fixing CP brass auto closing system basin pillar tap of Jaquar PRS - 031 or Equivalent as approved by Engineer- In Charge

Providing and fixing C.P. brass auto-closing basin pillar tap, **single lever or push-type**, of approved design and quality, confirming to relevant **IS standards**. The tap shall have **automatic closing mechanism** to ensure controlled water flow, smooth operation, and durability.

The tap shall be fixed on the **wash basin**, including **all necessary fittings, washers, connections, and accessories**, ensuring **leak-proof installation**. The work shall include cutting, making good, and painting of surrounding surfaces, if required, as per the directions of the Engineer-in-Charge.

Model: Jaquar PRS-031 or approved equivalent

Finish: Chrome Plated (C.P.)

Measurement

Measurement shall be made **per number (Each)** of tap **completely installed and accepted**, **as per BOQ** and directions of Engineer-in-Charge.

Rate

The rate shall be **as per BOQ** and shall be **inclusive of cost of all labour, materials, fittings, accessories, tools and plants**, transportation, fixing, testing, and all incidental works required for **satisfactory completion** of the item.

The rate shall be for a unit of One Number, as per BOQ.

item no.192 Providing and fixing chromium plated, bottle trap with necessary couplings of approved quality for wash basin

Providing and fixing chromium plated (C.P.) bottle trap of approved quality, suitable for **wash basin** installation. The bottle trap shall include all **necessary couplings, washers, and fasteners** required for proper jointing to the wash basin waste outlet and soil pipe.

The bottle trap shall be **C.P. finished**, corrosion-resistant, smooth, and free from manufacturing defects. Installation shall ensure **leak-proof jointing**, proper alignment, and easy maintenance, as per the directions of the Engineer-in-Charge.

Measurement

Measurement shall be made **per number (Each)** of bottle trap **completely installed and accepted**, **as per BOQ** and directions of Engineer-in-Charge.

Rate

The rate shall be **as per BOQ** and shall be **inclusive of cost of all labour, materials, fittings, couplings, tools and plants**, transportation, fixing, testing, and all incidental works required for **satisfactory completion** of the item.

The rate shall be for a unit of One Number, as per BOQ.

item no.193 Providing and fixing Kitchen sink with C.I. or M.S. brackets, painted white including cutting holes in walls and making good the same but excluding fittings. (C) Vitreous China Sink.(i) 600mm x 450mm x 150mm size

Providing and fixing kitchen sink made of **vitreous china** of approved quality, size **600 × 450 × 150 mm**, free from cracks, pinholes, and other manufacturing defects.

The sink shall be fixed using **C.I. or M.S. brackets**, painted white, securely anchored to wall/structure. The work shall include **cutting necessary holes in walls, fixing the brackets, and making good the wall/ surfaces** after installation.

The sink shall be installed **level and plumb**, ensuring proper alignment and stability, as per the directions of the Engineer-in-Charge.

Measurement

Measurement shall be made **per number (Each)** of kitchen sink **completely installed and accepted**, **as per BOQ** and directions of Engineer-in-Charge.

Rate

The rate shall be **as per BOQ** and shall be **inclusive of cost of all labour, materials, brackets, painting, cutting, making good, tools and plants**, transportation, fixing, and all incidental works required for **satisfactory completion** of the item.

The rate shall be for a unit of One Number, as per BOQ

item no.194 "Providing and fixing white vitreous china laboratory sink with C.I. brackets, C.P. brass chain with rubber plug, 40 mm C.P brass waste and 40mm C.P. brass trap with necessary C.P. brass unions complete, including painting of fittings and brackets, cutting and making good

Providing and fixing white vitreous china laboratory sink of approved size and shape, made of **best quality vitreous china**, free from cracks, pinholes, and other manufacturing defects.

The sink shall be fixed using **C.I. brackets**, painted with approved paint. The installation shall include:

- **C.P. brass chain with rubber plug**
- **40 mm C.P. brass waste**
- **40 mm C.P. brass trap with necessary C.P. brass unions**

The work shall also include **painting of fittings and brackets**, cutting of walls or counters where required, and **making good the surface** after installation. The sink shall be installed **level, plumb, and securely fixed**, and all connections shall be **leak-proof**.

All works shall be carried out **as per manufacturer's specifications and directions of the Engineer-in-Charge**.

Measurement

Measurement shall be made **per number (Each)** of laboratory sink **completely installed and accepted**, **as per BOQ** and directions of Engineer-in-Charge.

Rate

The rate shall be **as per BOQ** and shall be **inclusive of cost of all labour, materials, fittings, accessories, painting, cutting, making good, tools and plants**, transportation, fixing, testing, and all incidental works required for **satisfactory completion** of the item.

The rate shall be for a unit of One Number, as per BOQ.

item no.195 Providing and fixing C.P. brass waste for washbasin or sink. (A) 32mmdia.

Providing and fixing C.P. brass waste of **32 mm diameter** for **wash basin or sink**, of approved quality and finish, confirming to relevant **IS standards**.

The waste shall include all **necessary washers, couplings, and fittings** for proper jointing to the basin/sink outlet and connection to the trap. The waste shall be **chromium plated**, corrosion-resistant, smooth, and free from manufacturing defects.

Installation shall ensure **proper alignment, leak-proof jointing**, and secure fixing, as per the directions of the Engineer-in-Charge.

Measurement

Measurement shall be made **per number (Each)** of C.P. brass waste **completely installed and accepted**, **as per BOQ** and directions of Engineer-in-Charge.

Rate

The rate shall be **as per BOQ** and shall be **inclusive of cost of all labour, materials, fittings, couplings, tools and plants**, transportation, fixing, testing, and all incidental works required for **satisfactory completion** of the item.

The rate shall be for a unit of One Number, as per BOQ.

item no.196 Providing and fixing C.P. brass waste for washbasin or sink. (B) 40mm dia.

Providing and fixing C.P. brass waste of **40 mm diameter** for **wash basin or sink**, of approved quality and finish, conforming to relevant **IS standards**.

The waste shall include all **necessary washers, couplings, and fittings** for proper jointing to the basin/sink outlet and connection to the trap. The waste shall be **chromium plated**, corrosion-resistant, smooth, and free from manufacturing defects.

The installation shall ensure **proper alignment, leak-proof jointing**, and secure fixing, as per the directions of the Engineer-in-Charge.

Measurement

Measurement shall be made **per number (Each)** of C.P. brass waste **completely installed and accepted**, **as per BOQ** and directions of Engineer-in-Charge.

Rate

The rate shall be **as per BOQ** and shall be **inclusive of cost of all labour, materials, fittings, couplings, tools and plants**, transportation, fixing, testing, and all incidental works required for **satisfactory completion** of the item.

The rate shall be for a unit of One Number, as per BOQ.

item no.197 Providing and fixing M.I. fisher union for washbasin or sink. (A) 32mm dia.

Providing and fixing M.I. (Malleable Iron) Fisher Union of **32 mm diameter** for **wash basin or sink**, of approved quality and finish, conforming to relevant **IS standards**.

The union shall include all **necessary washers, couplings, and fittings** required for proper jointing between the wash basin/sink outlet and the waste pipe or trap. The installation shall ensure **leak-proof jointing, proper alignment, and secure fixing**, as per the directions of the Engineer-in-Charge.

Measurement

Measurement shall be made **per number (Each)** of M.I. Fisher Union **completely installed and accepted**, **as per BOQ** and directions of Engineer-in-Charge.

Rate

The rate shall be **as per BOQ** and shall be **inclusive of cost of all labour, materials, fittings, couplings, tools and plants**, transportation, fixing, testing, and all incidental works required for **satisfactory completion** of the item.

The rate shall be for a unit of One Number, as per BOQ.

item no.198 Providing, laying and jointing in true line and level 110 diametre U.P.V.C (TypeB) conforming to IS13592-1992 with one end plain and othe rend socketed with rubberring, & fittings conforming to ISI14735-1999 of approved make for drainage system pipe line, pipe shall be jointed with each other with rubber lubricant, pipe shall be fixed on wall using of PVC clamp of the size 110 mm diametre x149mm length x145mm heigh at every 2000 mm center to center or shall be concealed in walls as directed including necessary fittings such as bends, shoes etc.including testing of pipes and joints and jointed with adhesive solvent cement including cost of all materials.

Workmanship
The relevant specifications of item No. 211 shall be followed except that upvc pipe (Type b) Guideline instead of CPVC Pipe SDR13.5.
Mode of Measurement &Payment
The relevant specifications of item No. 211 shall be followed:

item no.199 Providing, laying and jointing in true line and level 75 diametre U.P.V.C (TypeB) conforming to IS13592-1992 with one end plain and othe rend socketed with rubberring, & fittings conforming to ISI14735-1999 of approved make for drainage system pipe line, pipe shall be jointed with each other with rubber lubricant, pipe shall be fixed on wall using of PVC clamp of the size 75 mm diametre x149mm length x145mm heigh at every 2000 mm center to center or shall be concealed in walls as directed including necessary fittings such as bends, shoes etc.including testing of pipes and joints and jointed with adhesive solvent cement including cost of all materials.

Workmanship
The relevant specifications of item No. 211 shall be followed except that upvc pipe (Type b) Guideline instead of CPVC Pipe SDR13.5.
Mode of Measurement &Payment
The relevant specifications of item No. 211 shall be followed:

item no.200 Providing and fixing cast iron spigot and socket soil, waste and ventilating pipes of the following nominal size.(B) 75mm dia.

The pipes shall be **spigot and socket type**, including all necessary **rubber or jute gasket joints**, clamps, collars, and fittings required for proper alignment and leak-proof connection. The work shall include **cutting, fixing, jointing, and testing** of the pipes for soil, waste, or vent connections as per CPWD specifications and directions of the Engineer-in-Charge.

The pipes shall be fixed **true to line and level**, supported adequately to avoid sagging, and properly sealed to prevent leakages.

Measurement

Measurement shall be made **per metre (Running Meter)** of C.I. S.W.V. pipe **completely fixed and accepted**, **as per BOQ** and directions of Engineer-in-Charge.

Rate

The rate shall be **as per BOQ** and shall be **inclusive of cost of all labour, materials, fittings, joints, supports, tools and plants**, transportation, fixing, testing, and all incidental works required for **satisfactory completion** of the item.

The rate shall be for a unit of One Metre, as per BOQ.

item no.201 Providing and fixing cast iron spigot and socket soil, waste and ventilating pipes of the following nominal size.(C) 100mm dia.

Workmanship
The relevant specifications of item No.211 shall be followed except that upvc pipe (Type b) Guideline instead of CPVC Pipe SDR13.5.
Mode of Measurement &Payment
The relevant specifications of item No. 211 shall be followed:

item no.202 Providing and fixing in position cowel went to pipes.(B) 75mm dia.

Providing and fixing in position cowl vent to soil, waste, or ventilating (S.W.V.) pipes of **75 mm nominal diameter**, of approved design and quality.

The cowl vent shall be made of **cast iron, PVC, or other approved material**, suitable for ventilating the pipe system. It shall be fixed securely on top of the pipe using **proper jointing, clamps, or collars** as required. The work shall ensure **free airflow**, prevent entry of rainwater, debris, or pests, and include all necessary **alignment, fixing, and sealing** as per cpwd technical specification and directions of the Engineer-in-Charge.

Measurement

Measurement shall be made **per number (Each)** of cowl vent **completely fixed and accepted**, **as per BOQ** and directions of Engineer-in-Charge.

Rate

The rate shall be **as per BOQ** and shall be **inclusive of cost of all labour, materials, fittings, clamps, tools and plants**, transportation, fixing, testing, and all incidental works required for **satisfactory completion** of the item.

The rate shall be as per BOQ.

item no.203 Providing and fixing in position cowel went to pipes.(C) 100mm dia

Workmanship
The relevant specifications of item No.211 shall be followed except that upvc pipe (Type b) Guideline instead of CPVC Pipe SDR13.5.
Mode of Measurement &Payment
The relevant specifications of item No. 211 shall be followed:

item no.204 Providing and fixing SWR floor drain consisting of 100x63mm PVC elbow (grating and SWR pipe to be paid separately), complete as per instructions.(C) 100mm dia.

Providing and fixing SWR floor drain consisting of 100 mm × 63 mm PVC elbow, of approved make and quality, suitable for soil and waste water drainage, complete as per specifications and as directed by the Engineer-in-Charge.

The item shall include fixing of the PVC elbow in proper position, making all necessary connections, ensuring correct alignment, line and level, and making the installation leak-proof. Grating and SWR pipe shall be paid for separately.

The floor drain shall be securely fixed and tested to ensure smooth flow of water and proper drainage, complete in all respects.

Measurement

Measurement shall be made per number (Each) of SWR floor drain completely installed and accepted, as per BOQ and directions of Engineer-in-Charge.

Rate

Rate: As per BOQ

item no.205 Supply and fixing of SWR Plain / Multi Floor Trap of `P' , "S" or `Q' type and 110 mm outlet complete, including cost of materials, labour, HOM of machinery & equipments with all lead and lifts, loading and unloading charges, transportation cost and conveyance, all other incidental charges etc. complete for successful completion of work as per specifications, and as directed by Engineer -in- Charge. 110mm inlet and 110 mm outlet,

(170)

Providing and fixing **SWR Plain / Multi Floor Trap of P / S / Q type**, of approved make and quality, having **110 mm inlet and 110 mm outlet**, suitable for soil and waste water discharge, conforming to relevant **IS standards**.

The trap shall be of heavy-duty construction with smooth internal surface to ensure free flow and prevention of choking, and shall provide an effective water seal. The trap shall be complete with suitable **grating / cover** of approved material (CI / SS / PVC as specified).

The work shall include all necessary connections with SWR pipes, making joints properly leak-proof, and cutting and making good of walls and floors wherever required for correct installation.

The trap shall be fixed true to line, level and plumb, securely embedded and tested for water tightness, proper drainage and retention of water seal, complete in all respects, as per specifications and directions of the **Engineer-in-Charge**.

Measurement

Measurement shall be made **per number (Each)** of SWR Floor Trap completely installed, tested and accepted, as per BOQ and directions of Engineer-in-Charge.

Rate

Rate: **As per BOQ**

item no.206 Painting two coats (excluding priming coat) on external surface of new rain water, soil, waste and vent pipes and fittings with ready mixed bituminous brushing, black, anticorrosive to give an even shade including cleaning of all dirt, dust and other foreign matter. (B) 75mm dia.

Painting two coats (excluding priming coat) on external surface of new **rain water, soil, waste, and vent pipes and fittings** of **75 mm diameter**, using **ready-mixed bituminous brushing, black, anticorrosive** paint to give an **even shade**.
The work shall include **cleaning of all dirt, dust, grease, and other foreign matter** from the surface before painting, ensuring proper adhesion and uniform finish. The painting shall be applied neatly to **entire exposed surface** of pipes and fittings as per the directions of the Engineer-in-Charge.

