

Surat Smart City Development Ltd.

Section-6 : Detailed Technical Specifications

Vol-2 (Part I) – Technical Bid

BIDDING DOCUMENT

for the

Work for 24 x 7 Water Supply System under Smart City Mission in 07 (Seven) T.P. Schemes area of East and South East Zone of Surat Municipal Corporation including Refurbishment of existing network in part area of TP Scheme No. 53 (Magob Dumbhal), TP Scheme No. 64 (Magob-Dumbhal), TP Scheme No. 19 (Parvat-Magob) including all work of Mechanical, Electrical, SCADA, Household connections, consumer water meter fittings and work including Management of 24x7 Water Supply in SMART CITY for a period of 10 years

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6.20 DETAILED TECHNICAL SPECIFICATIONS

6.20.1 PREAMBLE

1. In the specification “as directed” / “approved” shall be taken to mean, “as directed / approved by the Engineer-in-charge”.
2. Wherever a reference to any Indian Standard appears in the specifications, it shall be taken to mean as a reference to the latest edition of the same in force on the date of agreement.
3. In “Mode of Measurement” in the specification wherever a dispute arises in the absence of specific mention of a particular point or aspect, the provisions on these particular point or aspects in the relevant Indian Standards shall be referred to.
4. All measurements and computations, unless otherwise specified, shall be carried out nearest to the following limits.

(i)	Length, width and depth (height)	..	0.01Mt.
(ii)	Areas	..	0.01Sq.mt
(iii)	Cubic Contents	..	0.01Cu.mt.

In recording dimensions of work the sequence of length, width and height (depth) or thickness shall be followed.
5. The distance, which constitutes lead, shall be determined along the shortest practical route and not necessarily the route actually taken. The decision of the Engineer-in-charge in this regard shall be taken as final.
6. Where no lead is specified, it shall mean “all leads”.
7. Definite particulars covered in the items of work, though not mentioned or elucidated in its specifications shall be deemed to be included therein.
8. Any material specified in detailed specification of items shall be of quality and property as mentioned in the respective general specifications of materials mentioned in this tender.
9. Approval of the samples of various materials given by the Engineer-in-charge shall not absolve the Contractor from the responsibility of replacing defective material brought on site or materials used in the work found defective at a later date. The Contractor shall have no claim to any payment or compensation whatsoever on account of any such materials being rejected by the Engineer-in-charge.
10. The contract rate of the item of work shall be for the work completed in all respects.
11. No collection of materials shall be made before it is got approved from the Engineer-in-charge.

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.

12. Materials, if and when rejected by the Engineer-in-charge, shall be immediately removed from the site of work.
13. 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 on overloading of the various components of the structure.
14. All work shall be carried out in a workmanlike manner as per the best techniques for the particular item.
15. All tools, templates, machineries and equipments for correct execution of the work as well as for checking lines, levels, alignment of the works during execution shall be kept in sufficient numbers and in good working condition on the site of work.
16. 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 and after completion of the structure.
17. 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 strength and quality. Acceptance of the same by the Engineer-in-charge shall not, however, absolve the Contractor of the responsibility of any adverse effects and consequences of adopting the same in the course of execution of completion of the work.
18. All installations pertaining to water supply and fixtures thereof as well as drainage lines and sanitary fittings shall be deemed to be completed only after giving satisfactory tests by the Contractor.
19. The Contractor shall be responsible for observing the rules and regulations imposed under the "Minor Minerals Act" and such other laws and rules prescribed by Government from time to time.
20. All necessary safety measures and precautions (including those laid down in the various relevant Indian Standards) shall be taken as also of the work itself.
21. The testing charges of all materials shall be borne by the Contractor.
22. Approval to any of the executed items for the work does not in any way relieve the Contractor of his responsibility for the correctness, soundness and strength of the structure as per the drawings and specifications.
23. All works shall be carried out strictly as per detailed technical specification provided in the tender. If not specified, the work shall be executed according to relevant applicable IS codes and standard engineering practice. In such case decision of the Engineer-in-charge shall be final and binding to the Contractor and in no case the Contractor will claim any extra for the same.
24. If Tenderer feels that detailed technical specifications for item mentioned in Schedule "B" are not provided with the tender, he will raise such points before quoting rates and submitting the tender. No claim on the basis of such argument shall be entertained during the course of work.
25. All measurements shall be considered as mentioned in the drawings / schedule / detailed specifications.

26. If Tenderers need any clarifications, they should obtain the same in writing from Owner / Engineer-in-charge.

Mm	Millimetres
Cm	Centimetres
Mt.	Metres
Km.	Kilometres
Sq.mt.	Square Metres
Cu.mt.	Cubic Metres
R.Mt.	Running Metres
No.	Numbers
C.I.	Cast Iron
R.C.C.	Reinforced Cement Concrete
Wt.	Weight
Kg.	Kilogram
M.T.	Metric Tonne
M.D.	Metre Depth
M.S.	Mild Steel
I.S.	Indian Standard
D.I.	Ductile Iron

**HYDRAULIC ENGINEER
SURAT MUNICIPAL CORPORATION**

SIGNATURE AND SEAL OF THE CONTRACTOR:

NAME AND ADDRESS:

DATE:

6.20.2 GENERAL SPECIFICATIONS OF MATERIALS

M-1 WATER

- 1.1 Water shall not be salty or brackish and shall be clean, reasonably clear and free from objectionable quantities of silt and traces of oil and injurious alkalis, salts, organic matter and other deleterious material which will either weaken the mortar or concrete or cause efflorescence or attack the steel in R.C.C. Container for transport, storage and handling of water shall be clean. Water shall conform to the standards specified in I.S. 456-2000.
- 1.2 If required by the Engineer-in-charge it shall be tested by comparison with distilled water. Comparison shall be made by means of standard cement tests for soundness, time of setting and mortar strength as specified in I.S. 269 –1976. Any indication of unsoundness, change in time of setting by 30 minutes or more or decrease of more than 10 percent in strength of mortar prepared with water sample when compared with the results obtained with mortar prepared with distilled water shall be sufficient cause for rejection of water under test.
- 1.3 Water for curing mortar, concrete or masonry should not be too acidic or too alkaline. It shall be free of elements which significantly affect the hydration reaction or otherwise interfere with the hardening of mortar or concrete during curing or those which produce objectionable stains or other unsightly deposits on concrete or mortar surfaces.
- 1.4 Hard and bitter water shall not be used for curing.
- 1.5 Potable water shall generally be found suitable for curing mortar or concrete.

M-2 LIME:

- 2.1 Lime shall be hydraulic lime as per I.S. 712-1973. Necessary tests shall be carried out as per I.S. 6932 (Parts I to X) 1973.
- 2.2 The following field tests for limes are to be carried out –
 - a) 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 indicate the unburnt lime stone.
 - b) Acid tests for determining the carbonate content in lime. Excessive amount of impurities and rough determination of class of lime.
- 2.3 Storage shall comply with I.S. 712-1973. The slaked lime, if stored, shall be kept in a weather proof and damp proof shed with impervious floor and sides to protect it against rain, moisture, weather and extraneous materials mixing with it. All lime that has been damaged in any way shall be rejected and all rejected materials shall be removed from site of work.
- 2.4 Field testing shall be done according to I.S. 162-1974 to show the acceptability of materials.

M-3 CEMENT

- 3.1 Cement shall be ordinary Portland cement **as per latest amendment of I.S. 12269 of 53/43 grade** or Portland slag cement as per I.S. 455 –1989.

M-4 WHITE CEMENT:

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

M-5 SAND:

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

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

I.S. Sieve Designation	% by weight passing sieve	I.S. Sieve Designation	% by weight passing sieve
4.75 mm	100	600 Micron	30 – 100
2.36 mm	90 – 100	300 Micron	5 – 70
1.18 mm	70 – 100	150 Micron	0 – 50

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

I.S. Sieve Designation	% by weight passing thru	I.S. Sieve Designation	% by weight passing thru.
4.75 mm	100	600 Micron	40 – 85
2.36 mm	100	300 Micron	5 – 50
1.18 mm	75-100	150 Micron	0 - 10

M-6 STONE GRIT:

6.1 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 flaky elongated pieces shall be avoided. It shall generally comply with the provisions of I.S. 383-1970.

Unless a special stone of a particularly quarry is mentioned, grit shall be obtained from the best black trap or equivalent hard stone as approved by the Engineer-in-charge. The grit shall have not deleterious reaction with cement.

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

I.S. Sieve Designation	% passing thru' sieve	I.S. Sieve Designation	% passing thru' sieve
12.50 mm	100%	4.75 mm	0-20%
10.00 mm	85-100%	2.36 mm	0-25%

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

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

M-7 LIME MORTAR:

- 7.1 LIME: Shall conform to specification M-2. WATER: water shall conform to specification M-1. SAND: Sand shall conform to specification M-5.
- 7.2 PROPORTION OF MIX: Mortar shall consist of such proportions of slaked lime and sand as may be specified in the item. The slaked lime and sand shall be measured by volume.
- 7.3 PREPARATION OF MORTAR : 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 sufficient water. Water shall be added as required during grinding (care being taken not to add more water) that will bring the mixed material to a consistency of stiff paste. Thoroughly wetted sand shall then be added evenly and the mixture ground for another 180 revolutions.
- 7.4 STORAGE: Mortar shall always be kept damp, protected from sun and rain till used up, covering it by tarpaulin or open sheds.
- 7.5 USE: All mortar shall be used as soon as possible after grinding. It should be used on the day on which it is prepared. But in no case mortar made earlier than 36 hours shall be permitted for use.

M-8 CEMENT MORTAR:

- 8.1 Water shall conform to specification M-1. Cement shall conform to specification M-3. Sand shall conform to M-5.
- 8.2 PROPORTION OF MIX: Cement and sand shall be mixed to specified proportions, sand being measured by measuring boxes. The proportion of cement shall be by volume on the basis of 50 Kg./bag of cement being equal to 0.0342 cu.m. The mortar may be hand mixed or machine mixed as directed.
- 8.3 PREPARATION OF MORTAR: In hand mixed mortar, cement and sand in the specified proportions shall be thoroughly mixed dry on a clean impervious platform by turning over at least 3 times or more till a homogeneous mixture of uniform colour is obtained. Mixing platform shall be so arranged that no deleterious extraneous material shall get mixed with mortar or mortar shall flow out. While mixing, the water shall be gradually added and thoroughly mixed to form a stiff plastic mass of uniform colour so that each particle of sand shall be completely covered with a film of wet cement. The water cement ratio shall be adopted as directed.
- 8.4 The mortar so prepared shall be used within 30 minutes of adding water. Only such quantity of mortar shall be prepared as can be used within 30 minutes.