Measurement
Measurement shall be made **per metre (Running Meter)** of pipe **including fittings**, **completely painted and accepted**, **as per BOQ** and directions of Engineer-in-Charge.
Rate
Rate: As per BOQ.

item no.207 Painting two coats (excluding priming coat) on external surface of new rain water, soil, waste and vent pipes and fittings with ready mixed bituminous brushing, black,

anticorrosive to give an even shade including cleaning of all dirt, dust and other foreign matter. (C) 100mm dia.

Workmanship
The relevant specifications of item No.211 shall be followed except that upvc pipe (Type b) Guideline instead of CPVC Pipe SDR13.5.
Mode of Measurement &Payment
The relevant specifications of item No. 211 shall be followed:

item no.208 Providing and fixing 125 mm square S/S grating (with or without hole)for floor or Nahani trap.

Providing and fixing 125 mm square stainless steel (S.S.) grating for **floor drains or Nahni traps**, with or without hole, of approved quality and finish.
The grating shall be made of **stainless steel**, corrosion-resistant, smooth, and free from sharp edges or manufacturing defects. The grating shall be **firmly fixed in position** over the floor drain or Nahni trap using **screws, clamps, or other approved fasteners**, ensuring proper alignment and flush finish with surrounding floor.
The work shall be carried out **as per the directions of the Engineer-in-Charge**, including any adjustments required to ensure **level, secure, and leak-proof installation**.

Measurement
Measurement shall be made **per number (Each)** of stainless steel grating **completely fixed and accepted**, **as per BOQ** and directions of Engineer-in-Charge.
Rate
Rate: As per BOQ.

item no.209 Providing and fixing C.P soap dispenser with all complete as directed by the Engineer-in-Charge.

Providing and fixing chromium-plated (C.P.) soap dispenser, of approved design, capacity, and quality, including all necessary **fittings, screws, fasteners, and accessories** required for complete installation.

The soap dispenser shall be fixed **securely at the designated location**, ensuring **proper operation, alignment, and ease of use**. The work shall include any minor **adjustments, cutting, or making good of wall surfaces** if required, **as per CPWD Specification Vol-II** and directions of the Engineer-in-Charge.

Measurement

Measurement shall be made **per number (Each)** of soap dispenser **completely fixed and accepted**, **as per BOQ** and directions of Engineer-in-Charge.

Rate

Rate: As per BOQ.

item no.210 Providing & fixing C.P. brass towel ring all complete with required acceessories as directed by the Engineer-in-Charge. Towel Ring Round with Round Flange (Make -Jaquar Cat no- ACN-1121BN).

The work shall include:

- Supply and installation of C.P. (chrome-plated) brass towel ring of approved make and model (Jaquar ACN-1121BN).
- All required accessories for proper installation, including screws, plugs, and brackets, shall be provided.
- The towel ring shall be fixed firmly on the wall at the required height and alignment as directed by the Engineer-in-Charge.
- Installation shall ensure smooth finish, proper alignment, and functional usability.

Materials and Workmanship:

- The towel ring shall be of high-quality brass, chrome-plated, corrosion-resistant, and free from defects.
- All accessories (screws, plugs, brackets) shall be of compatible quality to ensure secure installation.
- Workmanship shall ensure neat fixing without damage to wall finishes.

Measurement:

Measurement shall be made per towel ring fixed in position, including all accessories, as per BOQ and directions of the Engineer-in-Charge.

Rate:

Rate: As per BOQ.

item no.211 Providing and fixing concealed center point to wall ceiling & floor CPVC (SDR 13.5) PIPE having National Sanitation Foundation (NSF) seal for potable water of following dia. nominal bore tube fittings and clamps including making good the wall, ceiling and floor etc. complete. [D] 32mm.

Workmanship

18.9 CHLORINATED POLYVINYL CHLORIDE (CPVC) PIPES

18.9.1 CPVC pipes & fittings used in hot & cold potable water distribution system shall conform torequirement of IS 15778. The material from which the pipe is produced shall consist of chlorinated polyvinyl chlorides. The polymer from which the pipe compounds are to be manufactured shall have chlorine content not less than 66.5%.

The internal and external surfaces of the pipe shall be smooth, clean and free from grooving and other defects. The pipes shall not have any detrimental effect on the composition of the water flowing though it. SDR 13.5 Shall be Followed.

18.9.2 Dimensions of Pipes The outside diameter as per mentioned in boq item.

18.9.2.1 Diameter : of Pipes The outside diameter as per mentioned in boq item

18.9.2.3 Wall Thickness : The wall thickness of the pipes shall be as per SDR 13.5. Wall thickness shall be measured by any of the three methods given in IS 12235 (part 1). To check the conformity of the wall thickness of the pipe throughout its entire length, it is necessary to measure the wall thickness of the pipe at any point along its length. This shall be done by cutting the pipe at any point along its length and measuring the wall thickness as above. Alternatively, to avoid destruction of the pipe, non destructive testing methods such as the use of ultrasonic wall thickness measurement gauges shall be used at any four points along the length of the pipe.

Tolerance on Wall Thickness

(a) For pipes of minimum wall thickness 6 mm or less, the permissible variation between the minimum wall thickness (eMin) and the wall thickness at any point (e), (e - eMin) shall be positive in the form of +y, where y=0.1 eMin+0.2 mm.

(b) For pipes of minimum wall thickness greater than 6mm, the permissible variation of wall thickness shall again be positive in the form of +y, where y would be applied in two parts.

(c) The average wall thickness shall be determined by taking at least six measurements of wall thickness round the pipe and including both the absolute minimum and absolute maximum measured values. The tolerance applied to this average wall thickness from these measurements shall be within the range 0.1 eMin+0.2 mm

(d) The maximum wall thickness at any point shall be within the range 0.15eMin (see Table 18.16). (e) The results of these calculations for checking tolerance shall be rounded off to the next higher 0.1 mm.

18.9.2.4 Effective Length (Le) : If the length of a pipe is specified, the effective length shall not be less than that specified. The preferred effective length of pipes shall be 3, 5 or 6 m. The pipes may be supplied in other lengths where so agreed upon between the manufacturer and the purchaser.

18.9.3 Pipe Ends The ends of the pipes meant for solvent cementing shall be cleanly cut and shall be reasonably square to the axis of the pipe or may be chamfered at the plain end.

18.9.4 Physical and Chemical Characteristics

18.9.4.1 Visual Appearance : The colour of the pipes shall be off-white. Slight variations in theappearance of the colour are permitted. The internal and external surface of the pipe shall be smooth, clean and free from grooving and other defects.

18.9.4.2 Opacity : The wall of the plain pipe shall not transmit more than 0.1 per cent of the visible lightfalling on it when tested in accordance with IS 12235 (Part 3). 18.9.4.3 Effect on Water : The pipes shall not have any determinate effect on the composition of the water flowing through them, when tested as per 10.3 of IS 4985.

18.9.4.4 Reversion Test : When tested by the method prescribed in IS 12235 (Part 5/ Sec 1 and Sec 2), a length of pipe 200 ±20 mm long shall not alter in length by more than 5 per cent. 18. 9.4.5 Vicat Softening Temperature : When tested by the method prescribed in IS 12235 (part 2), the Vicat softening temperature of the specimen shall not be less than 110°C. 18.9.4.6 Density : When tested in accordance with IS 12235 (Part 14), the density of the pipes shall be between 1450kg/m3 and 1650kg/m3 .

18.9.5 Mechanical Properties

18.9.5.1 Hydrostatic Characteristics : When subject to internal hydrostatic pressure test in accordance with the procedure given in IS 12235 (part 8/Sec 1), the pipe shall not fail during the prescribed test duration. The temperatures, duration and hydrostatic (hoop) stress for the test shall conform to the requirements given in Table 18.17. The test shall be carried out not earlier than 24 h after the pipes have been manufactured

18.9.5.2 Thermal Stability by Hydrostatic Pressure Testing : When subject to internal hydrostaticpressure test in accordance with the procedure given in IS 12235 (Part 8/Sec 1).,

18.9.5.3 Resistance to External Blow at 0°C : When tested by the method prescribed in IS 4985, , the pipe shall have a true impact rate of not more than 10 per cent

18.9.5.5 Tensile Strength : When tested by the method prescribed in IS 12235 (Part 19), the tensilestrength at yield shall not be less than 50 MPa at 27 ± 2°C. 18.9.6 Sampling and Criteria for Conformity The sampling procedure and criteria for conformity shall be as given in Annexure F. 1

8.9.7. Marking

18.9.7.1 Each pipe shall be clearly and indelibly marked in ink/paint or hot embossed on white base at intervals of not more than 3 m. The marking shall show the following: (a) Manufacturer's name or trade-mark (b) Outside diameter, (c) Class of pipe and pressure rating, and (d) Batch or lot number 18.9.7.2 BIS Certification Marking : Each pipe may also be marked with the Standard Mark.

18.9.8 Fittings The fittings shall be as follows: (a) Plain CPVC solvent cement fittings from size 15 mm to 160 mm. (b) Brass threaded fittings. (c) Valve from size 15 mm to 160 mm (d) Brass Threaded Fittings: All types of one end brass threaded male/female adaptors in various fittings like coupler, socket, elbow, tee are available for transition to other plastic/metal piping and for fixing of CP fittings. Ball, Gate valves in CPVC are available in all dimensions. All fittings shall carry the following information: (1) Manufacturer's name/trade mark. (2) Size of fitting

18.9.9 Piping Installation Support and Spacing

18.9.9.1 Concealed Piping: Pipes can be concealed in chases. The pipes and fitting are to be pressure tested prior to concealing the chases. To maintain alignment of CP fittings while joining, all alignment of fittings and pipe shall be done correctly.

18.9.9.2 External Installations: For pipes fixed in the shafts, ducts etc. there should be sufficient space to work on the pipes. Pipes sleeves shall be fixed at a place the pipe is passing through a wall or floor so as to allow freedom for expansion and contraction. Clamping of the pipe is done to support it while allowing the freedom for movement. All pipes exposed to sunlight shall be painted with a water based acrylic paint emulsion to enhance UV protection. Pipes in trenching shall be laid in accordance to the Good Plumbing practices followed for Metal piping.

18.9.9.3 Expansion LOOP: CPVC systems, like all piping materials, expand and contract with changes in temperatures. CPVC pipes shall expand 7.5 cm per 30 m length for a 400C temperature change. Expansion does not vary with Pipe size. Thermal expansion can be generally be accommodated at changes in direction. On a long straight run, an offset or loop based on the following chart is required.

18.9.10 Testing All water supply systems shall be tested to hydrostatic pressure test. The pressure tests are similar to the test pressure used for other plastic/metal pipes. System may be tested in sections and such section shall be entirely checked on completion of connection to the overhead tank or pumping system or mains.

18.9.11 Measurements The net length of pipes as laid or fixed shall be measured in running meters correct to a cm for the finished work, which shall include CPVC pipe and fittings including plain and Brass threaded fittings and jointing solvent cement.

STORAGE CPVC pipes of all sizes are packed in polyethylene packing rolls and both the ends of the packed roll are sealed with air bubble film cap in order to provide protection during handling and transportation. After packing, the whole bunch of pipes is tightened with polypropylene/ HDPE strapping. Each role is then marked with size/type of the pipe, lot number and quantity. The packed pipe rolls are stored in their respective racks in properly covered storage area. Apart from providing protection during handling and transportation, the packing rolls also protect the pipe from ultra violet rays.

E-2 INSTALLATION

E-2.1 Visually inspect pipe ends before making the joint. Use of a chamfering tool will help identify and crakes, as it will catch on to any crack.

E-2.2 Pipe may be cut quickly and efficiently by several methods. Wheel type plastic tubing cutters are preferred. Ratchet type cutter or fine tooth saw are another options. However, when using the ratchet cutter be certain to score the exterior wall by rotating the cutter blade in circular motion around the pipe. Do this before applying significant downward pressure to finalize the cut. This step leads to a square cut. In addition, make sure ratchet cutter blades are sharp. Cutting tubing as squarely as possible provides optimal bonding area within a joint.

E-2.3 Burrs and filings can prevent proper contact between the tube and fittings during the assembly, and should be removed from the outside and inside of the tube. A chamfering tool is preferred, but a pocket knife or file is also suitable for this purpose.

E-2.4 Use only CPVC cement/Adhesive solvent jointing. Use CPVC cement/Adhesive solvent, which is fully recommended by the manufacturer.

E-2.5 When using adhesive solution/solvent cement be certain of proper ventilation.

E-2.6 When making a join, apply a heavy, even coat of cement to the pipe end. Use the same applicator without additional cement to apply a thin coat inside the fitting socket. Too much cement can cause clogged waterways. Do not allow excess cement to puddle in the fitting and pipe assembly. This could result in a weakening of the pipe wall and possible pipe failure when the system is pressurized.

E-2.7 Rotate pipe one-quarter to one-half turn while inserting it into the fitting socket and remove the excess adhesive solution/solvent cement from the joint with clean rag.

E-2.8 When making a transition connection to metal threads, use a special transition fitting or CPVC male threaded adapter whenever possible. Do not over-torque plastic threaded connections. Hand tight plus one-half turn should be adequate.

E-2.9 Hang or strap CPVC systems loosely to allow for thermal expansion. Do not use metal straps with sharp edges that might damage the tubing.

E- 2.10 CPVC stub outs for lavatories, closets and sinks are appropriate. However, on areas where there is a likelihood that movement or impact abuse will occur, metal pipe nipples may be amore appropriate stub-out material. Showerheads, tub spouts and outside still cocks are examples.

E-2.11 When connected to a gas water heater, CPVC tubing should not be located within 50 cm of the flue. For water heaters lacking reliable temperature control, this distance may be increased up to 1 m a metal nipple or flexible appliance connector should be utilized. This measure eliminates the potential for damage to plastic piping that might result from excessive radiant heat from the flue

Mode of Measurement &Payment
The rate shall be for a unit of mtr.

item no.212 Providing and fixing concealed center point to wall ceiling & floor CPVC (SDR 13.5) PIPE having National Sanitation Foundation (NSF) seal for potable water of following dia. nominal bore tube fittings and clamps including making good the wall, ceiling and floor etc. complete. [E] 40mm.

Workmanship
The relevant specifications of item No.211 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 211 shall be followed:

item no.213 Providing and fixing concealed center point to wall ceiling & floor CPVC (SDR 13.5) PIPE having National Sanitation Foundation (NSF) seal for potable water of following dia. nominal bore tube fittings and clamps including making good the wall, ceiling and floor etc. complete. [F] 50mm.

Workmanship
The relevant specifications of item No.211 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 211 shall be followed:

item no.214 Providing and fixing stainless steel hand dryer (Heavy Traffic) all complete as directed by the Engineer-in-Charge.

Providing and fixing a stainless steel hand dryer (Heavy Traffic) of approved design, capacity, and quality, suitable for **high usage areas**, including all necessary **mounting brackets, screws, fasteners, and electrical connections** required for complete installation.

The hand dryer shall be fixed **securely at the designated location**, ensuring **proper operation, alignment, and safety**. The work shall include any minor **adjustments, cutting, or making good of wall surfaces** if required, **as per CPWD Specification Vol-II** and directions of the Engineer-in-Charge.

Measurement

Measurement shall be made **per number (Each)** of hand dryer **completely fixed and accepted**, **as per BOQ** and directions of Engineer-in-Charge.

Rate

Rate: As per BOQ.

Water Supply

item no.215 Providing and fixing concealed center point to wall ceiling & floor CPVC (SDR 13.5) PIPE having National Sanitation Foundation (NSF) seal for potable water of following dia. nominal bore tube fittings and clamps including making good the wall, ceiling and floor etc. complete.[A] 15 mm.

Workmanship

18.9 CHLORINATED POLYVINYL CHLORIDE (CPVC) PIPES

18.9.1 CPVC pipes & fittings used in hot & cold potable water distribution system shall conform torequirement of IS 15778. The material from which the pipe is produced shall consist of chlorinated polyvinyl chlorides. The polymer from which the pipe compounds are to be manufactured shall have chlorine content not less than 66.5%.

The internal and external surfaces of the pipe shall be smooth, clean and free from grooving and other defects. The pipes shall not have any detrimental effect on the composition of the water flowing though it. SDR 13.5 Shall be Followed.

18.9.2 Dimensions of Pipes The outside diameter as per mentioned in boq item.

18.9.2.1 Diameter : of Pipes The outside diameter as per mentioned in boq item

18.9.2.3 Wall Thickness : The wall thickness of the pipes shall be as per SDR 13.5. Wall thickness shall be measured by any of the three methods given in IS 12235 (part 1). To check the conformity of the wall thickness of the pipe throughout its entire length, it is necessary to measure the wall thickness of the pipe at any point along its length. This shall be done by cutting the pipe at any point along its length and measuring the wall thickness as above. Alternatively, to avoid destruction of the pipe, non destructive testing methods such as the use of ultrasonic wall thickness measurement gauges shall be used at any four points along the length of the pipe.

Tolerance on Wall Thickness

(a) For pipes of minimum wall thickness 6 mm or less, the permissible variation between the minimum wall thickness (eMin) and the wall thickness at any point (e), (e - eMin) shall be positive in the form of +y, where y=0.1 eMin+0.2 mm.

(b) For pipes of minimum wall thickness greater than 6mm, the permissible variation of wall thickness shall again be positive in the form of +y, where y would be applied in two parts.

(c) The average wall thickness shall be determined by taking at least six measurements of wall thickness round the pipe and including both the absolute minimum and absolute maximum measured values. The tolerance applied to this average wall thickness from these measurements shall be within the range 0.1 eMin+0.2 mm

(d) The maximum wall thickness at any point shall be within the range 0.15eMin (see Table 18.16). (e) The results of these calculations for checking tolerance shall be rounded off to the next higher 0.1 mm.

18.9.2.4 Effective Length (Le) : If the length of a pipe is specified, the effective length shall not be less than that specified. The preferred effective length of pipes shall be 3, 5 or 6 m. The pipes may be supplied in other lengths where so agreed upon between the manufacturer and the purchaser.

18.9.3 Pipe Ends The ends of the pipes meant for solvent cementing shall be cleanly cut and shall be reasonably square to the axis of the pipe or may be chamfered at the plain end.

18.9.4 Physical and Chemical Characteristics

18.9.4.1 Visual Appearance : The colour of the pipes shall be off-white. Slight variations in theappearance of the colour are permitted. The internal and external surface of the pipe shall be smooth, clean and free from grooving and other defects.

18.9.4.2 Opacity : The wall of the plain pipe shall not transmit more than 0.1 per cent of the visible lightfalling on it when tested in accordance with IS 12235 (Part 3). 18.9.4.3 Effect on Water : The pipes shall not have any determinate effect on the composition of the water flowing through them, when tested as per 10.3 of IS 4985.

18.9.4.4 Reversion Test : When tested by the method prescribed in IS 12235 (Part 5/ Sec 1 and Sec 2), a length of pipe 200 ±20 mm long shall not alter in length by more than 5 per cent. 18. 9.4.5 Vicat Softening Temperature : When tested by the method prescribed in IS 12235 (part 2), the Vicat softening temperature of the specimen shall not be less than 110°C. 18.9.4.6 Density : When tested in accordance with IS 12235 (Part 14), the density of the pipes shall be between 1450kg/m3 and 1650kg/m3 .

18.9.5 Mechanical Properties

18.9.5.1 Hydrostatic Characteristics : When subject to internal hydrostatic pressure test in accordance with the procedure given in IS 12235 (part 8/Sec 1), the pipe shall not fail during the prescribed test duration. The temperatures, duration and hydrostatic (hoop) stress for the test shall conform to the requirements given in Table 18.17. The test shall be carried out not earlier than 24 h after the pipes have been manufactured

18.9.5.2 Thermal Stability by Hydrostatic Pressure Testing : When subject to internal hydrostaticpressure test in accordance with the procedure given in IS 12235 (Part 8/Sec 1).,

18.9.5.3 Resistance to External Blow at 0°C : When tested by the method prescribed in IS 4985, , the pipe shall have a true impact rate of not more than 10 per cent

18.9.5.5 Tensile Strength : When tested by the method prescribed in IS 12235 (Part 19), the tensilestrength at yield shall not be less than 50 MPa at 27 ± 2°C. 18.9.6 Sampling and Criteria for Conformity The sampling procedure and criteria for conformity shall be as given in Annexure F. 1

8.9.7. Marking

18.9.7.1 Each pipe shall be clearly and indelibly marked in ink/paint or hot embossed on white base at intervals of not more than 3 m. The marking shall show the following: (a) Manufacturer’s name or trade-mark (b) Outside diameter, (c) Class of pipe and pressure rating, and (d) Batch or lot number 18.9.7.2 BIS Certification Marking : Each pipe may also be marked with the Standard Mark.

18.9.8 Fittings The fittings shall be as follows: (a) Plain CPVC solvent cement fittings from size 15 mm to 160 mm. (b) Brass threaded fittings. (c) Valve from size 15 mm to 160 mm (d) Brass Threaded Fittings: All types of one end brass threaded male/female adaptors in various fittings like coupler, socket, elbow, tee are available for transition to other plastic/metal piping and for fixing of CP fittings. Ball, Gate valves in CPVC are available in all dimensions. All fittings shall carry the following information: (1) Manufacturer’s name/trade mark. (2) Size of fitting

18.9.9 Piping Installation Support and Spacing

18.9.9.1 Concealed Piping: Pipes can be concealed in chases. The pipes and fitting are to be pressure tested prior to concealing the chases. To maintain alignment of CP fittings while joining, all alignment of fittings and pipe shall be done correctly.

18.9.9.2 External Installations: For pipes fixed in the shafts, ducts etc. there should be sufficient space to work on the pipes. Pipes sleeves shall be fixed at a place the pipe is passing through a wall or floor so as to allow freedom for expansion and contraction. Clamping of the pipe is done to support it while allowing the freedom for movement. All pipes exposed to sunlight shall be painted with a water based acrylic paint emulsion to enhance UV protection. Pipes in trenching shall be laid in accordance to the Good Plumbing practices followed for Metal piping.

18.9.9.3 Expansion LOOP: CPVC systems, like all piping materials, expand and contract with changes in temperatures. CPVC pipes shall expand 7.5 cm per 30 m length for a 400C temperature change. Expansion does not vary with Pipe size. Thermal expansion can be generally be accommodated at changes in direction. On a long straight run, an offset or loop based on the following chart is required.

18.9.10 Testing All water supply systems shall be tested to hydrostatic pressure test. The pressure tests are similar to the test pressure used for other plastic/metal pipes. System may be tested in sections and such section shall be entirely checked on completion of connection to the overhead tank or pumping system or mains.

18.9.11 Measurements The net length of pipes as laid or fixed shall be measured in running meters correct to a cm for the finished work, which shall include CPVC pipe and fittings including plain and Brass threaded fittings and jointing solvent cement.

STORAGE CPVC pipes of all sizes are packed in polyethylene packing rolls and both the ends of the packed roll are sealed with air bubble film cap in order to provide protection during handling and transportation. After packing, the whole bunch of pipes is tightened with polypropylene/ HDPE strapping. Each role is then marked with size/type of the pipe, lot number and quantity. The packed pipe rolls are stored in their respective racks in properly covered storage area. Apart from providing protection during handling and transportation, the packing rolls also protect the pipe from ultra violet rays.

E-2 INSTALLATION

E-2.1 Visually inspect pipe ends before making the joint. Use of a chamfering tool will help identify and crakes, as it will catch on to any crack.

E-2.2 Pipe may be cut quickly and efficiently by several methods. Wheel type plastic tubing cutters are preferred. Ratchet type cutter or fine tooth saw are another options. However, when using the ratchet cutter be certain to score the exterior wall by rotating the cutter blade in circular motion around the pipe. Do this before applying significant downward pressure to finalize the cut. This step leads to a square cut. In addition, make sure ratchet cutter blades are sharp. Cutting tubing as squarely as possible provides optimal bonding area within a joint.

E-2.3 Burrs and filings can prevent proper contact between the tube and fittings during the assembly, and should be removed from the outside and inside of the tube. A chamfering tool is preferred, but a pocket knife or file is also suitable for this purpose.

E-2.4 Use only CPVC cement/Adhesive solvent jointing. Use CPVC cement/Adhesive solvent, which is fully recommended by the manufacturer.

E-2.5 When using adhesive solution/solvent cement be certain of proper ventilation.

E-2.6 When making a join, apply a heavy, even coat of cement to the pipe end. Use the same applicator without additional cement to apply a thin coat inside the fitting socket. Too much cement can cause clogged waterways. Do not allow excess cement to puddle in the fitting and pipe assembly. This could result in a weakening of the pipe wall and possible pipe failure when the system is pressurized.

E-2.7 Rotate pipe one-quarter to one-half turn while inserting it into the fitting socket and remove the excess adhesive solution/solvent cement from the joint with clean rag.

E-2.8 When making a transition connection to metal threads, use a special transition fitting or CPVC male threaded adapter whenever possible. Do not over-torque plastic threaded connections. Hand tight plus one-half turn should be adequate.

E-2.9 Hang or strap CPVC systems loosely to allow for thermal expansion. Do not use metal straps with sharp edges that might damage the tubing.

E- 2.10 CPVC stub outs for lavatories, closets and sinks are appropriate. However, on areas where there is a likelihood that movement or impact abuse will occur, metal pipe nipples may be amore appropriate stub-out material. Showerheads, tub spouts and outside still cocks are examples.

E-2.11 When connected to a gas water heater, CPVC tubing should not be located within 50 cm of the flue. For water heaters lacking reliable temperature control, this distance may be increased up to 1 m a metal nipple or flexible appliance connector should be utilized. This measure eliminates the potential for damage to plastic piping that might result from excessive radiant heat from the flue

Mode of Measurement &Payment
The rate shall be for a unit of mtr

item no.216 Providing and fixing concealed center point to wall ceiling & floor CPVC (SDR 13.5) PIPE having National Sanitation Foundation (NSF) seal for potable water of following dia. nominal bore tube fittings and clamps including making good the wall, ceiling and floor etc. complete. [B] 20 mm.

Workmanship
The relevant specifications of item No.211 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 211 shall be followed:

item no.217 Providing and fixing concealed center point to wall ceiling & floor CPVC (SDR 13.5) PIPE having National Sanitation Foundation (NSF) seal for potable water of following dia. nominal bore tube fittings and clamps including making good the wall, ceiling and floor etc. complete. [C] 25 mm.

Workmanship
The relevant specifications of item No.211 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 211 shall be followed:

item no.218 Providing and fixing concealed center point to wall ceiling & floor CPVC (SDR 13.5) PIPE having National Sanitation Foundation (NSF) seal for potable water of following dia. nominal bore tube fittings and clamps including making good the wall, ceiling and floor etc. complete. [D] 32mm.

Workmanship
The relevant specifications of item No.211 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 211 shall be followed:

item no.219 Providing and fixing concealed center point to wall ceiling & floor CPVC (SDR 13.5) PIPE having National Sanitation Foundation (NSF) seal for potable water of following dia. nominal bore tube fittings and clamps including making good the wall, ceiling and floor etc. complete. [E] 40mm.

Workmanship
The relevant specifications of item No.211 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 211 shall be followed:

item no.220 Providing and fixing concealed center point to wall ceiling & floor CPVC (SDR 13.5) PIPE having National Sanitation Foundation (NSF) seal for potable water of following dia. nominal bore tube fittings and clamps including making good the wall, ceiling and floor etc. complete. [F] 50mm.

Workmanship
The relevant specifications of item No.211 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 211 shall be followed:

item no.221 Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes, having thermal stability for hot & cold water supply, including all CPVC plain & brass threaded fittings, i/c fixing the pipe with clamps at 1.00 m spacing.This includes jointing of pipes & fittings with one step CPVC solvent cement and the cost of cutting chases and making good the same including testing of joints complete as per direction of Engineer in Charge.

Internal work - Exposed on wall

a. 65 mm dia nominal bore

b. 80 mm dia nominal bore

Workmanship
The relevant specifications of item No. 211 shall be followed
Mode of Measurement &Payment
The relevant specifications of item No. 211 shall be followed:

item no.222 Providing and fixing 600mm x 450mm bevelled edge mirrror of superior glass mounted on 6mm thick A.C. sheet or plywood sheet and fixing to wooden pluge with C.P. brass screws and washers.

Providing and fixing a bevelled edge mirror of **600 mm × 450 mm** size, made of **superior quality glass**, mounted on **6 mm thick A.C. sheet or plywood sheet**.

The mirror shall be fixed to the wall using **C.P. brass screws and washers** on **wooden plugs**, ensuring proper alignment, level, and secure fixing. The work shall include all necessary **preparation, cutting, adjustments, and making good of wall surfaces**, as per the directions of the Engineer-in-Charge and **CPWD Specification Vol-II**.

The mirror surface shall be **clean, scratch-free, and free from distortions**, and the edges shall be **bevelled uniformly** for aesthetic finish.

Measurement

Measurement shall be made **per number (Each)** of mirror **completely fixed and accepted**, **as per BOQ** and directions of Engineer-in-Charge.

Rate

Rate: As per BOQ.