M-9 STONE COARSE AGGREGATE FOR NOMINAL MIX:

- 9.1 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.
- 9.2 The aggregate shall generally be cubical in shape. Unless special stones of particular quarries are mentioned aggregates shall be machine crushed from the best black trap or equivalent hard stone as approved. Aggregate shall have no deleterious reaction with cement. The size of the coarse aggregate for plain cement concrete and ordinary reinforced cement concrete shall generally be as per the table given below. However, in case of reinforced cement concrete the maximum limit may be restricted to 6 mm. less than the minimum lateral clear distance between bars or 6 mm. less than the cover whichever is smaller.

TABLE

I.S. Sieve Designation	Percentage passing for single sized aggregates of Nominal size			I.S. Sieve Designation	Percentage passing for single sized aggregates of Normal size		
	40 mm	20 mm	16 mm		40 mm	20 mm	16 mm
80 mm	-	-	-	12.5 mm	-	-	-
63 mm	100	-	-	10.00 mm	0-5	0-20	0-30
40 mm	85-100	100	-	4.75 mm	-	0-50	0-50
20 mm	0-20	85-100	100	2.36 mm	-	-	-
16 mm	-	-	85-100				

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

- 9.3 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 I.S. 456-2000 shall have to be carried out to ensure the acceptability. The arrangement shall be stored separately and handled in such a manner as to prevent the intermixing of different aggregates. If the aggregates are covered with dust, they shall be washed with water to make, them clean.

M-10 BLACK TRAP OR EQUIVALENT HARD STONE COARSE:

- 10.1 Aggregate for Design Mix concrete : Coarse aggregate shall be of machine crushed stone of black trap or equivalent hard stone and be hard, strong, dense, durable, clean and free from skin and coating likely to prevent proper adhesion of mortar.
- 10.2 The aggregates shall generally be cubical in shape, unless special stones of particular quarries are mentioned, aggregates shall be machine crushed from the best, black trap or equivalent hard stones as approved. Aggregate shall have no deleterious reaction with cement.
- 10.3 The necessary tests indicated in I.S. 383-1970 and I.S. 456-2000 shall have to be carried out to ensure the acceptability of the material.
- 10.4 If aggregate is covered with dust it shall be washed with water to make it clean.

M-11 BRICK BATS AGGREGATE:

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

M-12 BRICKS:

- 12.1 The bricks shall be hand or machine molded and made from suitable soils and kiln burnt. They shall be free from cracks and flaws not nodules of free lime. They shall have smooth rectangular faces with sharp corners and shall be of uniform colour. The bricks shall be molded with a frog of 100 mm x 40 mm and 10 mm to 20 mm deep on one of its flat sides. The bricks shall not break when dropped on the ground from a height of 600 mm.
- 12.2 The size of modular bricks shall be 190 mm x 90 mm x 90 mm.
- 12.3 The size of conventional bricks shall be as under:
225 x 110 x 75 mm .
- 12.4 Only bricks of one standard size shall be used on one work. The following ipsneces shall be permitted in the conventional size adopted in a particular work.
- | | | |
|--------|---|---------|
| Length | : | 3.00 mm |
| Width | : | 1.50 mm |
| Height | : | 1.50 mm |
- 12.5 The crushing strength of the bricks shall not be less than 35 kg./Sq.cm. The average water absorption shall not be more than 20% by weight. Necessary tests for crushing strength and water absorption etc. shall be carried out as per I.S. 3495 (Part I to IV) – 1976.

M-12A FLYASH BUILDING BRICKS

The flyash building bricks shall confirm to IS-13757, IS-5454, IS-12894, IS-3495, IS-3812.

The frog of 80 to 100 mm X 40 mm X 10 to 20 mm size

The size of modular bricks shall be 190 mm X 90 mm X 90 mm.

The size of conventional brick shall be 230 mm X 110 mm X 70 mm.

Only bricks of one standards size shall used on one work. The following tolerances shall permitted in the conventional size adopted in a particular work:

Length	:	±3 mm
Width	:	±2 mm
Height	:	±2 mm

The physical characteristic of bricks shall be as follows –

The minimum compressive strength of Burnt Clay Flyash building bricks shall not be less than 70 kg/sq. cm. And the test shall be conform to IS-3495 (Part-I)

The average water absorption shall not be more than 20 percentage by weight and the test shall confirm to IS-3495 (Part – 3). Sampling of flyash building bricks and criteria for conformity shall be as per IS:5454

M-13 STONE:

- 13.1 The stone shall be of the specified variety such as Granite / Trap stone/Quarzite or any other type of good hard stones. The stones shall be obtained only from the approved quarry and shall be hard, sound, durable and free from defects like cavities, cracks, sand holes, flaws, injurious veins, patches of loose or soft materials etc. and weathered portions and other structural defects and strength. The stone with round surface shall not be more than 5% of dry weight. When tested in accordance with I.S. 1134 – 1974. The minimum crushing of the strength of the stone shall be 200 Kg./Sq.cm. unless otherwise specified.
- 13.2 The samples of the stone to be used shall be got approved before the work is started.
- 13.3 The Khanki facing stone shall be dressed by chisel as specified in the item for khanki facing in required shape and size. The face of the stone shall be so dressed that the bushing on the exposed face shall not project by more than 40mm. 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-14 MILD STEEL BARS:

- 14.1 Mild steel bars reinforcement for R.C.C. work shall conform to I.S. 432 (Part-I) – 1982 and shall be of tested quality. It shall also comply with the relevant part of I.S. 456-2000.
- 14.2 All the reinforcement shall be clean and free from dirt, paint, grease, mill scale or loose or thick rust at the time of placing.
- 14.3 For the purpose of payment, the bar shall be measured correct upto 10 mm length and weight payable worked out as per the rate specified below:

i)6 mm	0.22 Kg/Rmt.	viii)	20 mm	2.47 Kg/Rmt.
ii)8 mm	0.39 Kg/Rmt	ix)	22mm	2.98 Kg/Rmt.
iii)10mm	0.62 Kg/Rmt.	x)	25 mm	3.85 Kg/Rmt.
iv)12 mm	0.89 Kg/Rmt.	xi)	28 mm	4.83 Kg/Rmt.
v)14 mm	1.21 Kg/Rmt.	xii)	32 mm	6.31 Kg/Rmt.
vi)16 mm	1.58 Kg/Rmt.	xiii)	36 mm	7.31 Kg/Rmt
vii)18 mm	2.00 Kg/Rmt.	xiv)	40 mm	9.86 Kg/Rmt

M-15 HIGH YIELD STRENGTH STEEL DEFORMED BARS (CRS – Corrosion Resistant Steel and TMT):

- 15.1 High yield strength steel deformed bars shall be either cold twisted or hot rolled and shall conform to I.S. 1786-1985.
- 15.2 Other provision and requirements shall conform to specification No. M-14 for Mild Steel bars.

M-16 HIGH TENSILE STEEL WIRES:

- 16.1 The high tensile wires for use in pre-stressed concrete shall conform to I.S. 2090-1962.
- 16.2 The tensile strength of the high tensile steel bars shall be as specified in the item. In absence of the given strength, minimum strength shall be taken as per para. 6-1 or the I.S. 1785-1962. Testing shall be done as per I.S. requirements.
- 16.3 The high tensile steel shall be free from loose mill scale, rust, oil, grease or any other harmful matter. Cleaning of steel bars may be carried out by immersion in solvent solution, wire brushing or passing through a pressure box containing carborundum.

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

M-17 MILD STEEL BINDING WIRE:

- 17.1 The mild steel wire shall be of 1.63 mm or 1.22 mm (16 or 18 gauge) diameter and shall conform to I.S. 280 –1972).
- 17.2 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-18 STRUCTURAL STEEL:

- 18.1 All structural steel shall conform to I.S. 226 – 1965. 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. Rivet bars shall conform to I.S. 1148-1973.
- 18.2 When the steel is supplied by the Contractor. Test certificates of the manufacturers shall be obtained according to I.S. 226-1975 and other relevant Indian Standards.

M-19 SHUTTERING:

- 26.1 The shuttering shall be either of wooden planking of 30 mm minimum thickness with or without steel lining or of steel plates stiffened by steel angles. The shuttering shall be supported on battens and beams and props of vertical ballies properly cross braced together so as to make the centering rigid. In places of ballie props, bricks pillar of adequate section built in mud mortar may be used.
- 26.2 The form work shall be sufficiently strong and shall have camber, so that it assumes correct shape after deposition of the concrete and shall be able to resist forces caused by vibration of concrete, live load of men, working with it and other incidental loads associated with it. The shuttering shall have smooth and even surface and its joints shall not permit leakages of cement grout.
- 26.3 If at any stage of work during or after placing concrete in the structure, the form work sags or bulges out beyond the required shape of the structure, the concrete shall be removed and work redone with fresh concrete and adequately rigid form work. The complete form work shall be got inspected by and approved from Engineer-in-charge, before the reinforcement bars are placed in position.
- 26.4 The props shall consists of bullies having 100 mm minimum diameter measured at mid length and 80 mm at the end and shall be placed as per design requirement. These shall rest squarely on wooden sole plates 40 mm. thick and minimum bearing area of 0-10 sq.m. laid on sufficiently hard base.
- 26.5 Double wedges shall further be provided between the sole plate and wooden props so as to facilitate tightening and easing of shuttering without jerking the concrete.
- 26.6 The timber used in shuttering shall not be so dry so as to absorb water from concrete and swell or bulge nor so green or wet so as to shrink after erection. The timber shall be properly swan and planed on the sides and the surface coming in contact with concrete. Wooden form work with metal sheet lining or steel plates stiffened by steel angles shall be permitted.

- 26.7 As far as practicable, clamps shall be used to hold the forms together and use of nails and spikes avoided.
- 26.8 The surface of timber shuttering that would come in contact with concrete shall be well wetted and coated with soap solution before the concreting is done. Alternatively coat of raw linseed oil or oil of approved manufacture may be applied in place of soap solution. In case of steel shuttering either soap solution or raw linseed oil shall be applied after thoroughly cleaning the surface. Under no circumstances black or burnt oil shall be permitted.
- 26.9 The shuttering for beams and slabs shall have camber of 4 mm per metre (1 in 250) or as directed by the Engineer-in-charge so as to offset the subsequent deflection. For cantilevers, the camber at free end shall be 1/50 of the projected length or as directed by the Engineer-in-charge.

M-20 TEAK WOOD:

- 20.1 The teak wood shall be of good quality as required for the item to be executed. When the kind of wood is not specifically mentioned, good Indian teak wood as approved shall be used.
- 20.2 Teak wood shall generally be free from large, loose, dead or cluster knots, flaws, warps, twists, shakes, bends or any other defects. It shall generally be uniform in substance and of straight fibers as far as possible. It shall be free from rot, decay, harmful fungi and other defects of harmful nature, which will affect the strength, durability or its usefulness for the purpose for which it is required. The colour shall be uniform as far as possible. Any effort like painting, using any adhesive or resinous materials made to hide the defects shall render the pieces liable to rejection by the Engineer-in-charge.
- 20.3 All scantlings, planks etc. shall be sawn in straight lines and planes in the direction of grains and of uniform thickness.
- 20.4 The tolerances in the dimensions shall be allowed at the rate of 1.5 mm per face to be planed.
- 20.5 First Class Teak Wood:

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.

- 20.6 Second Class Teak Wood:

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

M-21 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 frames whereas only Kalai, Siras, Halda, Kalam etc. will be permitted for shutters after proper seasoning and chemical treatment.

The non teak wood shall be free from large, loose dead or cluster knots, flaws, shakes, warps, bends, or any other defect. It shall be uniform in substance and of straight fibres

as far as possible. It shall be free from rots, decay, harmful fungi and other defects of similar nature which will affect the strength, durability or its usefulness for the purpose for which it is required. The colour of the wood shall be uniform as far as possible. The scantlings, planks etc. shall be sawn in straight lines and planes in the direction of grain and of uniform thickness.

The department will use the Agency to produce a certificate from the Forest Department in the event of a dispute and the decision of the Department shall be final and binding to the Contractor.

M-22 WOODN FLUSH DOOR SHUTTERS (SOLID CORE):

22.1 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, 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.

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

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

22.4 The shutters shall be tested for ----

i) End Immersion Test : The test shall be carried out as per I.S. 2202 (Part-I) 1980. There shall be no delamination at the end of the test.

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

iii) Glue Adhesion Test : The flush door shall be tested for glue adhesive test in accordance with I.S. 2202 (Part-I) – 1980. The shutters all be considered to have passed the test if no delamination occurs in the glue lines in the plywood and if no single delamination more than 80 mm. in length and more than 3 mm. in depth has occurred in the assembly glue lines between the plywood face and the style and rail. Delamination at the corner shall be measured continuously around the corner.

Delamination at the knots knot, hole and other permissible wood defects shall not be considered in assessing the sample.

22.5 The tolerance in size of solid core type flush door as under –

In nominal thickness # 1.2 mm. In nominal height # 3 mm. The thickness of the shutters shall be uniform throughout with a permissible variation of not more than 0.8 mm. when measured at any two points.

M-23 ROLLING SHUTTERS:

23.1 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 constructed with interlocking lath sections formed from

cold rolled steel strips not less than 0.9 mm. thick and 80 mm. wide for shutters up to 3.5 m. width not less than 1.25 mm. thick and 80 mm. wide for shutters 3.5 m. in width and above unless otherwise specified.

- 23.2 Guide channels shall be of mild steel deep channel section and of rolled pressed or built up (fabricated) joint less construction. The thickness of sheet used shall not be less than 3.15 mm.
- 23.3 Hood covers shall be made of M.S. sheets not less than 0.92 mm. thick. For shutters having width 3.5 mts. and above, the thickness of M.S. sheet for the hood covers shall be not less than 1.25 mm.
- 23.4 The spring shall be of best quality and shall be manufactured from tested high tensile spring steel wire or strip of adequate strength to balance the shutters in position. The spring pipe shaft etc. shall be supported on strong M.S. or malleable C.I. brackets. The brackets shall be fixed on the or under the lintel as specified with rawl plugs and screws bolts etc.
- 23.5 The rolling shutters shall be of self rolling type upto 8 sq.m. clear area without ball bearing and upto 12 sq.m. clear area with ball bearing. If the rolling shutters are of larger then gear operated type shutters shall be used.
- 23.6 The locking arrangement shall be provided at the bottom of shutter at both ends. The shutters shall be opened from outside.
- 23.7 The shutters shall be completed within door suspension, shafts, locking arrangements, pulling hooks, handles and other accessories.

M-24 COLLAPSIBLE STEEL GATE:

- 24.1 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, plates 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..
 - i) Pickets : These shall be of 20 mm. M.S. channels of heavy sections unless otherwise shown on drawings. The distance center to center of pickets shall be 12 cms. with an opening of 10 cms.
 - ii) Pivoted M.S. flats shall be 20 mm. x 6 mm.
 - iii) Top and bottom guides shall be from tee or flat iron of approved size.
 - iv) The fittings like stoppers, fixing hold fasts, locking cleats, brass handles and cast iron rollers shall be of approved design and size.

M-25 GLASS :

- 25.1 All glass shall be of the best quality, free from specks, bubbles, smokes, veins, air holes blisters and other defects. The kind of glass to be used shall be as mentioned in the item or specification or in the special provisions or as shown in detailed drawings. Thickness of glass panes shall be uniform. The specifications for different kinds of glass shall be as under-
Sheet Glass:
In the absence of any specified thickness or weight in the item or detailed specifications of the item of work, sheet glass shall be weighing 7.5 Kg./Sq.m. for panes upto 600 mm x 600 mm.

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

Sheet glass shall be patent flattened glass of best quality and for glazing and framing purposes shall conform to I.S. 761-1960. Sheet glass of the specified colours shall be used, if so shown on detailed drawings or so specified. For important buildings and for panes with any dimensions over 900 mm. plate glass of specified thickness shall be used.

Plate Glass:

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 the absence of any specified thickness, the thickness of plate glass to be supplied shall be 6 mm. and a tolerance of 0.20 mm. shall be admissible.

Obscured Glass:

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

Wired Glass :

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

M-26 FIXTURES & FASTENINGS:

General

- i) 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 ventilator catch shall be made of the metal as specified in the item or its specifications.
- ii) They shall be of iron, brass, aluminium, chromium plated iron, chromium plated brass, copper oxidized iron, copper oxidized brass or anodized aluminium as specified.
- iii) The fixtures shall be heavy, medium or light type. The fixtures and fastenings shall be smooth finished and shall be such as will ensure ease of operation.
- iv) The samples of fixtures and fastenings shall be got approved as regards quality and shape before providing them in position.
- v) Brass and anodized aluminium fixtures and fastenings shall be bright finished.

Holdfasts:

- i) 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. dia. holes shall be made in it for fixing it to the frame with screws. At the other end, the holdfast shall be forked and bent at right angles in opposite directions.

Butt Hinges:

- i) Railway standard heavy type butt hinges shall be used when so specified.
- ii) Tee and strap hinges shall be manufactured from M.S. sheet.

Sliding Door Bolts (Aldrops) :

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

Tower Bolts (Barrel Type):

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

Door Latch

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

Bathroom Latch:

- i) Bathroom latch shall be similar to tower bolt.

Handle:

- i) 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.

Door Stoppers:

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

Door Catch :

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

Wooden Door Stop with Hinges:

- i) Wooden door stop of size 100 mm. x 60 mm x 40 mm shall be fixed on the door frame with a hinge of 75 mm. size and at a height of 900 mm. from the floor level. The wooden door stop shall be provided with 3 coats of approved oil paint.

Casement window Fastner:

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

Casement Stays (Straight Peg.Stay):

- i) The stays shall be made from a channel section having three holes at appropriate position so that the window can be opened either fully or partially as directed.

Size of the stay shall be 250 mm to 300 mm. as directed.

Ventilation Catch:

- i) The pattern and shape of the catch shall be as approved.

Pivot:

- i) The base and socket plate shall be made from minimum 3 mm. thick plate, and projected pivot shall not be less than 12 mm. dia. and 12 mm. length and shall be firmly riveted to the base plate case of iron pivot and in single piece base in the case of brass pivot.

M – 27 PAINTS:

27.1 Oil Paints:

Oil paints shall be of the specified colour and shade, and as approved. The ready mixed paints shall only be used.

However, if ready mixed paint of specified shade or tint is not available white ready mixed paint with approved strainer will be allowed. In such a case, the Contractor shall ensure that the shade of the paint so allowed shall be uniform.

All the paints shall need with the following general requirements –

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

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

27.2 Enamel Paints

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

M-28 FRENCH POLISH:

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

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

M-29 MARBLE CHIPS FOR MARBLE MOSAIC TERRAZZO:

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

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

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

M-30 FLOORING TILES:

A Plain Cement tiles:

- 30.1.1 The plain cement tiles shall be of general purpose type. These are the tiles in the manufacture of which no pigments are used. Cement used in the manufacture of tiles shall be as per Indian Standards.
- 30.1.2 The tiles shall be manufactured from a mixture of cement and natural aggregates by pressure process. During manufacture, the tiles shall be subjected to a pressure of not less than 140 kg/sq.cm. The proportion of cement to aggregate in the backing of the tiles shall be not leaner than 1:3 by weight. The wearing face, though the tiles are of plain cement, shall be provided with stone chips of 1 to 2 mm in size. The proportion of cement to the marble chips aggregate in the wearing layer of the tiles shall be three parts of cement to one part of chips by weight. The minimum thickness of wearing layer shall be 3 mm. The colour and texture of wearing layer shall be uniform throughout in face and thickness. On removal from mould, the tiles shall be kept in moist condition continuously atleast for seven days and subsequently, for such long period as would ensure their conformity to requirements of I.S. 1237-1980 requiring resistance to wear and water absorption.
- 30.1.3 The wearing face of the tiles shall be plain, free from projections, depressions and cracks and shall be reasonably parallel to the back face of the tile. All angles shall be right angle and all edges shall be sharp and true.
- 30.1.4 The tile sizes shall generally be square shape 24.85 cm. X 24.85 cm. or 25 cm x 25 cm. The thickness of the tiles shall be 20 mm.
- 30.1.5 The tolerance for length and breadth shall be plus or minus 1 mm. the tolerance on thickness shall be plus 5 mm.
- 30.1.6 The tiles shall satisfy the tests as regards transverse strength, resistance to wear and water absorption as per I.S. 1237 – 1980.

B Plain Coloured Tiles:

- 30.2.1 These tiles shall have the same specifications as for plain cement tiles as per (A) above except that they shall have a plain wearing surface wherein pigments are used. They shall conform to I.S. 1237-1980.
- 30.2.2 The pigment used for colouring cement shall not exceed 10% by weight of cement used in the mix. The pigments, synthetic or otherwise, used for flooring tiles shall have permanent colour and shall not contain materials detrimental to concrete.
- 30.2.3 The colour of the tiles shall be specified in the item or as directed.

C Marble Mosaic Tiles:

- 30.2.4 These tiles have the same specifications as per plain cement tiles except the requirements as stated below-
- 30.2.5 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 of projections, depressions and cracks and shall be reasonably parallel to the back face of the tiles. All angles shall be right angles and all edges shall be sharp and true.

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

D Chequered Tiles

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

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

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

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

E Chequered Tiles for Staircases:

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

- i) the length of a tile including nose shall be 330 mm.
- ii) The minimum thickness shall be 28 mm.
- iii) The nosing shall have the same wearing layer at the top.
- iv) The nosing edge shall be rounded.
- v) 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 chequered pattern.