Providing and fixing gun metal gate valve with C.I. wheel of approved quality (screwed end) :

item no.223 Providing and fixing Gun metal check or non-return fullway wheel valve.(B) 20mm dia.

Providing and fixing gun metal gate valve of approved quality, with **C.I. wheel**, **screwed end** type, suitable for **water, soil, or waste pipelines** as required.

The valve shall be made of **high-quality gun metal**, corrosion-resistant, and capable of smooth operation under normal working pressure. It shall be fixed **securely in the pipeline** with proper **threaded connections**, ensuring **leak-proof jointing** and alignment.

The work shall include all **necessary adjustments, supports, and testing** to ensure proper functioning, **as per CPWD Specification Vol-II** and directions of the Engineer-in-Charge.

Measurement

Measurement shall be made **per number (Each)** of gate valve **completely fixed and accepted**, **as per BOQ** and directions of Engineer-in-Charge.

Rate

Rate: As per BOQ.

item no.224 Providing and fixing Gun metal check or non-return fullway wheel valve.(C) 25mm dia.

Workmanship
The relevant specifications of item No.223 shall be followed except dia 25mm to be considered
Mode of Measurement &Payment
The relevant specifications of item No. 223 shall be followed:

item no.225 Providing and fixing Gun metal check or non-return fullway wheel valve.(D) 32mm dia.

Workmanship
The relevant specifications of item No.223 shall be followed except dia 32mm to be considered
Mode of Measurement &Payment
The relevant specifications of item No. 223 shall be followed:

item no.226 Providing and fixing Gun metal check or non-return fullway wheel valve.(E) 40mm dia.

Workmanship
The relevant specifications of item No.223 shall be followed except dia 40 mm to be considered
Mode of Measurement &Payment
The relevant specifications of item No. 223 shall be followed:

item no.227 Providing and fixing gun metal gate valve with C.I. wheel of approved quality (screwed end) :

50 mm dia. nominal bore
65 mm dia. nominal bore

Workmanship
The relevant specifications of item No. 223 shall be followed except dia 50&65mm to be considered
Mode of Measurement &Payment
The relevant specifications of item No. 223 shall be followed:

item no.228 Supply ,Erection , Testing & Commissioning of Automatic water level control panel & related accessories for pumping automation with consisting of automatic water level controller , level sensor with stainless steel probe, motorized butterfly valve, motorized valve controller with complete in all respect.

upto 50 mm dia. nominal bore

Providing, supplying, erecting, testing, and commissioning of an automatic water level control system including microprocessor-based water level controller, level sensor with stainless steel probe, motorized butterfly valve, motorized valve controller, wiring, and all associated accessories required for proper functioning.
The system shall be suitable for pumping automation of water tanks, sumps, and pipelines up to 50 mm nominal bore.
The work shall include all necessary installation, supports, conduit wiring, terminations, adjustments, calibration, and functional testing to ensure proper operation, as per CPWD Specifications Vol-II, relevant IS standards, and directions of the Engineer-in-Charge.
Measurement:
Measurement shall be made **per complete system** comprising control panel, level sensor, motorized butterfly

valve with actuator, and associated accessories, fully installed, tested, and commissioned, as accepted by the Engineer-in-Charge.

Rate:

Rate: As per BOQ

item no.229 Providing and fixing Stainless steel braided connection pipe with brass unions :45 cm length and 15 mm dia

Providing and fixing stainless steel braided flexible connection pipe of approved quality with brass unions, 45 cm length and 15 mm nominal diameter. The pipe shall be corrosion-resistant, durable, and capable of withstanding normal water pressure.

The work shall include proper alignment, secure fixing, and leak-proof connections to the pipeline, as per CPWD Specification Vol-II and directions of the Engineer-in-Charge.

Measurement:

Measurement shall be made **per connection pipe** completely fixed and accepted, as per BOQ and directions of the Engineer-in-Charge.

Rate:

Rate: As per BOQ.

item no.230 Providing and fixing C.P. Angle stop cock 15 mm Heavy duty with cap

Providing and fixing **chromium-plated (C.P.) heavy-duty angle stop cock** of 15 mm nominal diameter, complete with cap and suitable for water supply lines.

The stop cock shall be corrosion-resistant, durable, and capable of smooth operation under normal working pressure.

The work shall include proper alignment, secure fixing, leak-proof jointing, and testing, as per CPWD Specification Vol-II and directions of the Engineer-in-Charge.

Measurement:

Measurement shall be made **per stop cock** completely fixed and accepted, as per BOQ and directions of the Engineer-in-Charge.

Rate:

Rate: As per BOQ.

item no.231 Providing and fixing hand held ablution fitting (health faucet) with one meter long flexible tube and wall hook, all complete approved engineer-in-charge

Providing and fixing **hand-held ablution fitting (health faucet)** of approved quality, complete with **1 meter long flexible hose**, wall hook, and necessary fittings.
The fitting shall be corrosion-resistant, durable, and suitable for normal water supply pressure.
The work shall include secure fixing, leak-proof connections, proper alignment, and testing, as per CPWD Specification Vol-II and directions of the Engineer-in-Charge.

Measurement:
Measurement shall be made **per set** of health faucet with flexible tube and wall hook, completely fixed and accepted, as per BOQ and directions of the Engineer-in-Charge.

Rate:
Rate: As per BOQ.

item no.232 Supply and fixing of 15mm CP brass 2 -Way Bib Cock with wall flange and suitable length CP brass extension pipe all of approved engineer-in-charge

Supply and fixing of **15 mm chromium-plated (C.P.) brass 2-way bib cock** of approved quality, complete with **wall flange** and **suitable length C.P. brass extension pipe**.
The bib cock and extension pipe shall be corrosion-resistant, durable, and capable of smooth operation under normal water pressure.
The work shall include proper alignment, secure fixing, leak-proof connections, and testing, as per CPWD Specification Vol-II and directions of the Engineer-in-Charge.

Measurement:
Measurement shall be made **per bib cock set** with wall flange and extension pipe, completely fixed and accepted, as per BOQ and directions of the Engineer-in-Charge.

Rate:
Rate: As per BOQ.

item no.233 Providing and fixing Sink Cock with swinging casted spout (cat. No. LYR 38347 equivalent) of approved quality

Providing and fixing **sink cock with swinging casted spout**, Cat. No. LYR 38347 or equivalent, of approved quality.
The sink cock shall be **chromium-plated, corrosion-resistant, and durable**, suitable for normal water supply pressure.
The work shall include **proper alignment, secure fixing, leak-proof connections, and testing**, as per CPWD Specification Vol-II and directions of the Engineer-in-Charge.

Measurement:

Measurement shall be made **per sink cock** completely fixed and accepted, as per BOQ and directions of the Engineer-in-Charge.

Rate:

Rate: As per BOQ.

item no.234 Supply Installation Testing Commissioning of water Cooler with all required accessories to complete the job including appropriate Prefilter with its housing and Pipe at the inlet of water cooler appropriate Level Sensor for Water Cooler for switching UV Lamp as direction of Engineering in charge.The details as below:
Minimum Storage Capacity 80L, Minimum Cooling Capacity 150L/Hr,No of faucets 01+01 nos (1 Normal,1 Cool),Front Tray drain pipe system, Hermetically sealed reciprocating compressor having R-134 a refrigerant,Cabinet Material Stainless steel AUG J1 grade,Stainless Steel Water Tank with float type sensor, Warranty on Cooler and other parts: Minimum 1 years,Supply Volatge-230 V AC,Make of the water Cooler- Voltas/ Blue Star/ Aquaguard / Usha After installation the agency should submit the test report of functioning of all its parts like Float Sensor,Cooling etc. The Unit and its accessories should be leackage free during the warranty period,any leackages found during warranty period agency should attend it on their own cost.

Supply, installation, testing, and commissioning of **water cooler** of approved make (Voltas / Blue Star / Aquaguard / Usha) complete with all required accessories including:

- **Prefilter with housing and inlet pipe**
- **Level sensor for switching UV lamp**
- Minimum storage capacity: **80 L**
- Minimum cooling capacity: **150 L/hr**
- Number of faucets: **01 normal + 01 cool**
- Front tray drain pipe system
- Hermetically sealed reciprocating compressor with **R-134a refrigerant**
- Cabinet material: **Stainless Steel (AUG J1 grade)**
- Stainless steel water tank with float type sensor
- Supply voltage: **230 V AC**
- Warranty: **Minimum 1 year** on cooler and accessories

The work shall include **proper installation, alignment, secure fixing, leak-proof connections, prefilter installation, electrical connections, calibration, and functional testing** of all components including float sensor, cooling unit, and UV lamp operation.

After installation, the agency shall submit a **test report** confirming proper functioning of all components. Any leakage or malfunction during the warranty period shall be rectified by the agency at their own cost, as per CPWD Specification Vol-II and directions of the Engineer-in-Charge.

Measurement:

Measurement shall be made **per water cooler unit** complete with accessories, installed, tested, and accepted, as per BOQ and directions of the Engineer-in-Charge.

Rate:

Rate: As per BOQ.

item no.235 Providing and fixing Stainless Steel pipe and fitting of grade 316L as per IS 6911:2017 and conforming to EN-10312 standards complete with press type fitting (fitting shall be paid for separately) i/c fixing of the pipe with clamps at 1.00 m spacing including cutting and making good the walls including testing of joints complete as per direction of Engineer-in-charge. (The pipe length inserted in the fitting shall not be measured for payment)

The work shall include:

- Supply and installation of **stainless steel pipes (grade 316L)** conforming to IS 6911:2017 and EN-10312 standards.
- Pipes shall be fixed using **clamps at 1.00 m spacing**, including cutting, aligning, and making good the walls after installation.
- **Press-type fittings** shall be used for joints; fittings themselves shall be paid separately.
- Joints shall be **tested for leak-proof performance** as per directions of the Engineer-in-Charge.
- Proper alignment, leveling, and support shall be ensured throughout the installation.
- as per CPWD Specification Vol-II and directions of the Engineer-in-Charge.

Materials and Workmanship:

- Stainless steel pipes shall be free from defects, corrosion, or dents.
- Clamps shall be of compatible material, corrosion-resistant, and securely fixed.
- Cutting, handling, and installation shall avoid damage to pipes and walls.
- All work shall comply with relevant IS standards and directions of the Engineer-in-Charge.

Measurement:
Measurement shall be made **per meter of stainless steel pipe laid**, excluding the length of pipe inserted in the fittings, including clamps, cutting, making good walls, and testing, as per BOQ and directions of the Engineer-in-Charge.

Rate:
Rate: As per BOQ.

item no.236 Providing and fixing Stainless Steel pipe and fitting of grade 316L as per IS 6911:2017 and conforming to EN-10312 standards complete with press type fitting (fitting shall be paid for separately) i/c fixing of the pipe with clamps at 1.00m spacing and also including cutting of chases and making good the walls including testing of joints complete as per direction of Engineer -in-charge. (The pipe length inserted in the fitting shall not be measured for payment)

The work shall include:

- Supply and installation of **stainless steel pipes (grade 316L)** conforming to IS 6911:2017 and EN-10312 standards.
- Pipes shall be fixed using **clamps at 1.00 m spacing**, with proper alignment and leveling.

- **Chases** in walls shall be carefully cut to lay the pipes and made good after installation.
- **Press-type fittings** shall be used for joints; fittings themselves will be paid separately.
- All joints shall be **tested for leak-proof performance** as per the directions of the Engineer-in-Charge.
- as per CPWD Specification Vol-II and directions of the Engineer-in-Charge.

Materials and Workmanship:

- Stainless steel pipes shall be of approved quality, free from dents, corrosion, or other defects.
- Clamps shall be corrosion-resistant and securely fixed to support the pipes.
- Cutting, handling, and installation shall ensure no damage to walls or existing finishes.
- All work shall conform to relevant IS standards and the Engineer-in-Charge's directions.

Measurement:
Measurement shall be made **per meter of stainless steel pipe laid**, excluding the length of pipe inserted in the fittings, including clamps, cutting of chases, making good walls, and testing, as per BOQ and directions of the Engineer-in-Charge.

Rate:
Rate: As per BOQ.

item no.237 Providing and fixing required Stainless Steel Fitting of press fit design of grade 316L as per IS 6911:2017 and conforming to EN-10312 standards with V-profile and with O-ring sealing gasket of EPDM material of required dia as per direction of Engineer-in-charge.

Technical Specification:
The work shall include:

- Supply and installation of **stainless steel press-fit fittings (grade 316L)** conforming to IS 6911:2017 and EN-10312 standards.
- Fittings shall have **V-profile press design** and **O-ring sealing gasket of EPDM material** to ensure leak-proof joints.
- Fittings shall be of required diameter suitable for the pipe system and shall be installed as per the layout and directions of the Engineer-in-Charge.
- Proper alignment and secure fitting shall be ensured during installation.
- All joints shall be **tested for leak-proof performance** after installation.
- as per CPWD Specification Vol-II and directions of the Engineer-in-Charge.

Materials and Workmanship:

- Stainless steel fittings shall be corrosion-resistant, defect-free, and of approved quality.
- EPDM gaskets shall be high-quality, suitable for potable water and thermal stability as required.
- Installation shall ensure that fittings are properly seated, aligned, and securely pressed according to manufacturer specifications.
- Workmanship shall ensure durable, leak-proof, and neat joints.

Measurement:
Measurement shall be made **per fitting installed**, including all gaskets, press fitting, and testing, as per BOQ and directions of the Engineer-in-Charge.
Rate:
Rate: As per BOQ.

item no.238 Providing and fixing required Stainless Steel Fitting of press fit design of grade 316L as per IS 6911:2017 and conforming to EN-10312 standards with V-profile and with O-ring sealing gasket of EPDM material of required dia as per dirction of Engineer-in-charge

Technical Specification:
The work shall include:

- Supply and installation of **stainless steel press-fit fittings (grade 316L)** conforming to IS 6911:2017 and EN-10312 standards.
- Fittings shall have **V-profile press design** and **O-ring sealing gasket of EPDM material** to ensure leak-proof joints.
- Fittings shall be of required diameter suitable for the pipe system and shall be installed as per the layout and directions of the Engineer-in-Charge.
- Proper alignment and secure fitting shall be ensured during installation.
- All joints shall be **tested for leak-proof performance** after installation.
- as per CPWD Specification Vol-II and directions of the Engineer-in-Charge.

Materials and Workmanship:

- Stainless steel fittings shall be corrosion-resistant, defect-free, and of approved quality.
- EPDM gaskets shall be high-quality, suitable for potable water and thermal stability as required.
- Installation shall ensure that fittings are properly seated, aligned, and securely pressed according to manufacturer specifications.
- Workmanship shall ensure durable, leak-proof, and neat joints.
- as per CPWD Specification Vol-II and directions of the Engineer-in-Charge.