M31 ROUGH KOTAH STONE:

31.1 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 stones shall not be allowed for use. They shall be without any soft veins, cracks or flaws.

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

31.3 Tolerance of minus 30 mm. on account of chisel dressing of edges shall be permitted for length as well as breadth. Tolerance in thickness shall be plus 3 mm.

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

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

M-32 POLISHED KOTAH STONES:

- 32.1 Polish kotah stone shall have the same specifications as per rough kotah stone except as mentioned below:

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

M-33 WHITE GLAZED TILES:

- 33.1 The tiles shall be of best quality as approved by the Engineering-in-charge. They shall be flat and true to shape. They shall be free from cracks, crazing, spots, chipped edges and corners. The glazing shall be of uniform shade.
- 33.2 The tiles shall be of nominal size of 150 mm. x 150 mm. unless otherwise specified. The maximum variation from the stated sizes, other than the thickness of tile, shall be plus or minus 1.5 mm. The thickness of the tile shall be 6 mm. except as above the tiles shall conform to I.S. 777-1970.

M-34 GALVANISED IRON PIPES AND FITTINGS:

Galvanized iron pipe shall be of the medium type and of required diameter and shall comply with I.S. 1239-1979. The specified diameter of the pipes shall refer to the inside diameter of the bore. Clamps, screw and all galvanized iron fittings shall be of the standard "R" or equivalent make.

M-35 BIB COCK AND STOP COCK:

- 35.1 A bib cock is a draw off tap with a horizontal inlet and a free outlet. A stop cock is a valve with a suitable means of connection for insertion in a pipe line for controlling or stopping the flow.
- 35.2 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 polished bright.
- 35.3 The minimum finished weight of bib cock and stop cock shall be as given below –

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

M-36 GUN METAL WHEEL VALVE:

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

M-37 WHITE GLAZED PORCELAIN WASH BASIN:

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

M-38 CAST IRON PIPES AND FITTINGS:

- 38.1 All soil, waste, vent and antisiphonage pipes and fittings shall conform to I.S. 1729-1964. the pipes shall have spigot and socket ends with head on spigot end. The pipes and fittings shall be true to shape, smooth, cylindrical their inner and outer surfaces being as nearly as practicable concentric. They shall be sound and nicely cast and shall be free from cracks, laps, pin holes or other imperfections and shall be neatly dressed and carefully fettled.
- 38.2 The end of pipes and fittings shall be reasonably square to their axis.
- 38.3 The sand cast iron pipes shall be of the diameter as specified in the description and shall be in length of 1.5 M., 1.8 M. & 2.0 M. including socket ends of the pipe unless shorter length are either specified or required at junction etc. The pipes and fittings shall be supplied without ears unless specified or directed otherwise.
- 38.4 Tolerances : The standard weights and thickness of pipes shall be as shown in the table below. A tolerance upto minus 10% may however be allowed against these standard weight.

Sr. No	Nominal Dia	Overall Thickness	Weight of Pipe Excluding Ears		
			1.5M.long	1.8M long	2M. long 1
1.	75 mm.	5.0 mm.	12.83 Kg.	16.52 kg.	18.37 kg.
2.	100 mm.	5.0 mm.	18.14 kg.	21.67 kg.	24.15 kg.
3.	150 mm				
4.	250 mm				

A tolerance upto minus 15% in thickness and 20 mm. in length will be allowed. For fittings tolerance in lengths shall be plus 25 mm. and minus 10 mm.
The thickness of fittings and their socket and spigot dimensions shall conform to the thickness and dimensions specified for the corresponding sizes of straight pipes. The tolerance in weights and thickness shall be the same as for straight pipes.

M-39 ASBESTOS CEMENT PIPE (A.C. PIPE):

- 39.1 The asbestos cement pipe of diameter as specified in the description of the item shall conform to I.S. 1926-1980. Special like bends, shoes cowls, etc. shall conform to relevant Indian Standards. The interior of pipe shall have a smooth finish, regular, surface and regular internal diameter. The tolerance in all dimensions shall be as per I.S. 1926- Part-I-1980.

M-40 BITUMEN FELT FOR WATER PROOFING AND DAMP PROOFING:

- 40.1 Bitumen felt shall be on the Hessian bases and shall be of type 3, self finished felt grader and shall conform to I.S. 1322-1970

M-41 SELECTED EARTH:

- 41.1 The selected earth shall be that obtained from excavated material or shall have to be brought from outside as indicated in the item. If item does not indicate anything, the selected earth shall have to be brought from outside.
- 41.2 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 arrangements at his own costs for land for borrowing selected earth. The stacking of materials shall be done as directed by the Engineer-in-charge in such a way as not to interfere with any constructional activities and in proper stacks.
- 41.3 When excavated material is to be used, only selected, stuff got approved from the Engineer-in-charge shall be used. It shall be stacked separately and shall comply with all the requirements of selected earth mentioned above.

M-42 MARBLE SLAB:

Marble slabs shall be white or of other colour and of best quality as approved by the Engineer-in-charge. Slab shall be bard, close, uniform and in texture. They shall also be free of defects and cracks. The surface shall be machine polished to an even and perfectly plane surface and the edges machine cut true and square. The rear face shall be rough enough to provide key for the mortar.

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 slabs shall be minimum 450 mm x 450 mm. and preferably 600 mm x 600 mm. However, smaller sizes will be allowed to be used to the extent of maintaining required pattern.

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

Except as above, the marble slabs shall conform to I.S. 1130 –1969 or as revised from time to time.

M-43 INDIAN TYPE WATER CLOSET:

The Indian type white glazed water closet of first class quality, size as specified in the item and conforming to I.S. 771-1979 and I.S. 2556- (Part-II) – 1981. Each pan shall have integral flushing ring of suitable type with adequate number of holes all around as directed to have satisfactory flushing. It shall also have an inlet at back of front for connecting flush pipe as directed. The inside of the bottom of the pan shall have sufficient slope from the front towards the outlet and the surface shall be uniform and smooth. Pan

shall be provide with 100 mm. diameter “p” or “S” trap with approximately 50 mm. water seal and 50 mm. diameter vent horn.

FOOT RESTS:

A pair of white glazed earthen ware rectangular foot rests of minimum size 250 mm x 130 mm. shall be provided with the water closet.

M-44 GLAZED EARTHEN WARE SINK:

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

M-45 GLAZED EARTHEN WARE LIPPED TYPE FLAT BACK URINAL / CORNER TYPE URINAL.

The lipped type urinal shall be flat back or corner type as specified in the item and shall conform to I.S. 771-1979.

It shall be of best Indian make and size as specified and approved by the Engineer-in-charge. The flat back or corner type urinal must be of first class quality, free from any defects, cracks etc.

M-46 FLUSH COCK:

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

M-47 NAHNI TRAP:

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 from crack, chips and other flaws or any other kind of defects which affect serviceability. The size of nahni trap shall be as specified and shall be of self cleansing design.

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

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

M-48 GULLY TRAP:

Gully trap shall conform to I.S. 651-1960. It shall be sound, free from defects such as fire cracks or hair cracks. The glaze of the traps shall be free from crazing.

They shall give a sharp clear note when struck with light hammer. There shall be no broken blisters.

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

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 weighing not less than 4,53 Kg. and the frame not less than 2.72 Kg. The grating cover and frame shall be of sound and good casting and shall have truly square machined seating faces.

M-49 GLAZED STONE WARE PIPE AND FITTINGS:

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

M-50 CRYDON BALL VALVE:

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

M-51 CRACKSEAL:

Crackseal manufactured by Chemistic / Chemisol Indian Ltd., is an acrylic base ready application compound.

M-52 COLOURED CEMENT

- 52.1 Coloured cement shall be with white or gray Portland cement as specified in the item of the work.
- 52.2 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 pigments and cement has such properties as to provide for durability under exposure to sunlight and weather.

M-53 STONE DUST:

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

M-54 CINDER:

- 54.1 Cinder is well burnt furnace residue which has been fused or sintered into lumps of varying sizes.
- 54.2 Cinder aggregates shall be well burnt furnace residue obtained from furnace using coal fuel only. It shall be sound clean and free clay, dirt, ash or other deleterious matter.

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

20 mm	100
10 mm	86
5.75 mm	70
2.36mm	52

M-55 GALVANIZED IRON SHEETS:

55.1 The galvanized iron sheets shall be plain or corrugated sheets of gauge as specified in item. The G.I. sheets shall conform to IS: 277-1977. The sheets shall be undamaged in carriage and handling either by rubbing off of zinc coating or otherwise. They shall have clean and bright surface and shall be free from dents, bends, holes, rust or white powdery deposit.

55.2 The length and width of G.I. sheets shall be as directed as per site condition.

M55-A G.I. VALLEYS GUTTER, RIDGES:

55-A.1 The G.I. ridges and hips shall be of plain galvanized sheet class-3 of the thickness as specified in item. These shall be 600-mm width and properly bent up to shape without damage to the sheets in process of bending.

55-A.2 Valley gutters and flashing shall be also of galvanized sheet of thickness as specified in item. Valleys shall be 900 mm wide over all and flashing shall be 380 mm, wide over all. They shall be bent to the required shape without damage to the sheet in the process of bending.

M-56 ALUMINIUM DOORS, WINDOWS, VENTILATORS:

56.1 Aluminium alloy used in the manufacture of extruded window sections shall conform to IS designation HEA-WP of IS:733-1975 and also to IS:Designation WVG-WP OF IS: 1285-1975. The sections shall be as specified in the drawing and design. The fabrication shall be done as directed.

56.2 The hinges shall be cast or excluded aluminium hinges of same type as in window but of large size.

56.3 The hinges shall normally be of 50 mm projecting types 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 shall be provided. In double shutter door, the first closing shall have a concealed aluminium alloy bolt at top and bottom.

M-57 PLYWOOD

57.1 The plywood for general purpose shall conform to IS:303-1975. Plywood is made by cementing together thin boards or sheets of wood into panels. There are always an odd number of layers 3,5,7,9 ply etc. The piles are placed so that the grain of each layer is at right angles to the grain in the adjacent layers.

57.2 The chief advantage of plywood over 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 slitting with change in moisture content.

- 57.3 Usually synthetic resins are used for gluing. Phenolic resins are usually cured in a hot press which compresses and simultaneously heats the piles 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 any thing from 2 to 60 minutes depending upon thickness.
- 57.4 When water glue are used the wood absorbs so much water that the finished plywood must be dried carefully. When synthetic resins are used as adhesive, the finished plywood must be exposed to atmosphere of controlled humidity until the proper amount of moisture has been absorbed.
- 57.5 According to IS:303-1975 the plywood for general purpose shall be of three grades namely BWR, WWR and CWR depending upon the adhesives used for bonding the veneers and it will be further classified into six types namely AA, AB, AC, BB, BC and CC based on the quality of the two faces, each being of three kinds namely A, B and C. After pressing, the finished plywood should be reconditioned to a moisture content not less than 8 percent and not more than 16 percent.