Measurement:
Measurement shall be made **per fitting installed**, including all gaskets, press fitting, and testing, as per BOQ and directions of the Engineer-in-Charge.

Rate:
Rate: As per BOQ.

item no.239 Providing and fixing required Stainless Steel Fitting of press fit design of grade 316L as per IS 6911:2017 and conforming to EN-10312 standards with V-profile and with O-ring sealing gasket of EPDM material of required dia as per direction of Engineer-in-charge.

Technical Specification:

The work shall include:

- Supply and installation of **stainless steel press-fit fittings (grade 316L)** conforming to IS 6911:2017 and EN-10312 standards.
- Fittings shall have **V-profile press design** and **O-ring sealing gasket of EPDM material** to ensure leak-proof joints.
- Fittings shall be of required diameter suitable for the pipe system and shall be installed as per the layout and directions of the Engineer-in-Charge.
- Proper alignment and secure fitting shall be ensured during installation.
- All joints shall be **tested for leak-proof performance** after installation.

Materials and Workmanship:

- Stainless steel fittings shall be corrosion-resistant, defect-free, and of approved quality.
- as per CPWD Specification Vol-II and directions of the Engineer-in-Charge.
- EPDM gaskets shall be high-quality, suitable for potable water and thermal stability as required.
- Installation shall ensure that fittings are properly seated, aligned, and securely pressed according to manufacturer specifications.
- Workmanship shall ensure durable, leak-proof, and neat joints.

Measurement:

Measurement shall be made **per fitting installed**, including all gaskets, press fitting, and testing, as per BOQ and directions of the Engineer-in-Charge.

Rate:

Rate: As per BOQ.

item no.240 Providing and fixing required Stainless Steel Fitting of press fit design of grade AISI 304 conforming to JWWA G116 standard with V-profile or M-profile and with O-ring sealing gasket of EPDM material of required dia as per direction of Engineer-in-charge.

Technical Specification:

The work shall include:

- Supply and installation of **stainless steel press-fit fittings (grade AISI 304)** conforming to JWWA G116 standard.
- Fittings shall have **V-profile or M-profile press design** and **O-ring sealing gasket of EPDM material** to ensure leak-proof joints.
- Fittings shall be of required diameter suitable for the pipe system and installed as per the layout and directions of the Engineer-in-Charge.
- Proper alignment, seating, and secure pressing shall be ensured during installation.
- All joints shall be **tested for leak-proof performance** after installation.
- as per CPWD Specification Vol-II and directions of the Engineer-in-Charge.

Materials and Workmanship:

- Stainless steel fittings shall be corrosion-resistant, defect-free, and of approved quality.
- EPDM gaskets shall be high-quality, suitable for potable water and thermal stability.
- Installation shall ensure fittings are properly seated, aligned, and securely pressed according to manufacturer specifications.
- Workmanship shall ensure durable, leak-proof, and neat joints.

Measurement:
Measurement shall be made **per fitting installed**, including all gaskets, press fitting, and testing, as per BOQ and directions of the Engineer-in-Charge.

Rate:
Rate: As per BOQ.

item no.241 "Supply and fixing HDPE double wall corrugated (DWC) I.S 16098 (Part - 2) 3013 for soil / waste pipe under ground drainage system with jointed with rubber ring with good quality lubricant for fittings, inclusive of all necessary specials like bends, tees, offsets, junctions, etc complete.

A.150 mm diameter
B.200 mm diameter

Supply and fixing of **HDPE double wall corrugated (DWC) pipe**, conforming to **IS 16098 (Part-2) 2013**, for **soil/waste underground drainage system**.
The pipe shall be jointed with **rubber rings** and **good quality lubricant** for fittings, ensuring leak-proof connections.
The work shall include **all necessary specials** such as bends, tees, offsets, junctions, and other fittings required for a complete and functional underground drainage system, as per CPWD Specification Vol-II and directions of the Engineer-in-Charge.
Measurement:
Measurement shall be made **per metre of pipe laid**, including all bends, tees, offsets, junctions, and other specials, fully installed, tested, and accepted, as per BOQ and directions of the Engineer-in-Charge.
Rate:
Rate: As per BOQ.

item no.242 Providing and fixing S.W. gully trap with C.I. grating brick masonry chamber and water tight C.I. cover with frame of 300mm x 300mm size (inside) with standard weight.(i) Square mouth traps.(B) 150mm x 100mm size P or R type

Materials : (t) Water shall conform to M-1. (2) Cement mortar of proportion 1:5 shall conform to M-11. (3) Burnt brick shall conform to M-15. (4} The S.W. Galley trap of 150 mm. x 100 mm. size shall confirm to.M-70a.

2.0. Workmanship

2.1. Excavation for gulley trap shall be done true to dimensions and levels as indicated on plans or as directed. The excavation work shall generally be done as per relevant specifications of item 2.of earth work.

2.2. Fixing:

2.2.1. The gully trap shall be fixed over cement concrete 1:5:10 (I cement : 5 sand : 10 graded brick bats aggregate 40 mm nominal size) foundation. 650 square and 100 mm. thick The depth of top of concrete below the ground level shall be 675 mm. The jointing of gulley outlet to the branch drain shall be done .

2.3. Brick masonry chamber : After fixing and testing gulley and branch drain, a brick masonry 300 x 330 mm. inside with bricks in CM 1:5 (1 cement : 5 sand) shall be built with a 100 mm. brick work round OH; gulley trap from the top of bed concrete up to ground level. The space between the chamber walls and

the trap shall be filled with cement concrete 1:5:10. The upper portion of the chamber i.e. above the top level of the trap shall be plastered inside with cement mortar 1:3 (1 cement: 3 sand) finished with floating coat of neat cement. The corners and bottom of the chamber shall be rounded of so as to slope towards thegrating.

2.4. C.I. cover with frame 300 mm, x 300 mm. (inside) size shall then be fixed on the top of the brick masonry with C.c. 1:2:4 (1 lent : 2 coarse sand : 4 graded aggregate 20 mm. nominal size) 40 mm. thick and rendered smooth. The finished top of the cover shall be left about 40 mm. above the adjoining ground level so as to exclude the surface water from entering the gulleytrap.

3.0. Mode of measurements &payment

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

The rate shall be for a unit of one numberbasis

item no.243 Providing laying (to level or slopes) and jointing reinforced concrete Light duty non-pressure pipes I.S. class NP2 of the following internal diameter with collars and butt ends prepared for collar joints including testing of joints complete.(B) 150mm

Workmanship and Material

19.2.2 Cement Concrete Pipes (with and without Reinforcement) (Light Duty, Non-Pressure)

The pipes shall be with or without reinforcement as required and shall be of class not lesser than NP2. These shall conform to IS 458 and shall be capable of withstanding a test pressure of 0.07 MPa (7 m head). The reinforced cement concrete pipes shall be manufactured by centrifugal (or spun) process while un -reinforced cement concrete pipes by spun or pressure process. All pipes shall be true to shape, straight, perfectly sound and free from cracks and flaws. The external and internal surface of the pipes shall be smooth and hard. The pipes shall be free from defects resulting from imperfect grading of the aggregate mixing or moulding.

Concrete used for the manufacture of un-reinforced and reinforced concrete pipes and collars shall not be leaner than 1:2:4 (1 cement: 2 coarse sand: 4 graded stone aggregate). The maximum size of aggregate should not exceed one third of the thickness of the pipe or 20 mm whichever is smaller for pipes above 250 mm internal diameter. But for pipes of internal diameter 80 to 250 mm, the maximum size of aggregate should be 10mm. The reinforcement in the reinforced concrete pipes shall extend throughout the length of the pipe. The circumferential and longitudinal reinforcements shall be adequate to withstand the specified hydrostatic pressure and further bending stresses due to the weight of water when running full across a span equal to the length of pipe plus three times its own weight.

The dimensional requirements of concrete pipes are given in Appendix I. The minimum clear cover for reinforcement in pipes and collars shall be as given in Table 19.3.

TABLE 19.3

TABLE 19.3

Sl. No.	*Precast concrete pipe/collar*	*Minimum clear cover, mm*
(i)	Barrel wall thickness	
(a)	Upto and including 75 mm	8
(b)	Over 75 mm	15
(ii)	At spigot steps	5
(iii)	At end of longitudinal	5

Note : An effective means shall be provided for maintaining the reinforcement in position and for ensuring correct cover during manufacture of the unit. Spacers for this purpose shall be of rust proof material or of steel protected against corrosion.

19.2.2.1 Laying and Jointing Cement Concrete Pipes and Specials

(i) Trenches: Where the pipes are to be bedded directly on soil, the bed shall be suitably rounded to fit the lower part of the pipe, the cost for this operation being included in the rate for laying the pipe itself.

(ii) Loading, transporting and unloading of concrete pipes shall be done with care. Handling shall be such as to avoid impact. Gradual unloading by inclined plane or by chain pulley block is recommended. All pipe sections and connections shall be inspected carefully before being laid. Broken or defective pipes or connections shall not be used. Pipes shall be lowered into the trenches carefully. Mechanical appliances may be used. Pipes shall be laid true to line and grade as specified. Laying of pipes shall proceed upgrade of a slope.

(iii) If the pipes have spigot and socket joints, the socket ends shall face upstream. In the case of pipes with joints to be made with loose collars, the collars shall be slipped on before the next pipe is laid. Adequate and proper expansion joints shall be provided where directed.

(iv) In case where foundation conditions are unusual such as in the proximity of trees or holes, under existing or proposed tracks manholes etc. the pipe shall be encased all-around in 15 cm thick cement concrete 1:5:10 (1 cement : 5 fine sand : 10 graded stone aggregate 40 mm nominal size) or compacted sand or gravel.

(i) In cases where the natural foundation is inadequate the pipes shall be laid either in concrete cradle supported on proper foundations or on any other suitably designed structure. If a concrete cradle bedding is used the depth of concrete below the bottom of the pipe shall be at least 1/4th of the internal dia of the pipe subject to the min. of 10 cm and a maximum of 30 cm. The concrete shall extend up the sides of the pipe at least to a distance of 1/4th of the outside diameter of pipes 300 mm and over in dia. The pipe shall be laid in this concrete bedding before the concrete has set. Pipes laid in trenches in earth shall be bedded evenly and firmly and as far up the haunches of the pipe as to safely transmit the load expected from the backfill through the pipe to the bed. This shall be done either by excavating the bottom of the trench to fit the curve of the pipe or by compacting the earth under around the curve of the pipe to form an even bed. Necessary provision shall be made for joints wherever required.

(vi) When the pipe is laid in a trench in rock hard clay, shale or other hard material the space below the pipe shall be excavated and replaced with an equalising bed of concrete, sand or compacted earth. In no place shall pipe be laid directly on such hard material.

(vii) The method of bedding and laying the pipes under different conditions are illustrated.

(viii) When the pipes are laid completely above the ground the foundations shall be made even and sufficiently compacted to support the pipe line without any material settlement. Alternatively the pipe line shall be supported on rigid foundations at intervals. Suitable arrangements shall be made to retain the pipe line in the proper alignment, such as by shaping the top of the supports to fit the lower part of the pipe. The distance between the supports shall in no case exceed the length of the pipe. The pipe shall be supported as far as possible close to the joints. In no case shall the joints come in the centre of the span. Care shall be taken to see that super imposed loads greater than the total load equivalent to the weight of the pipe when running full shall not be permitted. Suitably designed anchor blocks at change of direction and grades for pressure lines shall be provided where required.

(ix) Jointing: Joints are generally of rigid type. Where specified flexible type joints may also be provided.

(a) Rigid Spigot and Socket Joint: The spigot of each pipe shall be slipped home well into the socket of the pipe previously laid and adjusted in the correct position. The opening of the joint shall be filled with stiff mixture of cement mortar in the proportion of 1:2 (1 cement: 2 fine sand) which shall be rammed with caulking tool. After a day's work any extraneous material shall be removed from the inside of the pipe and the newly made joint shall be cured.

(b) Rigid Collar Joint: The two adjoining pipes shall be butted against each other and adjusted in correct position. The collar shall then be slipped over the joint, covering equally both the pipes. The annular space shall be filled with stiff mixture of cement mortar 1:2 (1 cement: 2 fine sand) which shall be rammed with caulking fool. After a day's work any extraneous materials shall be removed from the inside of the pipe and the newly made joint shall be cured.

(c) Semi Flexible Spigot and Socket Joint: The joint is composed of specially shaped spigot and socket ends on the concrete pipes. A rubber ring shall be placed on the spigot which shall be forced into the socket of the pipe previously laid. This compresses the rubber ring as it rolls into the annular space formed between the two surfaces of the spigot and the socket, stiff mixture of cement mortar 1:2 (1 cement: 2 fine sand) shall then be filled into the remaining annular space and rammed with a caulking tool. After day's work any extraneous materials shall be removed from the inside of the pipe and the newly made joint shall be cured.

(d) Semi Flexible Collar Joint: This is made up of a loose collar which covers two specially shaped pipe ends . Each end shall be fitted with a rubber ring which when compressed between the spigot and the collar, seal the joint. Stiff mixture of cement mortar 1:2 (1 cement: 2 fine sand), shall then be filled into the remaining annular space and rammed with a caulking tool. After day's work, any extraneous material shall be removed from the inside of the pipe and the newly made joint shall be cured.

(e) Internal Flush Joint : This joint is generally used for culvert pipe of 60 cm dia and over. The ends of the pipe are specially shaped to form a self centering joint with an internal jointing space 1.3 cm wide the finished joint is flush with both inside and outside with the pipe wall . The jointing space is filled with cement mortar 1:2 (1 cement: 2 fine sand) mixed sufficiently dry to remain in position when forced with a trowel or rammer. After day's work, any extraneous material shall be removed from the inside of the pipe and the newly made joint shall be cured.

(f) External Flush Joint : This joint is suitable for pipes which are too small for jointing from inside. This joint is composed of specially shaped pipe ends. Each end shall be butted against each other and adjusted in correct position. The jointing space shall then be filled with cement mortar 1:2 (1 cement: 2 fine sand) sufficiently dry and finished off flush. Great care shall be taken to ensure that the projecting ends are not damaged as no repairs can be readily affected from inside the pipe.

(x) In all pressure pipe lines the recess at the end of the pipe line shall be filled with jute braiding dipped in hot bitumen or other suitable approved compound. Pipes shall be so jointed that the bitumen ring of one pipe shall set into the recess of the next pipe. The ring shall be thoroughly compressed by jacking or by any other suitable method. The number of pipes that shall be jacked together at a time shall depend on the diameter of the pipes and the bearing capacity of the soil, for small pipes up to 25 cm diameter, six pipes can be jacked together at a time. The quantity of jute and bitumen in the ring shall be just sufficient to fill the recess in the pipe when pressed hard by jacking or by any other suitable method. Before and during jacking care shall be taken to see that there is no offset at the joint.