57.6 THICKNESS OF PLYWOOD BOARDS

Board	Thickness
3 ply	3mm
	4mm
	5mm
	6mm
5 ply	5mm
	6mm
	8mm
	9mm
7 ply	9mm
	13mm
	16mm
9 ply	13mm
	16mm
	19mm
11 ply	19mm
	22mm
	25mm

M-58 FLUSH COCK:

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

HYDRAULIC ENGINEER
SURAT MAHANAGAR SEVA SADAN.

SIGNATURE AND SEAL OF THE CONTRACTOR:

NAME AND ADDRESS:

DATE:

6.20.3 ITEMWISE DETAILED TECHNICAL SPECIFICATIONS OF PREPARATIVE ACTIVITIES

Item No. 1 :Topographical Survey and Mapping

A detailed topographical survey, of the components involved as shown in the boundary limit, within the project area shall be carried out using Total Station equipment and the spot levels and the contours at 0.5 m interval shall be carried out & stored in editable digital format on the GIS base. Contractor will survey all underground utilities located within the Sub Project Area up to 1.5 m depth and mark on GIS based maps.

Mode of Payment :

The payment shall be made on kilometer basis.

Item No. 2 : Consumer Survey

Consumer Survey / Consumer Matching and Geo-Spatial Data Integration as Specified to the satisfaction of Engineer In charge/ Project Management Consultant etc. complete.

1.1 Scope

This specification covers consumer survey, Engineering surveys, investigations, inventory and condition assessment and digitization on GIS platform to visualize and model the entire water supply network in the Command area from source to household. This includes preparation and maintenance of comprehensive data regarding complete water supply system with the help of latest softwares for optimization of maintenance works and future documentation

1.2 CONSUMER SURVEY

SCOPE OF WORK:

This specification covers the work of carrying out a consumer survey in the Service Area to record all potential and existing consumers. The survey should capture, inter alia, the number of existing and potential domestic, commercial, bulk and industrial consumers. The data to be collected during the survey will be finalized in consultation with SMC.

OBEJECTIVES:-

The objectives of the survey are:

Details of consumption of water by different beneficiaries, i.e. Domestic, Industrial Commercial, non domestic etc.

- Determine the perception of water services received.
- Provide facts for formulation of policy for Water billing and revenue collection
- Provide information and measures to be taken to improve the efficiency and financial performance of the Water distribution system.
- Evaluate the quality of service when reporting problems or making enquiries.
- Determine the level of awareness of promotional water conservation initiatives.
- Identify issues relating to payment and billing for services.

COMPONENT INCLUDES

Survey of the Utility

- 1 Survey of Consumers in all households in water Distribution area (Residential consumption).
- 2 Survey has to be conducted in all non-domestic consumers like hotels, Lodge, shops (Commercial consumption).
- 3 Survey has to be conducted in all institutions like Schools, hostels, Bus stands, Government offices, hospitals, etc (Institutional consumption).
- 4 Survey has to be conducted in industrial area. (Industrial consumption)
- 5 Survey has to be conducted at all public stand posts (public stand post consumption)
- 6 No of properties dependent on stand post should be found out Also No. of stand post working / non-working should be noted during surveys.

DATA COLLECTION

Survey form has main five categories as below

1. Identification –

Under this category basic information has to collect his house number, complete address, telephone number, etc.

2. Economic status -

Under this category data has to be collected like name of respondent, sex, education, occupation, family income and size of family etc.

3. Details of House / Building –

Data to capture in this section are type of building, where they live, and construction of building. Also information about number of water closet, number of total taps use in house, uses of water like whether they use water for gardening.

4. Connection Details

In this data collect information of the customer / owner on whose name the connection is Register. Bill connection no. of connection name must be fill accurately.

5. Quantity and use –

Use of water for daily activities in liters from various sources.

6. Health Information:

Information of main diseases occurred in last one year.

TRAINING

Two days training course has to be conducted for surveyor by staff of the company. The aim of the training will be to build their capacities to conduct survey successfully. All surveyors will be given two days training on how to conduct survey, how to interact with respondent, how to facilitate to respondent, how to fill information in the survey form. How to read facial expression of respondent, so that surveyor can get correct information.

METHODOLOGY

Survey has to be conducted house to house

The survey has to simply design to collect information about customer perceptions, their billing habits, their water consumption and usage, their misunderstanding about the water tariff and system, their satisfaction area.

Methodology is an operational framework within which facts are placed so that their meaning may be seen more clearly. The scientific method is further a systematic and organised series of steps that ensures maximum consistency and objectivity in researching a problem.

This survey has to be conducted in which data collectors have to participate as facilitator to the respondents. Data has to be collected by utilising structured interviews conducted for a total number Household recorded in Municipals Corporation.

A disadvantage of employing interviews to gather data is that the responses given may not be accurate and may not reflect real behavior. Respondents may also provide wrong information and may forget or lack the information required. These disadvantages of the selected data gathering method may well influence the findings of this survey. The surveyor should take care such matters.

The interview schedules questionnaires for the structured interviews have to supply by the Water supply and Sanitation Department. These schedules and survey approach had to be kept consistent for all areas and wards.

Properties shall be taken as per the property register of SMC.

If a single property / Building contains no. of flats, then nomenclature of flat in the building shall be represented as 300/1, 300/2 and so on.

For Chawls and or tenants within a property extra numbers to be considered.

Illegal properties or M.C. water connections shall be identified during consumer survey and shall be shown on G.I.S. Map. By checking day today Register or unregistered consumer & take note in consumer form also.

The contractor has to find out total No. of properties having connection and total no. of properties without connection. Also he has to find out from where the properties without connection gets the water. This should clearly be mentioned in the consumer survey report.

Mode of Measurement and Payment :

Breakup of Payment of rate stipulated in schedule B shall be based on completion of activities at stages below:

1. After completion of consumer survey 50 %

2. After computerization & submission 20 % of computerised data in excel worksheet for checking.
3. After submission of analysis of data and report of computerization data. 10 %
4. After validation approval for the data and report 10 %
5. Submission of G.I.S. layer 10 %

ItemNo.3 :Preparation of GIS Map

Preparation of GIS based consumer mapping, survey & investigation, plotting assets on GIS map by linking with Geospatial data base and hydraulic modeling using suitable software for water supply system.

1.3 Survey of Existing water supply System and digitization on GIS Platform

1.3.1 Scope of the Work

This specification covers the survey, investigation, digitization work and also preparation and maintenance of comprehensive data regarding complete water supply system with the help of latest softwares for optimization of maintenance works and future documentation and digitization of the same on GIS platform.

1.3.2 General

Carry out preliminary activities of surveying all the components of existing water supply system with their details by GPS mapping.

Confirm all ground and underground assets such as pipeline, pumping station, service reservoirs and other important appurtenances by using GPS & pipe locator or GPR technique.

Confirmation of location and other important information of all existing components related to water supply project and correcting same on the base map.

Inserting all the collected information on GIS platform (satellite image & existing Base map will be provided) and preparation of the detailed base map of existing water supply system.

While updating the base map the alignment of existing pipeline (whether left or right side of the road) and interconnections of the existing pipeline network should be corrected according to the road along which the pipelines are laid.

Survey form for surveying existing water supply system should be approved from the authority and bellow is the list of existing Water Supply System Components to be surveyed as per approved survey form & the collected information to be updated on the base map and GIS platform.

1.3.3 List of the Water Supply Components:

1.3.3.1 Pipe network and appurtenances

- 1. Pipe details**
 - a. Diameter
 - b. Length
 - c. Material
 - d. Pressure class of the pipe
 - e. Installation year
 - f. Lining details
 - g. Depth from Ground Level

- 2. Control Valves/ Gate Valves/ Sluice Valves**
 - a. Diameter
 - b. Material
 - c. Valve type
 - d. Zone / DMA name
 - e. Installation year
 - f. Make
 - g. Operation time

- 3. Isolation Valves**
 - a. Diameter
 - b. Material
 - c. Valve type
 - d. Installation year
 - e. Make

- 4. Air Valve**
 - a. Diameter
 - b. Material
 - c. Valve type
 - d. Installation year
 - e. Make

- 5. Scour Valve**
 - a. Diameter
 - b. Material
 - c. Valve type
 - d. Installation year
 - e. Make

- 6. PRV**
 - a. Diameter
 - b. Material
 - c. Valve type
 - d. Installation year
 - e. Pressure Setting
 - f. Make

7. **Bulk flow meter**
 - a. Diameter
 - b. Material
 - c. Flowmeter type
 - d. Installation year
 - e. Make
8. **Pressure Transmitter**
 - a. Material
 - b. Type
 - c. Installation year
 - d. Make
9. **Consumer connection/meter**
 - a. Diameter
 - b. Connection Type
 - c. Material
 - d. Installation year
 - e. Make
10. **Flow Control Valve**
 - a. Diameter
 - b. Material
 - c. Valve type
 - d. Installation year
 - e. Make
11. **Hydrant**
 - a. Diameter
 - b. Material
 - c. Hydrant type
 - d. Installation year
 - e. Make
12. **End plug or end stop**
 - a. Diameter
 - b. Material
 - c. Installation year
 - d. Make

1.3.3.2 Structural, Mechanical & Electrical Component

1. **Water Treatment Plant**
 - a. Name
 - b. Capacity
 - c. Eleven
2. **Service Reservoir**
 - a. Name
 - b. Capacity
 - c. Staging height
 - d. LDL
 - e. FSL

3. **Pumping Station**
 - a. Name
 - b. Elevation
 - c. Number of Pumps

4. **Pump**
 - a. Type
 - b. Discharge
 - c. Head
 - d. Make

5. **Sump**
 - a. Size
 - b. Capacity
 - c. Level

6. **Intake structure**
 - a. Location
 - b. Level
 - c. Size

7. **Valve Chamber**
 - a. Location
 - b. Size
 - c. Zone

8. **Manhole**
 - a. Location
 - b. Size
 - c. Zone

1.3.4 For carrying out the work, following data will be made available,

Latest database ward / zone wise in soft copy format on GIS platform the same to be verified and to be updated by the contractor for greatest accuracy.

List of Attributes for every water supply components to be collected/ documented.

Existing base map and satellite image for updating of existing water supply system components

1.3.5 The objectives of preliminary survey and digitization work,

Main objective is to prepare Geo-referenced database of existing water supply system .i.e. updating of base map as per the instructions from authority.

To provide information required for execution of the project.

To provide information to improve the efficiency and financial performance of the water distribution system.