(xi) Testing: For pressure pipes, the completed pipeline shall be tested for pressure (Known as site test pressure) which shall not be less than the maximum pipeline operating pressure plus the calculated surge pressure, but in no case shall it exceed the hydrostatic test pressure. For non-pressure pipes the joints shall be tested.

(xii) Refilling of Trenches: In case where pipes are not bedded on concrete special care shall be taken in refilling, trenches to prevent the displacement and subsequent settlement at the surface resulting in uneven street surfaces and dangers to foundations etc. The backfilling materials shall be packed by hand under and around the pipe and rammed with a shovel and light tamper. This method of filling will be continued up to the top of pipe. The refilling shall rise evenly on both sides of the pipe and continued up to 60 cm above the top of pipe so as not to disturb the pipe. No tamping shall be done within 15 cm of the top of pipe. The tamping shall become progressively heavier as the depth of the backfill increases.

(xiii) Measurements : The lengths of pipes shall be measured in running metres nearest to a cm as laid or fixed, from inside of one manhole to the inside of the other manhole. The length shall be taken along the centre line of the pipes over all fittings such as bends, collars, junctions, etc. which shall not be measured separately. Excavation, refilling, shoring and timbering in trenches, and cement concreting wherever required shall be measured separately under relevant items of work. The Location ,dia and levels shall be followed as per boq item.

(xiv) Rate: The rate shall include the cost of materials and labour involved in all the operations described above.

The rate shall be for a unit of One running meter

item no.244 Providing laying (to level or slopes) and jointing reinforced concrete Light duty non-pressure pipes I.S. class NP2 of the following internal diameter with collars and butt ends prepared for collar joints including testing of joints complete.(C) 250mm

Workmanship
The relevant specifications of item No.243 shall be followed except that dia of pipe 300mm.
Mode of Measurement &Payment
The relevant specifications of item No. 243 shall be followed:

item no.245 Constructing Manhole with R.C.C. top slab in 1:2:4 mix (1- cement :2-coarse sand : 4-graded stone aggregate 20mm nominal size) foundation concrete 1:3:6 mix (1-cement : 3- coarse sand :6-Brick bats 40 + 50mm size) inside plastering 15mm thick with Cement Mortar 1:3 (1-Cement : 3-coarse sand) finished with a floating coat of neat cement and making channels in cement concrete 1:2:4 mix (1-Cement :2-Coarse sand :4-stone aggregate 20mm nominal size) finished smooth complete including curing and festing (i) Inside size 900mm x 1200mm and 1.5M. deep including C.I. cover with frame size 560mm diameter total weight of cover and frame to be not less than 128 kgs. (Wt. of cover 64 Kg. and Wt. of frame 64 Kg.)(A) With 230mm thick walls of brick msonry using brick having crushing strength not less

than 35Kg. / Sq.cm. in Cement Mortar 1:5 (1- Cement: 5-Coarse sand) (1) A type depth 0.90 Metre for 150mm diameter sewer.

Materials : Water shall conform to M-1. Cement shall conform to M-6. Burnt bricks shall conform to M-15. Brick bats of 40 to 50 mm. size shall conform to M-14. Stone coarse aggregate of 20 mm. nominal size shall conform to M-12. Grit shall conform to M-8. Cement mortar of specified proportion shall conform to M-11. The cast iron manhole cover of 560 mm. dia. with frame shall conform to I.S. 1726- 1966.

2.0. Workmanship

2.1. The manholes of different types and sizes as specified shall be constructed in sewer line at such places and to such levels and dimension as shown in drawings of as directed.

2.2. The manholes shall be built on a bed of cement concrete 1:3:6 (1 cement : 3 coarse sand : 6 brick bats) (40) to 50 mm. nominal size) to the thickness of the bed concrete shall be 15 cms. for manhole upto

1. M. depth and 20 cms. for manholes over meter and up to over meter and up to 2 meters, depth and 30 cms. for manholes o greater depth.

2.2.2. Projection of bed concrete beyond the masonry wall shall be 15 cms.

2.3. Walls

2.3.1. The walls of manhole shall be carried out with burnt bricks using having bricks. crushing strength not less than 35 Kg/Cms in C.M. 2 in C.M. 1:5 (1 cement : 5 coarse sand). The thickness of brick masonry wall shall be 230 mm. The jointing face of such .brick shall be well buttered with cement mortar before laying so as to ensure a fulljoints.

2.4. Plaster

2.4.1. The inside of waits shall be plastered 15 mm. thick with C.M. 1:5 (1 cement : 5 coarse sand) and finished with floating coat of neat cement. All angles shall be rounded to 7.50 cms. radius and all rendered internal surfaces shall have hard impervious finish obtained by using a steel trowel. The external joints of masonry shall be finishedsmooth.

2.5. Channels & Benching:

2.5.1. Channels shall be semicircular in the bottom half and of diameter equal to the sewer. Above the horizontal diameter, the sides shall be extended vertically to the same level as the crown of the out going pipe and the top edge shall be suitably rounded off. The branch channels snail also be similarly constructed with respect to the benching but at their junction with the main channel an appropriate fall suitably rounded off in the direction of flow 'he main channel shall begiven.

2.5.2. The channel and benching shall be done in C.C. 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm. nominal size) rising at a slop in line from edges of channel. The channels of the bottom of the chamber shall be plastered with C.M. 1:2 (1 cement : 2 coarse sand) and steel trowelled smooth.

2.6. Cover slab:

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

2.7. Testing:

2.7.1. Manhole shall be tested by filling with water to a depth not exceeding .9 M. as directed.

2.7.2. After completion of work, manhole cover shall be sealed by means of thick grease.

3.0. Mode of measurements and payment

3.1. The depth of manholes shall be distance between the top of the manhole cover and the invert level of the main drain. The rate includes all labours, materials, tools, and plant etc. required for satisfactory completion of this item as directed above.

The rate shall be for a unit of the One number

item no.246 Constructing Manhole with R.C.C. top slab in 1:2:4 mix (1-cement :2- oarse sand : 4-graded stone aggregate 20mm nominal size) foundation concrete 1:3:6 mix (1-cement : 3- coarse sand :6-Brick bats 40 + 50mm size) inside plastering 15mm thick with Cement Mortar 1:3 (1-Cement : 3-coarse sand) finished with a floating coat of neat cement and making channels in cement concrete 1:2:4 mix (1- Cement :2-Coarse sand :4-stone aggregate 20mm nominal size) finished smooth complete including curing and festing (i) Inside size 900mm x 1200mm and 1.5M. deep including C.I. cover with frame size 560mm diameter total weight of cover and frame to be not less than 128 kgs. (Wt. of cover 64 Kg. and Wt. of frame 64 Kg.)(A) With 230mm thick walls of brick msonry using brick having crushing strength not less than 35Kg. / Sq.cm. in Cement Mortar 1:5 (1- Cement: 5-Coarse sand) (2) B type depth 1.50 Metre for 150mm diameter sewer.

2.0. Mode of measurements and payment

2.1. The relevant specifications of item No. 246 shall be followed except that type depth 1.50 Metre for 150mm diameter sewer. and part there of shall be paid over and above the rate of item No. 246

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

item no.247 Constructing Manhole with R.C.C. top slab in 1:2:4 mix (1-cement :2-coarse sand : 4-graded stone aggregate 20mm nominal size) foundation concrete 1:3:6 mix (1-cement : 3- coarse sand :6-Brick bats 40 + 50mm size) inside plastering 15mm thick with Cement Mortar 1:5 (1-Cement : 5-coarse sand) finished with a floating coat of neat cement and making channels in cement concrete 1:2:4 mix (1- Cement :2-Coarse sand :4-stone aggregate 20mm nominal size) finished smooth complete including curing and festing (i) Inside size 900mm x 1200mm and 1.5M. deep including C.I. cover with frame size 560mm diameter total weight of cover and frame to be not less than 128 kgs. (Wt. of cover 64 Kg. and Wt. of frame 64 Kg.)(A) With 230mm thick walls of brick msonry using brick having crushing strength not less than 35Kg. / Sq.cm. in Cement Mortar 1:5 (1- Cement: 5-Coarse sand) (3) C type depth 2.25 Metre for 150mm diameter sewer

2.3. Mode of measurements and payment

2.4. The relevant specifications of item No. 246 shall be followed except that type depth 2.25 Metre for 150mm diameter sewer. and part there of shall be paid over and above the rate of item No. 246

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

item no.248 (A) With 230mm thick walls of brick msonry using brick having crushing strength not less than 35Kg. / Sq.cm. in Cement Mortar 1:5 (1- Cement: 5-Coarse sand) (4) D type depth 3.15 Metre for 150mm diameter sewer

2.6. Mode of measurements and payment

2.7. The relevant specifications of item No. 246 shall be followed except that type depth 3.15 Metre for 150mm diameter sewer. and part there of shall be paid over and above the rate of item No. 246

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

item no.249 Extra rate for constructing B.B. masonry for every additional depth of 0.1M. or Part thereof over item No.24.27 (I) for depth from 0.9M to 1.5M.

The relevant specifications of item No. 246 shall be followed for excavation same, except that the depth of manhole shall be done 0.1 M. or part there of more then 0.90 meter up to 1.5 M. The extra payment shall be made for additional depth of 0.1 M. or part thereof manhole done over and above the depth 0.90meter.

2.9. Mode of measurements and payment

2.10. The relevant specifications of item No. 246 shall be followed except that the extra rate shall be paid for every additional depth of 0.1. M. and part there of shall be paid over and above the rate of item No. 246

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

item no.250 Providing and fixing cast iron steps of size 500mm x 150mm x 22.5mm and painting with two coats of Anti-corrosive paint etc. complete.

Providing and fixing **cast iron steps** of size **500 mm × 150 mm × 22.5 mm**, complete with **two coats of approved anti-corrosive paint**.

The steps shall be corrosion-resistant, durable, and properly fixed in position to ensure stability and safety. The work shall include **preparation of the surface, secure fixing, painting, and finishing**, as per CPWD Specification Vol-II and directions of the Engineer-in-Charge.

Measurement:

Measurement shall be made **per cast iron step** completely fixed, painted, and accepted, as per BOQ and directions of the Engineer-in-Charge.

Rate:

Rate: As per BOQ.

item no.251 Constructing Brick masonry road gully chamber 500mm x 450mm x 600mm including 500mm x 450mm C.I. horizontal grating wih frame complete.

Constructing **brick masonry road gully chamber** of size **500 mm × 450 mm × 600 mm**, using **first-class bricks in cement mortar (1:4)**.

The chamber shall include a **500 mm × 450 mm cast iron (C.I.) horizontal grating with frame**, properly fixed to allow free flow of surface water.

The work shall include **excavation, foundation preparation, masonry construction, proper alignment, leveling, and finishing**, as per CPWD Specification Vol-II and directions of the Engineer-in-Charge.

Measurement:

Measurement shall be made **per gully chamber** complete with masonry, C.I. grating, frame, and finished in position, as per BOQ and directions of the Engineer-in-Charge.

Rate:

Rate: As per BOQ.

item no.252 Constructing brick masonry chamber for underground C.I. Inspection chamber and bends with bricks having crushing strength not less than 35Kg/Cm2 in C.M. 1:5 C.I. cover with frame (Light duty) 455mm x 610mm intenal dimensions total weight of cover with frame to be not less than 38Kg. (Wt. of cover 23 Kg.) and Wt. of frame 15Kg.) (R.C.C. top slabe with 1:2:4 mix (1-cement :2- coarse sand :4-graded stone aggregate 20mm size) foundation concrete 1:5:10 inside plaster 15mm thick with cement mortar 1:3 finished smooth with a floating coat of neat cement on walls and bed concrete etc. complete.(i) Inside dimensions 455mmx 610mm and 450mm deep for single pipe line.

Constructing **brick masonry chamber** for underground **C.I. inspection chamber and bends** using **first-class bricks with crushing strength ≥ 35 kg/cm²** in **cement mortar 1:5**.

The chamber shall include:

- **C.I. cover with frame (light duty)** of internal dimensions **455 mm × 610 mm**, with total weight ≥ 38 kg (cover 23 kg + frame 15 kg)

- **R.C.C. top slab** in **1:2:4 mix** (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm)
- **Foundation concrete** in **1:5:10 mix**
- **Inside plaster** 15 mm thick in **1:3 cement mortar**, finished smooth with a floating coat of neat cement on walls and bed concrete

The chamber shall have **inside dimensions 455 mm × 610 mm and 450 mm deep** suitable for a **single pipeline**. The work shall include **excavation, masonry, concrete, plastering, alignment, leveling, and finishing**, as per CPWD Specification Vol-II and directions of the Engineer-in-Charge.

Measurement:

Measurement shall be made **per inspection chamber** complete with brick masonry, R.C.C. top slab, C.I. cover and frame, plastering, and finished in position, as per BOQ and directions of the Engineer-in-Charge.

Rate:

Rate: As per BOQ.

External water supply

item no.253 Providing and fixing brass ferrule with C.I. mouth cover including boring and tapping the main : 25 mm nominal bore

The work shall include:

- Supply and installation of **brass ferrule** of high-quality corrosion-resistant brass (ASTM B16/B21 or equivalent) for 25 mm nominal bore.
- **C.I. mouth cover** conforming to IS 210 / IS 1538, suitable for the ferrule, with bolts, nuts, and rubber/neoprene gasket to ensure leak-proof sealing.
- **Boring, drilling, and tapping** of the main pipeline to fit the ferrule accurately.
- Proper alignment, tightening, and installation to ensure leak-proof and durable connection.

Materials and Workmanship:

- Brass ferrule shall be machined smooth, free from burrs, and suitable for nominal 25 mm bore.
- C.I. mouth cover and frame shall be dimensioned to match the main pipeline.
- Bolts, nuts, and gaskets shall be of approved quality to ensure tight sealing.
- Threading shall conform to standard BSP/ISO/IS specifications.
- Installation shall be done in accordance with CPWD specifications and directions of the Engineer-in-Charge.

Measurement:

Measurement shall be made per **set of brass ferrule with C.I. mouth cover installed**, including all boring, tapping, fittings, bolts, nuts, gaskets, and finishing in position, as per BOQ and directions of the Engineer-in-Charge.

Rate:

Rate: As per BOQ.

item no.254 Providing and fixing of cast iron sluice valves (with cap) complete with bolts, nuts, rubber insertions etc. (the tail pieces if required will be paid separately):

100 mm diameter

Class II

The work shall include:

- Supply and installation of **cast iron (C.I.) sluice valves** of Class II, 100 mm nominal diameter, suitable for waterworks/pipeline service.
- Each valve shall be complete with **cap, bolts, nuts, and rubber insertions** to ensure leak-proof operation.
- Tail pieces, if required for connection to the main or branch line, will be paid separately.
- The sluice valve shall conform to relevant standards (IS 14846 / IS 780 or equivalent) for material, strength, and workmanship.
- Installation shall ensure proper alignment, firm seating, and smooth operation of the valve.

Materials and Workmanship:

- Cast iron body and cap of the valve shall be free from defects and cracks.
- Rubber insertions shall be of high-quality synthetic rubber suitable for potable water and corrosion resistance.
- Bolts and nuts shall be mild steel or stainless steel, properly tightened to prevent leakage.
- Installation shall include proper alignment, supports, and testing for leak-proof operation.

Measurement:

Measurement shall be made **per sluice valve installed**, including cap, bolts, nuts, rubber insertions, and proper installation in position, as per BOQ and directions of the Engineer-in-Charge.

Rate:

Rate: As per BOQ.

item no.255 Providing and fixing C.I. double acting air valve of approved quality with bolts, nuts, rubber insertion etc. complete (The tail pieces, tapers etc if required will be paid separately) :
100 mm dia

The work shall include:

- Supply and installation of **cast iron (C.I.) double-acting air valves** of approved quality, 100 mm nominal diameter, suitable for water supply/pipeline systems.
- Each valve shall be complete with **bolts, nuts, and rubber insertions** to ensure leak-proof operation and smooth functionality.
- Tail pieces, tapers, or other fittings required for connection to the pipeline will be paid separately.
- The valve shall conform to relevant standards (IS 13161 / IS 780 or equivalent) for material, strength, and performance.
- Installation shall ensure proper alignment, firm seating, and smooth operation of the valve.

Materials and Workmanship:

- Cast iron body of the valve shall be free from defects, cracks, and porosity.
- Rubber insertions shall be of high-quality synthetic rubber suitable for potable water and corrosion resistance.
- Bolts and nuts shall be mild steel or stainless steel, properly tightened to prevent leakage.
- Valve installation shall include proper alignment, supports, and testing to ensure leak-proof and correct operation.

Measurement:

Measurement shall be made **per air valve installed**, including bolts, nuts, rubber insertions, and complete installation in position, as per BOQ and directions of the Engineer-in-Charge.

Rate:

Rate: As per BOQ.

item no.256 Providing and fixing G.I. pipes complete with G.I. fittings including trenching and refilling etc.
65 mm dia nominal bore
80 mm dia nominal bore

Description: Providing and fixing G.I. pipes complete with G.I. fittings, including trenching and refilling, etc. – 65 mm and 80 mm nominal bore.

Technical Specification:

The work shall include:

- Supply and installation of **galvanized iron (G.I.) pipes** of specified nominal diameter (65 mm and 80 mm) conforming to IS 1239 (Part 1) or equivalent standards.
- The work shall include all **G.I. fittings** required for connections, bends, tees, and other pipeline accessories.
- Trenching, laying of pipes, and refilling of trenches to proper compaction shall be carried out as per CPWD specifications and directions of the Engineer-in-Charge.
- Pipes and fittings shall be free from rust, defects, and shall be properly cleaned before installation.

Materials and Workmanship:

- G.I. pipes and fittings shall conform to relevant IS standards for material, thickness, and strength.
- Joints shall be made leak-proof using approved methods (threaded, gasketed, or welding if specified).
- Alignment, gradient, and supports of the pipeline shall be maintained as per drawings and site requirements.
- All excavation, backfilling, and compacting shall be carried out carefully to avoid damage to the pipeline.

Measurement:
Measurement shall be made **per meter of G.I. pipe laid**, including all fittings, trenching, laying, refilling, and compaction, as per BOQ and directions of the Engineer-in-Charge.
Rate:
Rate: As per BOQ.

item no.257 Providing and fixing HDPE pipes,PE-63 8kgf/cm2 to IS confirming IS 4984-1995 having thermal stability for hot & cold water supply including all threaded fittings. This includes jointing of pipes & fittings with one step HDPE solvent cement, trenching, refilling & testing of joints complete as per direction of Engineer in Charge.
25 mm nominal outer dia pipe
32 mm nominal outer dia pipe
50 mm nominal outer dia pipe
75 mm nominal outer dia pipe
100 mm nominal outer dia pipe

The work shall include:
- Supply and installation of **HDPE pipes (PE-63, 8 kgf/cm²)** suitable for hot and cold water supply, conforming to IS 4984-1995.
- All **threaded fittings** required for connections, bends, tees, and accessories shall be provided and installed.
- Jointing of pipes and fittings shall be done using **one-step HDPE solvent cement** as per manufacturer's instructions and IS standards.
- Trenching, laying of pipes, backfilling, and compaction shall be carried out to the required line, level, and gradient.
- **Testing of joints** for leak-proof performance shall be done after installation, as directed by the Engineer-in-Charge.

Materials and Workmanship:
- Pipes and fittings shall be free from defects, cracks, and conform to relevant IS standards.
- Solvent cement shall be of approved quality suitable for HDPE pipes, ensuring strong and durable joints.
- Excavation and backfilling shall follow safety norms and prevent damage to existing services or structures.
- All installed pipelines shall be properly aligned, supported, and tested for functionality.

Measurement:
Measurement shall be made **per meter of HDPE pipe laid**, including all fittings, jointing with solvent cement, trenching, refilling, compaction, and testing, as per BOQ and directions of the Engineer-in-Charge.
Rate:
Rate: As per BOQ.

item no.258 Constructing masonry Chamber 30x30x50 cm inside, in brick work in cement mortar 1:4 (1 cement :4 coarse sand) for stop cock, with C. I. surface box 100x100 x75 mm (inside) with hinged cover fixed in cement concrete slab 1:2:4 mix (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size), i/c necessary excavation, foundation concrete 1:5:10 (1 cement : 5 fine sand : 10 graded stone aggregate 40mm nominal size) and inside plastering with cement mortar 1:3 (1 cement : 3 coarse sand) 12mm thick, finished with a floating coat of neat cement complete as per standard design :
With common burnt clay F.P.S.(non modular) bricks of class designation 7.5

The work shall include:
- Excavation for the chamber to the required depth and dimensions.
- **Brick masonry** using common burnt clay F.P.S. (non-modular) bricks of class designation 7.5, laid in cement mortar 1:4 (1 cement : 4 coarse sand).

- **Cement concrete foundation** 1:5:10 (1 cement : 5 fine sand : 10 graded stone aggregate 40 mm nominal size).
- **Cement concrete top slab** 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size) to fix C.I. surface box with hinged cover (100 × 100 × 75 mm inside).
- **Plastering inside the chamber** with cement mortar 1:3 (1 cement : 3 coarse sand), 12 mm thick, finished with floating coat of neat cement.
- Proper alignment, leveling, and finishing as per standard design and directions of the Engineer-in-Charge.

Materials and Workmanship:

- Bricks shall be sound, well-burnt, uniform in shape and size, free from cracks.
- Cement, sand, and aggregates shall conform to relevant IS standards.
- C.I. surface box and cover shall be of approved quality, properly fixed and seated in the concrete slab.
- Workmanship shall ensure leak-proof, durable, and neatly finished chamber.

Measurement:

Measurement shall be made **per masonry chamber complete**, including brick masonry, foundation and top slab concrete, C.I. surface box with hinged cover, plastering, excavation, and finishing in position, as per BOQ and directions of the Engineer-in-Charge.

Rate:

Rate: As per BOQ.

Rain Water Harvesting & Tubewell

item no.259 Boring/drilling fore well of required dia for casing/ strainer pipe, by suitable method prescribed in IS: 2800 (part I), including collecting samples from difberent strata, preparing and submitting strata chart/ fore log, including hire & running charges of all equipments, tools, plants & machineries required for the job, all complete as per direction of Engineer -in-charge, upto 90 metre depth below ground level.

All types of soil

400 mm dia

Workmanship

The relevant specifications of item shall be followed cpwd technical specification Volume -II

Mode of Measurement &Payment

The relevant specifications of shall be followed AS PER boq

Rate: Rate: As per BOQ.

item no.260 Boring/drilling fore well of required dia for casing/ strainer pipe, by suitable method prescribed in IS: 2800 (part I), including collecting samples from difberent strata, preparing and submitting strata chart/ fore log, including hire & running charges of all equipments, tools, plants & machineries required for the job, all complete as per direction of Engineer -in-charge,beyond 90 metre & upto 150 metre depth below ground level.

All types of soil

400 mm dia

Workmanship

The relevant specifications of item shall be followed cpwd technical specification Volume -II

Mode of Measurement &Payment

The relevant specifications of shall be followed AS PER boq

Rate: Rate: As per BOQ.

item no.261 Supplying, assembling, lowering and fixing in vertical position in bore well, ERW (Electric Resistance Welded) FE 410 mild steel screwed and socketed/plain ended casing pipes of required dia, conforming to IS: 4270, of reputed & approved make, including painted with outside surface with two coats of anticorrosive paint of approved brand and manufacture, including required hire & labour charges, fittings & accessories, all complete, for all depths, as per direction of Engineer-in-charge.

200 mm nominal size dia having minimum wall thickness 5.40 mm

Workmanship

The relevant specifications of item shall be followed cpwd technical specification Volume -II

Mode of Measurement &Payment
The relevant specifications of shall be followed AS PER boq
Rate: Rate: As per BOQ.

item no.262 Supplying, assembling, lowering and fixing in vertical position in bore well, ERW (Electric Resistance Welded) FE 410 plain slotted (having slot of size 1.6/3.2 mm) mild steel threaded and socketed/ plain bevel ended pipe (type A) of required dia, conforming to IS: 8110, of reputed and approved make, having wall thickness not less than 5.40 mm, including painted with outside surface with two coats of anticorrosive bitumestic paint of approved brand and manufacture, ncluding hire & labour charges, fittings & accessories, all complete, for all depths, as per direction of Engineer -in-charge.
200 mm nominal size dia
Workmanship
The relevant specifications of item shall be followed cpwd technical specification Volume -II
Mode of Measurement &Payment
The relevant specifications of shall be followed AS PER boq
Rate: Rate: As per BOQ.

item no.263 Supplying, filling, spreading & leveling stone boulders of size range5 cm to 20 cm, in recharge pit, in the required thickness, for all leads & lifts, all complete as per direction of Engineer-in-charge.

Workmanship
The relevant specifications of item shall be followed cpwd technical specification Volume -II
Mode of Measurement &Payment
The relevant specifications of shall be followed AS PER boq
Rate: Rate: As per BOQ.

item no.264 Supplying, filling, spreading & leveling gravels of size range 5 mm to 10 mm, in the recharge pit, over the existing layer of foulders, in required thickness, for all leads & lifts, all complete as per direction of Engineer-in-charge.

Workmanship
The relevant specifications of item shall be followed cpwd technical specification Volume -II
Mode of Measurement &Payment
The relevant specifications of shall be followed AS PER boq
Rate: Rate: As per BOQ.

item no.265 Supplying, filling, spreading & leveling coarse sand of sizerange 1.5 mm to 2 mm in recharge pit, in required thickness over gravel layer, for all leads & lifts, all complete as per direction of Engineer -in-charge.

Workmanship
The relevant specifications of item shall be followed cpwd technical specification Volume -II
Mode of Measurement &Payment
The relevant specifications of shall be followed AS PER boq
Rate: Rate: As per BOQ.

item no.266 Gravel packing in tubewell construction in accordance with IS: 4097, including providing gravel fine/ medium/ coarse, in required grading & sizes as per actual requirement, all complete as per direction of Engineer-in-charge.

Workmanship
The relevant specifications of item shall be followed cpwd technical specification Volume -II
Mode of Measurement &Payment
The relevant specifications of shall be followed AS PER boq
Rate: Rate: As per BOQ.

item no.267 Providing and fixing factory made precast RCC perforated drain covers, having concrete of strength not less than M-25, of size 1000 x 450x50 mm, reinforced with 8 mm dia four nos longitudinal & 9 nos cross sectional T.M.T. hoop fars, including

providing 50 mm dia perforations @ 100 to 125 mm c/c, including providing edge finding with M.S. flats of size 50 mm x 1.6 mm complete, all as per direction of Engineer-in-charge.

Workmanship
The relevant specifications of item shall be followed cpwd technical specification Volume -II
Mode of Measurement &Payment
The relevant specifications of shall be followed AS PER boq
Rate: Rate: As per BOQ.

item no.268 Development of tube well in accordance with IS : 2800 (part I) and IS: 11189, to establish maximum rate of usable water yield without sand content (beyond permissible limit), with required capacity air compressor, running the compressor for required time till well is fully developed, measuring yield of well by "V" notch method or any other approved method, measuring static level & draw down etc. by step draw down method, collecting water samples & getting tested in approved laboratory, i/c disinfection of tubewell, all complete, including hire & labour charges of air compressor, tools & accessories etc., all as per requirement and direction of Engineer-in-charge.

Workmanship
The relevant specifications of item shall be followed cpwd technical specification Volume -II
Mode of Measurement &Payment
The relevant specifications of shall be followed AS PER boq
Rate: Rate: As per BOQ.

item no.269 Providing and fixing M.S. clamp of required dia to the top of casing/housing pipe of tubewell as per IS: 2800 (part I), including necessary bolts & nuts of required size complete. 200 mm clamp

Workmanship
The relevant specifications of item shall be followed cpwd technical specification Volume -II
Mode of Measurement &Payment
The relevant specifications of shall be followed AS PER boq
Rate: Rate: As per BOQ.

item no.270 Providing and fixing Bail plug/ Bottom plug of required dia to the bottom of pipe assemfly of tubewell as per IS:2800 (part I). 200 mm dia

Workmanship
The relevant specifications of item shall be followed cpwd technical specification Volume -II
Mode of Measurement &Payment
The relevant specifications of shall be followed AS PER boq
Rate: Rate: As per BOQ.