To provide details of operations of existing water supply system.

To improve efficiency, decision-making and communication by integrating various multiple and complex sets of information

To provide all the technical and other details of existing water supply system.

1.3.6 Geo-Spatial Data Integration

After survey & field data collection work, data integration on GIS platform and preparation of base map will be performed. This will include the following

Updating of base map for the infrastructure details collected. This has to be done in for all infrastructure details such as roads, footpath, medians, traffic signals, trees etc.

Updating & Drawing all the details collected in different layers as per the dimensions and locations on GIS and on the base map. For this the location attribute collected in survey for each feature will be used.

The scale of the base map is recommended to be at 1: 2000, 1:5000 and 1: 10000 scale based on the availability.

1.3.7 Finalization of GIS Data for Water Supply Scheme

The finalized data after getting all the approvals integrated into the GIS system developed for client. The outputs should be submitted in following formats

Spatial data in the form of shape and geo-database.

Non-spatial data in form of tables in Oracle or Access and Excel.

Base Map with all existing / proposed water supply components

Ward/Zone wise report including hardcopy output.

Mode of Payment :

The payment shall be made on square kilometer basis.

Item No. 4 : Preparation of Service Improvement Plan

Hydraulic Modeling requirements

The Contractor shall develop a Hydraulic Network Model (HNM) for water supply system based on DMAs of Operational zones. The data related to water supply infrastructure like Reservoirs, Pumping Stations, rising mains and distribution system , valves and demandallocations shall be obtained through field baseline study and consumer survey captured on the network model.

The hydraulic network modelling by using latest soft-wares shall be carried out by collecting the actual property wise water demand allocated to the nearest junction. Following broad guidelines may be followed during hydraulic modeling:

The junction shall be placed at the branching out/ at the crosses at the valves and where there is a large straight length at every 200 m. The model shall be worked out by considering the domestic demand as 150 lpcd water supply and actual demand for commercial and industrial requirement.

The hydraulic water use pattern for the day spread over 24 hours shall be based on the survey data captured through consumer habits of water use in different hours at present and by following the standard pattern, after continuous water supply is successfully implemented.

The storage reservoir capacities shall be modelled to verify the water level in various hours. It shall neither be empty nor overflow. The incoming flow at constant rate shall be decided accordingly.

The DMAs which are still to develop where the present water requirement is quite less as compared to the design demand, the present scenario with existing water demand shall be run and the incoming flow shall be adjusted accordingly.

The minimum pressure in the distribution network when full demand in the zone cum DMA is developed shall not be less than 17 m of water column at consumer meter point. The excessive pressure in the typical areas shall be managed using the appropriate pressure management techniques at distribution system level and other at the individual connection level.

All new connections shall considered and captured as additional demand in the model and updated model.

The work also includes the following :

Pressure Zero Tests:-

A Pressure Zero Test (PZT) shall be carried out in accordance with the procedure detailed in this clause in order to prove that the DMA can be isolated fully from the rest of the pressurised distribution system. PZTs shall not be undertaken when the DMA is isolated from the rest of the distribution system, e.g. as part of a water rationing schedule.

In order to undertake the Pressure Zero Tests sufficient pressure logging points shall be installed to verify that the mains pressure has dropped to zero across all parts of the DMA during the test. Suitable locations for pressure monitoring shall also be identified and installed to regularly monitor Average Zonal Pressure (AZP) and Critical Pressure Points (CPP) in each DMA. All AZP and CPP pressure points shall be permanently monitored at the central SCADA server. The PZT procedure shall be as follows:

1. Any sensitive (e.g. hospitals or schools) or large consumers shall be identified and individually informed of the proposed PZT. A general warning shall be given to all other consumers in accordance with the Employer's procedures.
2. Valves isolating the DMA from the rest of the distribution system shall be confirmed operable prior to undertaking the PZT.
3. PZT's are to take place between 1.00am and 5.00am, or during an alternative suitable period when water is available.
4. Deploy pressure loggers on the pressure logging points and set to 5 minute intervals.
5. Shut the supply valve(s) and boundary valves in order to isolate the DMA.
6. The pressure on the loggers, as read on-site, should fall as soon as the supply and boundary valves are closed. If the pressure falls to zero excluding static head, or reduces but will remain steady for more than one hour, this will be accepted as a successful PZT.
7. If a successful PZT is not achieved, check and sound each supply and boundary valve in turn. Passing valves should be fully closed, where possible, and the PZT repeated.
8. If the PZT is not successful, the Contractor shall organise further investigations to find the cause of the failure and then repeat the PZT.
9. On successful completion of the PZT, open the supply valve(s) and confirm that supplies have been restored to their former level within the DMA. Loggers deployed under (4) above shall be left in place for 7 days after the completion of a successful PZT to confirm the impact of the new boundary on local pressures. Customer contact shall be monitored and reviewed over this period also and any necessary action to rectify supply problems shall be taken by the Contractor in consultation with the Engineer-in charge.
10. Ensure all relevant records are completed before leaving site. Paper and electronic copies of the pressure data logging results shall be retained.
11. Prepare the PZT Completion Report in both hard and soft copies and submit to the Engineer.
12. Dial pressure gauges to also be installed during PZT.

All down loading of data from any logging equipment has to be done in the presence of engineer or may on the written permission of engineer. The printout be taken immediately and signed by engineer.

DMA Establishment:-

Following approval of the DMA Design Report by the Engineer-in charge, establishment of the DMA shall commence.

If consumers experience any water supply problems during the creation and proving of a DMA, or when operating DMA valves, the Contractor shall investigate the water supply problem immediately and make any adjustments to DMA design and implementation necessary to resolve it. Similarly, if the DMA boundary is breached, or boundary valves are operated by others, or the water supply regime is changed after DMA formation, the Contractor shall investigate and rectify such breaches. No claims or requests for extension of time will be considered for such investigations, remedial work or consequent delays.

All installation of pipelines, meters and ancillary works shall be carried out in accordance with the relevant clauses of this Specification.

During installation works pipe sections removed shall be bagged, tagged and sent for analysis in order to provide additional data for pipe condition assessment.

DMA boundaries may only be modified, or DMAs combined or sub-divided, with the approval of the Engineer.

With the isolation of DMA's if any area affected for water supply, Contractors shall need to make temporary arrangement of water supply for the affected area. It also includes the new proposal of the pipe line, valves etc. complete to establish the hydraulically discrete areas.

Close liaison with TMC staff is essential when undertaking any operations on live mains. Arrangements for communications shall be agreed and documented prior to any such operations commencing.

Record Plans

The Contractor shall prepare a DMA record plan showing:

- Limit of the DMA
- Names of all roads in which mains are laid
- Diameter and material type for each main
- Locations and sizes of flow meters
- Locations of all valves, with boundary isolating valves, circulating and step-test valves clearly indicated, numbered and marked Clockwise or anti-clockwise closing
- Valve operating schedule for step-testing

- Total number of domestic and non-domestic consumers (all consumers shall be metered) in the DMA and in each step-test area
- Location of any metered consumers that use large quantities of water in relation to the rest of the DMA or use high flow rates at specific times of the day or week
- Location of all public stand posts

The Contractor shall also provide an Operating and Maintenance (O&M) Manual that details a specification and describes operation and maintenance information for all equipment installed under the Contract, together with the procedures for water loss and leakage reduction and control in each DMA. For each DMA there will also be a DMA File recording the historical development of the DMA, its features, results achieved flows and leakage levels, trends, etc. The DMA Files shall be up-dated regularly as work is undertaken in each DMA.

All record plans and the O&M Manual shall be prepared in electronic format using the specified software and copied to CD. Paper copies of the record plans shall be A1 size. Five copies (paper) and two digital on CD of each DMA shall be issued to the Engineer-in charge.

Deliverables

Deliverables are briefly summarized below:

- Undertake pipeline mapping, location and interconnectivity surveys, and house connection survey
- Development of the Hydraulic Model and Hydraulic Analysis by providing Water Gems/equivalent software of unlimited nodes and pipes.
- Hydraulic analysis shall be done through latest version of Water Gems/equivalent software.

The cost of Water Gems /equivalent software need to be considered in the item. No separate payment shall be considered.

- Design DMA (including initial network models) and Establish DMA boundary (install boundary valves / cap mains, and install pressure monitoring points) Formation of District Meter Areas
- Identification of Average Zonal Pressure (AZP) and Critical Pressure Points (CPP) for each of the

Pilot zones and providing of data logger on the same & Undertake Pressure Zero Test

- Procurement and installation of bulk / DMA meter on inlet and outlet: volume of production (Distribution input). The cost of bulk / DMA meters, valves, rehabilitation of network will be paid separately as per bill of quantities.

- Procurement of DMA meters, for flow measurement, and consumer meters, valves for assessing consumption need to be done during this phase of the contract. The cost of the same will be paid from price bid.
- Preparation & execution of rehabilitation & Development plan for achievement of the performance targets as set in the contract.
- Record DMA meter readings and all consumer connections, stand post and slum area meters over set period.
- Final out put of DMA establishment is development of initial water balance and initial water loss levels as per formula below.

Water Loss (NRW) is widely reported in percentage terms. However, the water loss for each DMA should be expressed as follows:

$$\text{Initial \% NRW} = X - (A + B + C + D) \times 100 \%, X$$

Where:

X = Water input to the system (DMA) during the period

A = Water billed during the period

B = Water legally supplied but not billed (including slum and stand post consumption) during the period

C = Operational use (scouring, jetting, dust suppression, etc.) during the period

D = Tankers metered and billed/unbilled during the period

Cost under this item includes:-

1. Experts services
2. Design & SIP
3. Survey & investigation
4. Software (ARC GIS Editor, Water GEMS) & hardware's
5. Report generation
6. Water balance
7. Man power , equipment's
8. All item other than bills of quantity
9. Training

Cost under this item excludes:-

Cost to be paid separately under respective bills of quantity.

1. All items executed like house service connection, repairs, rehabilitation of network, pipe laying, valves, meters, water meters etc.

The performance of the contractor will be evaluated based on the successful establishment of the DMA's and will payable in terms of DMA fees. The formula to derive the DMA Fees as per performance is detailed out in Schedule 5 : Contract Payment Terms of the bid document.

Mode of Payment :

The payment shall be made on the approval of SIP by competent authority of SMC / consultant basis.

6.20.4 ITEMWISE DETAILED TECHNICAL SPECIFICATIONS OF WATER DISTRIBUTION STATION (2 NOS.) WITH BOOSTER HOUSE, SECURITY CABIN, TOILET BLOCK, COMPOUND WALL WITH & GATE AND INTERNAL ROAD

DTS:(1)

Clearing the site, setting out the layout, cutting of trees and carting its logs to any of SMC's store in contractors own vehicle.

The site shall be cleared of all trees having a girth of 60 cm or less, brushwood, loose stone, vegetations, bushes, stump and other objectionable materials. The roots of trees shall be removed to a depth of 60 CM below the required foundation level. All the materials cleared will be the property of the Corporation. Useful materials shall be arranged in convenient stacks. Unsuitable materials shall be burnt or otherwise disposed off by the Contractor at his own cost as directed by Engineer without causing any nuisance, inconvenience or damage to the work, property or people in the neighborhood.

All holes existing or produced by digging up roots, shall be carefully filled up with earth, well watered after ramming and leveled off.

After clearing the site, the line out shall be properly set out in true line, level and corners as shown in the plans and as directed by the Engineer. The Contractor shall provide all labour and materials such as lines, strings, pegs, nails, stones, mortar, concrete etc. required for fixing and maintaining the bench marks and other marks as long as they are required for the work in the opinion of the Engineer.

The center line should be marked on masonry pillar which must remain in position till the superstructure starts. The Contractor shall provide all necessary labours, pegs, string and other necessary materials.

If the Contractor defaults in fixing and maintaining bench marks and other marks as directed within the specified time they may be restored by the Engineer at the cost of the Contractor. Levels of the ground shall be taken and recorded in the presence of the Contractor or his authorized representative before the excavation is started to serve as the basis of measurement. If there is any disagreement the Contractor shall inform in writing to the officer concerned with specific reference, before starting further work. Once further work is started no cognizance of any complaint shall be taken. Merely not signing the book shall not be deemed as disagreement.

The permission will be given after the checking of layout and no work can be started without sanctioning the correct layout by the Engineer-in-charge. The Contractor is bound to correct all errors of setting out at his own expense.

The item includes all necessary labour, materials and tools required for carrying out the work as described above.

The rate shall be paid on a lump sum basis.

DTS:(2)

Excavation for foundation including sorting out and stacking of useful materials and disposing the excavated stuff up to 50m lead and lift as mentioned below in all sorts of soil. Item also include shoring, struting etc. if required and bailing out of water (dewatering) if necessity arises with contractors equipment. (if temporarily found). All excavated materials will be property of SMC.

DTS:(2-A)

Excavation for foundation up to 1.5m depth including sorting out and stacking of useful materials and disposing the excavated stuff up to 50 mt lead. All excavated materials will be property of SMC.

2A.0 GENERAL

Any soil which generally yields to the application of pick axes and shovels or jumpers scarifiers phawaras, rakes or any such excavation equipment or organic soil, gravel, silt, sand turf loam, clay, peat etc. fall under this category.

2A.1 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 shuttering at his own cost and as approved by the Engineer – in – charge. The payment for such precautionary measures shall be included in this work. 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 other reason excavation is made deeper or wider than that shown on the plan or as directed. The extra depth or width shall be made up with concrete of the same proportion as specified for the foundation concrete at the cost of the Contractor. The excavation up to 1.5 mts depth shall be measured under this item. The site conditions may require excavation in parts as per schedule of excavation. No extra payment will be claimed for this operation schedule.

2A.2 DISPOSAL OF EXCAVATED MATERIALS :

No material excavated from the foundation trenches, of whatever kind they may be are to be placed even temporarily upto 1.5mts or at the distance prescribed by the Engineer, from the outer edge of excavation. All materials excavated shall remain the property of the Corporation. Rate of excavation shall include sorting out of useful materials and stacking them separately as directed within the specified lead. Materials suitable and useful for back filling or other use shall be stacked in convenient places but not in such a way as to obstruct free movement of men, animals and vehicles or encroach upon the area required for constructional purposes. The site shall be left clean of all debris on completion.

Materials suitable for backfilling shall be stacked at convenient places within a lead of 50 Mts.

2A.3 DISPOSAL OF EXCAVATED MATERIALS IS SUBJECT TO THE FOLLOWING :

Unsuitable materials obtained from clearing site and excavation shall be disposed off within a lead of 50 mts. as directed. Useful materials obtained from cleaning site and excavation shall be stacked within lead of 500 mts. beyond the building area of 500 mts. and will be allowed to be used by the Contractor on payment at rates laid down in the contract or is not so laid down, at scheduled rates of the Division or at mutually agreed rates if there are no such rates in the schedule of rates.

2A.3.1 The measurement of excavation in trenches for foundation shall be made according to the sections of trenches shown on the drawing or as per sections given by the Engineer-in-charge of as directed. No payment shall be made for surplus excavation made in excess or above requirements or due to stopping and sloping back as found necessary on account of conditions of soil and requirements of safety or construction schedule requiring excavation to be done in parts.

2A.3.2 No extra payment shall be made for temporary pumping of water / sewage due to abnormal adverse conditions / climate.

2A.3.3 The rate shall be for a unit of one cubic meter.

NOTE: ***Excavation shall be in 1:5 slope (one horizontal and five vertical). These slopes shall be maintained after 30 CM from the edge of P.C.C. This shall be applicable at all depth.***

DTS:(2-B)

Excavation for foundation for depth from 1.5 m to 3.0 m including sorting out and stacking of useful materials and disposing the excavated stuff up to 50 mt lead. All excavated materials will be property of SMC.

2B.1 WORKMANSHIP

2B.1.1 The relevant specification of DTS No.2 (A) shall be followed except that the excavation work shall be carried out in all sorts of soil with lift 1.5 Mts. to 3.0 Mts.

2B.2.0 MODE OF PAYMENT

2B.2.1 The relevant specification of DTS No. 2(A) shall be followed.

2B.2.2 The excavation work of lift 1.5 Mts. to 3.0 Mts. shall be measured under this item.

2B.2.3 The rate shall be for a unit of one cubic metre.

DTS:(2-C)

Excavation for foundation for depth from 3.0 m to 4.5 m including sorting out and stacking of useful materials and disposing the excavated stuff up to 50 mt lead. All excavated materials will be property of SMC.

2C.1 WORKMANSHIP

2C.1.1 The relevant specification of DTS No.2 (A) shall be followed except that the excavation work shall be carried out in all sorts of soil with lift 3.0 Mts. to 5.0 Mts.

2C.2.0 MODE OF PAYMENT

2C.2.1 The relevant specification of DTS No. 2(A) shall be followed.

2C.2.2 The excavation work of lift 3.0 Mts. to 5.0 Mts. shall be measured under this item.

2C.2.3 The rate shall be for a unit of one cubic metre.

DTS:(2-D)

Excavation for foundation for depth from 4.5 m to 6.0 m including sorting out and stacking of useful materials and disposing the excavated stuff up to 50 mt lead. All excavated materials will be property of SMC.

2D.1 WORKMANSHIP

2D.1.1 The relevant specification of DTS No.2 (A) shall be followed except that the excavation work shall be carried out in all sorts of soil with lift 5.0 Mts. to 6.0 Mts.

2D.2.0 MODE OF PAYMENT

2D.2.1 The relevant specification of DTS No. 2(A) shall be followed.

2D.2.2 The excavation work of lift 5.0 Mts. to 6.0 Mts. shall be measured under this item.

2D.2.3 The rate shall be for a unit of one cubic metre.

DTS:(2-E)

Excavation for foundation for depth from 6.0 m to 7.0 m including sorting out and stacking of useful materials and disposing the excavated stuff up to 50 mt lead. All excavated materials will be property of SMC.

2E.1 WORKMANSHIP

2E.1.1 The relevant specification of DTS No.2 (A) shall be followed except that the excavation work shall be carried out in all sorts of soil with lift 6.0 Mts. to 7.0 Mts.

2E.2.0 MODE OF PAYMENT

2E.2.1 The relevant specification of DTS No. 2(A) shall be followed.

2E.2.2 The excavation work of lift 6.0 Mts. to 7.0 Mts. shall be measured under this item.

2E.2.3 The rate shall be for a unit of one cubic metre.

DTS:(2-F)

Excavation for foundation for depth from 7.0 m to below including sorting out and stacking of useful materials and disposing the excavated stuff up to 50 mt lead. All excavated materials will be property of SMC.

2E.1 WORKMANSHIP

2E.1.1 The relevant specification of DTS No.2 (A) shall be followed except that the excavation work shall be carried out in all sorts of soil with lift 7.0 Mts. to below .

2E.2.0 MODE OF PAYMENT

2E.2.1 The relevant specification of DTS No. 2(A) shall be followed.

2E.2.2 The excavation work of lift 7.0 Mts. to below shall be measured under this item.

2E.2.3 The rate shall be for a unit of one cubic metre.

DTS:(3)

Conveying, carting and removing of surplus excavated stuff from the site to any place within the Municipal limit as directed by the Engineer In Charge including loading, unloading, carting, dumping and / or spreading as directed etc. complete.

3.0.1 WORKMANSHIP:

3.1.1 The contractor has to convey the surplus excavated stuff from the site to the place within the municipal limit shall be dumped and / or spread in such a way as not to obstruct the path of vehicles but it shall also make approach to lay the earth beyond that dump. Neither any excuse for difficulties for passing the vehicle over the dumped earth shall be allowed nor any extra charge will be paid to the contractor for the same.

3.1.2 The conveying of earth shall be done in such a manner that it should not cause any delay in the progress of the work.

3.1.3 During the conveying of the earth due care should be taken that the earth should not be misused or wasted. The contractor shall have arranged to collect the mix-spread earth with his own coat.

3.1.4 The earth should be loaded, unloaded and spread or dumped in the presence of the Engineer-in-charge or his representative.

3.2.0 MODE OF MEASUREMENT AND PAYMENT

3.2.1 The conveyed earth shall be measured by the measurement of the conveying vehicles. The measurement shall be recorded by the Engineer-in charge or his representative and in token of his acceptance and as per the exact measurements at site.

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

DTS:(3A)

Filling pano sand for foundation including watering, ramming and compacting etc.

1 The sand to be used for filling shall be free from salt, sit, dirt and organic or other foreign matter. No soil like black cotton soil or ordinary soil shall be allowed to use.

2 The workmanship shall be in good manner and shall as per the directed by the Engineer in charge.

3 MODE OF MEASUREMENT AND PAYMENT

The payment shall be made for quantity of sand filling on cubic metre basis.

DTS:(4)

Filling with selected excavated earth (excluding rock) in trenches, plinth / sides of foundations/side of walls etc. in layers not exceeding 20 CM in depth consolidating each deposited layer by ramming and watering etc. complete as directed by the Engineer-in-charge.

4.1.0 WORKMANSHIP:

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

4.1.2 As soon as the work in foundation has been completed and measured the site of foundation shall be cleared of all debris, brick bats, mortar dropping and filled with earth

in layers not exceeding 20 cms. Layers 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 butt ends of crowbars where rammer cannot be used.