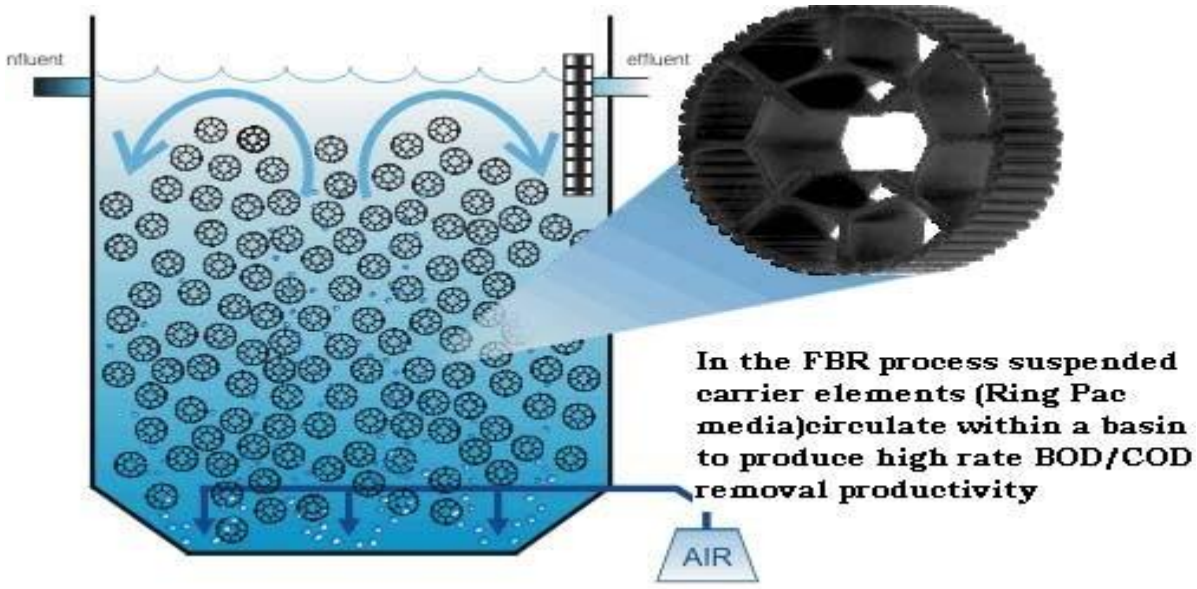
STP / WATER TREATEMENT EQUIPMENT & SUPPLY PUMPS

item no.271 Design, Construction ,Supplying, installing, testing & commissioning of Sewage Treatment Plant of 50m3/day based on MBR technology (Excluding excavation, back filling & disposal of surplus earth MS / Civil construction work) for the following duty:
Nature of Sewage - Domestic Sewage from Kitchen, Pantry and human waste for STP and from lab fro ETP.
The sewage treatment plant shall include the following items: Screen Chamber,Oil & Grease Trap,Reaction Tank,Clear Water Tank,Sewage equalization tank/sump,,Aeration Tank,,Sludge Holding Tank,Air Blowers, Pump sets & other equipment including submersible pumps in the drainage sump,Effluent,Sludge,,Tertiary Treatment,Irrigation, Flushing & Soft water pumpsets,Inlet and Outlet connection to Treated water storage Tanks,Electrical Control Panel & Cabling, earthing etc.,Piping, valves and Instrumentation including level controllers, pressure gages, sensors, rotameters and indicating cum recording meters for incoming sewage and outgoing treated effluents etc.,Contractor shall ensure submission of detailed GA drawings (Plan & Section), P&I diagram, schematic diagram for the above said components and equipment and additional component if so required for the complete working of the STP /ETP. The following list of civil units shall be in Client's Scope. However the size and design of the civil constructions required shall be given and guaranteed for its efficacy by the contractor for which the contractor shall take full

responsibility, Bar screen pit, Oil & Grease Chamber,Equalisation Tank,Sewage equalization tank/sump, Anoxic Tan,Aeration Tank,Sludge Holding Tank, Final Traeted water tank,Drain Sump for STP room,The STP shall consist of following units but not limited to these unit as may be required by the manufacturer's design.
The STP shall be designed based on the following parameters:
Daily average flow : 50 m3/Day
PH : 6.5 - 8.5
BOD5 : 50- 80 mg/l
S. Solids : 50- 80 mg/l
COD : 50- 80 mg/L
Oil & Grease : 20-30mg/L
ELECTRICAL INSTALLATION FOR SEWAGE TREATMENT PLANT Note : The mentioned ratings are for estimation purpose it may change as per final technical submittal. The Vendors are advised to quote as per actual. Design, fabrication, assembling, wiring, supply, installation, testing and commissioning of motor control centre shall be fabricated out of 14 gauge CRCA sheet steel in form in 3b formation with reinforcement of suitable size angle iron, channel 'T' sections irons and /or flats wherever necessary. Cable gland plates shall be provided on top as well as at the bottom of the panels. Panels shall be treated with all anticorrosive process before painting as per specifications with 2 coats of red oxide primer and final approved shade of powder coated paint. 2 Nos. earthing terminals shall be provided for 3 phase, 4 wire, 50 Hz supply system. Lifting hooks shall also be provided in case of large panels. Approval shall be taken for each panel before fabrication. Cadmium Plated hardware shall be used in fabrication of panels. Quoted rates shall inclusive of cables, cable trays, control cabling, earthing (in accordance to specification) with earthing from panel to each motor / equipment. MCC –1 (Sewage Treatment Plant) Incoming 100 amps TPN MCCB with the following accessories: - 1 No
"STP Describe as above item with complete in all respect."

Design, Construction ,Supplying, installing, testing & commissioning of Sewage Treatment Plant of 50KLD based on MBR technology Complete as per specifications
Wastech Infra India Pvt Ltd – MBBR / FBR PROCESS
Fluidized Bed Reactor (An Advance Biological Treatment Process)

The FBR process is the latest advance in attached growth aerobic biological treatment technology. Highly reliable and cost-effective to operate, the FBR employs RING PAC MEDIA, neutrally buoyant biofilm carrier elements, to achieve outstanding BOD/COD removal productivity from a compact bioreactor.



The neutrally buoyant plastic media within each aeration tank provides a stable base for the growth of a diverse community of microorganisms. Our media has a

very high surface-to- volume ratio, allowing for a high concentration of biological growth to thrive within the protected areas of the media. The FBR process enables self-sustaining biological treatment; The need to periodically waste sludge and the requirement to supply a dilute return activated sludge to maintain an appropriate food-to-microorganism (F/M) ratio is eliminated.

In this process, a volume of Ring Pac media is immersed in water and is fluidized (kept in constant motion) through the movement of gas and liquid in the treatment reactor. As the media supports a biomass concentration several times that achievable in activated sludge systems, treatment is significantly more productive. In addition, the neutrally buoyant media is subjected to a highly oxygenated, turbulent environment for maximum oxygen and mass transfer. The result of the FBR process is a very high rate of BOD reduction per volume. In addition, the excess biomass is automatically sloughed off in the process, maintaining a highly active biomass.

The FBR process has a number of significant advantages including:

- Small Space Requirement

The FBR requires very less hydraulic retention time (HRT) of an extended aeration or activated sludge process to perform the same BOD reduction duty.

- Quickly Responds to Load Fluctuations

High resident biomass concentration, intense mass transfer conditions and aggressive biomass sloughing action enable the process to rapidly respond to variations in process load.

- Minimal Operator Intervention

The mechanical simplicity, flow-through nature of the process and no sludge problems all result in an almost operator-free process.

- Resilient to Toxic Shocking

The fixed-film process will continually slough off outer layer(s) of dead biofilm and continue to produce new microorganisms to meet the organic load.

- Very High Loading Rate

The BOD removal rate continues to increase with loading rate even at loading rates in excess.

Prominent classes of applications for the FBR process include:

- Capacity Augmentation

Upgrading wastewater treatment plants by inserting FBR system upstream existing treatment components to achieve major reductions in BOD with a small footprint and low cost.

- Aeration Basin Retrofit

Addition of FBR media and media retaining screens to an existing aeration basin significantly increases treatment productivity.

- Modular Biological Treatment Systems

Incorporating multiple stages of FBR technology into a single stand-alone treatment module capable of producing excellent effluent quality.

- Nitrification/De-nitrification

Implementation of separate stage fixed film nitrification/de-nitrification is Easily accomplished with FBR technology.

General information

INLET & OUTLET CHARACTERISTICS

Parameters	Inlet	Outlet After Filters
PH	6.5-8	7 – 7.5
BOD	200 –300	<20
COD	450-500	<100
TN	35-40	<10
TP	10	<5
Suspended Solids	200 – 450	<20
Oil & Grease	15-20	<5
E.Coli	Present	Absent

Note: All parameters in mg/lit. except pH.

SYSTEM WRITE-UP

Sewage shall be collected in the collection cum Equalization Tank for dampening of flow variation and to equalized the concentration after passing through Screen and Oil and Grease Trap. Air shall be supplied by means of diffused aeration to keep the sewage in suspension.

The air-purged sewage from collection tank shall be pumped to Anoxic Tank for the Nitrification purpose and further to MBBR Reactor for the biodegradation of dissolved organics by biomass attached on the surface and inside the Bio carrier media. The air shall be induced through diffused aeration. The biodegraded Sewage from MBBR shall be let in to the secondary tube Settler for the separation of sludge. The sludge generation in the proposed system is minimal and required withdrawal after long time. Provision shall be maintained to recycle bio-sludge to MBBR Tank whenever required to maintain the MLSS and F/M ratio.

The overflow from the Secondary tube Settler shall be disinfected through chlorine with minimal dosing of 1-2 PPM only and then collected in a Clear Water Tank from where it shall be pumped under medium pressure through Pressure sand Filter for the removal of suspended impurities upto 30 micron in least dimensions. The clear water is further passed through the activated carbon filter unit for the adsorption of organic & inorganic impurities followed by disinfection by Ultraviolet disinfection system for the removal of E.Coli and MPN upto permissible limits. The final treated water are stored in treated water tank and can be used for gardening.

The sludge settled in the bottom of clarifier are withdrawn periodically and collected in the sludge holding tank before pumping it through filter press for mechanical sludge drying and disposal.

Scope of work includes designing, drawing, procurement, supply of components and supervision of erection and commissioning of one Sewage Treatment Plant of capacity 120 KL/day as per the technical specifications underlisted as mechanical, electrical and instrumentation, however excluding civil work:

A CIVIL : MOC of all the units shall be RCC M-25 unless specified.

Client Scope		
1	Foundations of the complete plant	1 Lot
2.	Screen chamber with O&G trap and Collection Tank	
Quantity		1 No.
Capacity		15 KL
3. Anoxic tank		
Quantity		1 No.
Capacity		8 KL
4. MBBR Reactor		
Quantity		2 Nos.
Capacity		8 KL each
5 Tube Settler		
Quantity		1 No.
Capacity		4 KL/Hr
6 Clear water Tank		
Quantity		1 No
Capacity		5 KL
7 Sludge Holding Tank		
Quantity	1 No.	
Capacity	10 KL	
8 Ladders / Walkways / Platform	1 Lot	

(B) MECHANICAL (WIIPL SCOPE):

1. Screen

Quantity 2 Nos.

Type	Perforated
Duty	To remove coarse solids
MOC	SS
Make	WIIPL

2. Air Source

Quantity	2 Nos. (1W + 1S)
Type	Twin Lobe
MOC	CI
Capacity	90 m3/hr. x 4500 mm each
Make	Beta

3. Air Purging Grid

Quantity	Lot
Type	Non-clog, segmented
MOC	CPVC
Location	Collection Tank, MBBR tank, SHT

4. Air Diffusers

Quantity	1 Lot
MOC	Silicon membrane
Type	SS Tubular with Silicon membrane
Size	63 mm OD x 630
Location	Collection Tank, MBBR Reactor, SHT Make WIIPL

6. Sewage Transfer Pump from collection tank to MBBR reactor

Quantity	2 Nos. (1W + 1S)
Capacity Type	4 KL/hr. x 8 m head Submersible
Solid Handling	40 mm
MOC	CI / SS
Make	Wilo / Ebara

7. Media in MBBR reactor

Quantity	1 Lot
Type	Ring

	MOC	PP
	Make	MM Aqua / Cool deck

8. Media in tube settler

	Quantity	1 Lot
	Type	Corrugated
	MOC	PVC
	Make	MM Aqua / Cool deck / Equivalent

9. Pressure Feed Pump

	Quantity	2 Nos. (1W + 1S)
	Capacity	4 KL/hr. x 30 m head
	Type	Horizontal
	MOC	CI
	Make	Kirloskar/Johnson

10 Dual Media Filter

	Quantity	1 No.
	Capacity	4 KL/hr.
	Duty of DMF	To remove suspended matters; To remove organics causing BOD & contributing to COD; Oil & Grease
	MOC	FRP
	Filtration Rate	20 KL/M2/Hr
	Diameter	600 mm x 1800 mm
	Op Pressure	2.5 □ 0.5 kg/cm2
	Make	Pentair

11 Activated Carbon Filter

	Quantity	1 No.
	Capacity	4 KL/hr
	Duty of ACF	To remove refractory and non-refractory organics that escape DMF and to decolorize the feed.
	MOC	FRP
	Filtration Rate	20 KL/M3/Hr
	Diameter	600 mm x 1800 mm

	Op Pressure Make Sludge Recycling Pump	2.5 □ 0.5 kg/cm2 Pentair
12		
	Quantity	2 Nos. (1W + 1S)
	Capacity	16 KL/hr. x 12 m head
	Type	Self Priming
	MOC	CI
	Make	Kirloskar
13	Sludge Transfer / Disposal Pump	
	Quantity	2 Nos. (1W + 1S)
	Capacity	2 KL/hr. x 12 m head
	Type	Self Priming
	MOC	CI
	Make	Kirloskar
14	Submersible Mixer in Anoxic Tank	
Qty		1 No.
MOC		PP
	Make	Aqua Italy
15	Chlorine Dosing System	
	Qty	1 No.
	MOC	PP – Dosing Pump HDPE – Dosing Tank
	Capacity	0-6 LPH
	Dosing Tank capacity	100 Liter
	Make	Asia LMI – Dosing Pump Sintex – Dosing tank
16	Sludge Feed Pump to Filter Press	
	No. of Units	2 Nos. (1W + 1S)
	Capacity	2 KL/hr x 40 M, each
	Type	Screw type
	MOC	CI
	Make	Roto

17	Filter Press :	
No. of Units		1 No.
Size		1200 x 1200
No. of plate		12 Number
Type		Recessed Plate and Frame
MOC		MS Frame with PP Plate
Make		Auro / Pharmatech

(C) ELECTRICAL :

1.	MOTOR CONTROL CENTRE	
Quantity		1No.
Type		Self standing, vermin proof
Make		WIIPL with individual components from L&T, ABB
D	INSTRUMENTATION :	
1.	Pressure Indicators	
Quantity		Lot
Type		Diaphragm
Make		H-Guru/Equivalent
2.	Level Switches	
Quantity		2 Nos.
Type		Probe type / float type
Make		Minilac / Status
3.	Flow meter cum Totaliser	
Quantity		1 No.
Make		Manas / Hydrocon
(E)	INTERCONNECTING PIPING & VALVING :	
1.	Piping	
Quantity		Lot
MOC		CPVC
Make		Astral

2. Valving

Quantity	Lot
MOC	CPVC
Make	Astral

(F) OTHER WORKS :

- P&I, hydraulic & layout.
- Supervision of erection and commissioning of the plant
- Operation & maintenance manual.

Battery Limit: Screen Chamber to outlet of ACF unit for a single site layout.