- 4.1.3 The plinth shall be similarly filled with earth in layers not exceeding 20 cms. adequately watered and consolidated by ramming with iron or wooden rammers. When filling reaches finishing level, the surface shall be flooded with water for at least 24 hours and allowed to dry and then consolidated.
- 4.1.4 The finished level of filling shall be kept to shape intended to be given to floor.
- 4.1.5 In cases of large heavy duty flooring like factory flooring, the consolidation may be done by power rollers, where so specified. The extent of consolidation required shall also be as specified.
- 4.1.6 The excavated stuff of the selected type shall be allowed to be used in filling the trenches and plinth. Under no circumstances black cotton soil be used for filling the plinth.
- 4.2.0 MODE OF MEASUREMENTS AND PAYMENT:
- 4.2.1 The payment shall be made for filling in plinth and trenches. No deduction shall be made for shrinkage or voids, if consolidated as instructed above.
- 4.2.2 The rate shall be for a unit of one cubic meter.

DTS:(5)

Providing and laying of P.C.C. as sub base to the foundation of walls, counterforts, bottom slab etc. in 1:3:6 (1 Cement : 3 Sand : 6 Coarse sand) nominal mix as per IS:456:2000 using 25mm to 37mm size B.T.metal as a coarse aggregate. The item includes mixing by mechanical device, formwork, placing in position, ramming, curing, leveling etc. complete as per specification and as directed by the Engineer in charge.

- 5.1.0 MATERIALS:
- 5.1.1 Water shall conform to M-1, Cement shall conform to M-3. Sand shall conform to M-5 Stone aggregate 40-mm nominal size shall conform to M-9.
- 5.2.0 WORKMANSHIP:
- 5.2.1 General :

Before starting concreting the bed of foundation trenches shall be cleared of all loose materials, leveled, watered and rammed as directed.
- 5.2.2 Proportion of Mix:

The proportion of cement, sand coarse aggregate shall be 1 part of cement, 3 parts of sand 6 parts of stone aggregate measured by volume.
- 5.2.3 Mixing:

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 Engineer-in-charge. When hand mixing is permitted by The Engineer-in-charge in case of break down of machinery

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 required shall have to be used without any extra cost. The mixing in mechanical mixer shall be done for a period of 1 ½ to 2 minutes. The quantity of water shall be just sufficient to produce dense concrete of required workability for the purpose.

5.2.4 Transporting and placing the concrete:

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

Compacting : The concrete shall be rammed with heavy iron rammer and rapidly to get the required compaction and to allow the interstices to be filled with mortar.

5.2.5 Curing:

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

5.3 MODE OF MEASUREMENT AND PAYMENTS:

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

DTS:(5A)

Providing & laying cement concrete 1:2:4 (1 cement, 2 Coarse sand, 4 graded stone aggregate 20 mm nominal size) and curing complete excluding cost of form work in foundation and plinth etc.

MATERIALS:

Water shall conform to M-1, Cement shall conform to M-3. Sand shall conform to M-5 Stone aggregate 40-mm nominal size shall conform to M-9.

WORKMANSHIP:

General :

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

Proportion of Mix:

The proportion of cement, sand coarse aggregate shall be 1 part of cement, 2 parts of sand 3 parts of stone aggregate measured by volume.

Mixing:

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 Engineer-in-charge. When hand mixing is permitted by The Engineer-in-charge in case of break down of machinery 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 required shall

have to be used without any extra cost. The mixing in mechanical mixer shall be done for a period of 1 ½ to 2 minutes. The quantity of water shall be just sufficient to produce dense concrete of required workability for the purpose.

Transporting and placing the concrete:

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

Compacting :

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

Curing:

After the final set, the concrete shall be kept continuously wet, if required by ponding for a period of not less than 7 days from the date of placement or as per requirement of IS – 456 -2000

MODE OF MEASUREMENT AND PAYMENTS:

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

DTS:(6)

Providing, mixing, placing, compacting by machine vibrator, curing, testing Design mix concrete as per IS 456:2000 (latest revision) and tender specification in all items including cost of form work and excluding cost of reinforcement.

RCC M:30 Controlled concrete for,

- (a) Bottom raft**
- (b) RCC wall**
- (c) Columns, counterforts etc. UG tank**
- (d) Tie beams sunk & bracket common header**
- (e) Top slab of UGSR and platform for panel**
- (f) Staircase**

The intent of this module is to bring out only the special requirements associated with the design and concrete work.

Any approval, instructions, permissions, checking, review etc., whatsoever by the Engineer, shall not absolve the Contractor of his responsibility and obligation towards the adequacy, correctness, completeness, safety, strength, workmanship, quality, target dates etc. of the work.

6.1 REINFORCED CEMENT CONCRETE (RCC) MIX DESIGN (M:30)

The Contractor shall get the concrete mix designed confirming to various design parameters given in these specifications and latest revision of IS:10262 for each grade of concrete mentioned above by a Government approved laboratory. The cost / charge of the MIX DESIGN work shall be borne by the Contractor.

The MIX DESIGN shall be got approved from the Structural Consultant. No volume batching shall be allowed at site. The concrete mix at site shall be done by Digital batch

mixer only. The proportion of cement, sand and coarse aggregates, water and admixtures if any shall be determined by weight. The Contractor shall make arrangements to weigh water by an electronic device at the site.

The Contractor shall follow the following specifications for mix design reinforced cement concrete work.

6.1.1 Proportioning Mix:

The mix of fine and coarse aggregate, cement and water as per the DESIGN MIX shall give the most dense concrete confirming to minimum quantity of cement paste and maximum water cement ratio for binding the materials to give required strength, Water content and the water cement ratio shall give the specified strength with the materials proposed for use in actual work carried out before the work is started, adopting the consistency suitable for the work and method of compaction that will be actually used on site subject to the water cement Ratio as Tabulated separately.

Target strength for M30 and shall be as detailed in the IS-456-2000.

6.1.2 Test:

Tests shall confirm to the specifications laid down in I.S. 456 – 2000. These tests shall be got done in an approved laboratory at the cost of Contractor.

a) Preliminary tests :

In preliminary test, three separate tests shall be carried out on samples collected from different stacks. Each test shall be carried out with six samples of 15 cm. (About 6”) cubes and 3 of these shall be tested at 7 days and 3 at 28 days. In preliminary tests the average crushing strength attained shall be 33 percent higher than that required on work tests.

b) Work test:

For each of the work test, 6 samples shall be prepared from the concrete being used on the site, 3 samples being tested at 7 days and the remaining 3 samples at 28 days. Work tests shall be carried out on each of the first six days and subsequently once in three working days or for every 60 cu.m. of concrete which ever is less and also whenever the quality or grading of the materials is changed. When a relation between the strengths at 7 days and 28 days is established, only 3 samples may be prepared and tested at 7 days only. This number of controlled specimen tests may be increased if the Engineer-in-charge considers it necessary.

6.1.3 Field Mix :

In the work tests, bulkage of sand due to moisture, if any, should be allowed for different batches according to the moisture actually present at the time of mixing. The moisture will be taken into account in controlling the mixing water also. The proportions once fixed by preliminary tests shall not be changed so long as the materials are the same, subject only to the quantities of fine aggregate and water being adjusted to compensate for bulkage due to the moisture in sand and free water in fine aggregate at the time of use.

No change of materials shall be allowed unless fresh tests with new materials show satisfactory results.

Water and cement content per batch or concrete as determined MIX DESIGN shall be maintained constant except for suitable allowances to be made for surface moisture of

the aggregates at the time of actual use. Immediately upon the receipt of the award of the contract, the Contractor shall inform the Engineer-in-charge the exact location of the sources of the acceptable materials which he proposes to use and get approved materials to be used. The CONCRETE MIX shall be got designed in an approved laboratory by the Contractor with minimum water cement ratio to give specified strength in the preliminary tests and the proportions got approved by the Engineer-in-charge in writing. These proportions shall be used so long as the materials contains to be of the same quality and from the same source subject only to slight changes in the relative quantities of fine and coarse aggregates for the purpose of promoting workability provided the works tests require the same. If during the progress of the work, the Contractor wishes to change the materials, the proportion shall be fixed on the basis of fresh MIX DESIGN to give the required strength after the Engineer-in-charge is satisfied that the materials satisfy the specifications. No adjustment of cost shall be made for change of proportions of cement fixed in the original preliminary tests.

6.1.4 Maximum Water Cement Ratio :

Sr.No	Types of concrete	Mix Strength	Maximum water cement ratio
1.	Reinforced concrete	(a) M-30	0.45
		(b) M-25	0.5
		(c) M-20	0.55
		(d) M-15	0.60

6.2 DETAILED SPECIFICATONS FOR CONCRETE:

6.2.1 INGREDIENTS

- Cement :**
The cement shall be ordinary Portland Cement confirming to **IS:269**. Under special circumstances other cements may be used with prior approval of Engineer-in-charge. Cement shall conform to M-3
- Aggregate:**
Aggregates shall comply with the requirements of IS:383. Generally aggregates having a nominal size of 20 mm shall be used. Coarse and Fine aggregate shall be weigh batched separately. Sand shall conform to M-5, Grit shall conform to M-6, Graded stone aggregate of design size shall confirm to M-9
- Water :**
Water shall conform to M-1. Water used for mixing and curing shall be as per Clause 5.4 of IS:456-2000.

- 6.2.2 Grades of concrete to be used shall be M10, M15, M20, M25, M30.
The Minimum cement content and maximum water cement ratio and min. grade of concrete shall be as follows :

Table-A		
Concrete Grade	Minimum Cement (in Kg)	Maximum Water Cement Ratio
M15	250	0.45
M20	325	0.55
M25	380	0.50
M30	410	0.45

For concrete with volumetric / nominal mix and other items with use of cement the same shall be as per prevailing standards of SMC.

Note:

1. The contractor shall have to carry out mix design with cement content for the relevant grade as per above table.
2. The contractor shall have to carry out mix design, for the relevant grades keeping in view the maximum cement content level (i.e. as far as possible the cement level shall be between the min. and max. cement content as above).
3. contractor will be allowed to use any admixtures of approved quality to achieve required strength and workability and up to maximum cement content.

All reinforcement shall be free from loose mill scale, loose rust, and coats of paints, oil, mud or other coatings. The Contractor shall get the reinforcement cleaned by using wire brush, rubbing with gunny bags, light acid itching etc. as required.

Workability of concrete shall be as per Clause 7.0 of IS:456-2000.

- 6.2.3 All reinforcement shall be free from loose mill scale, loose rust, and coats of paints, oil, mud or other coatings. The Contractor shall get the reinforcement cleaned by using wire brush, rubbing with gunny bags, light acid itching etc. as required.

- 6.2.4 Workability of concrete shall be as per Clause 6.0 of IS:456.

- 6.2.5 Durability :

In order to provide / produce durable concrete with low permeability, it must have an adequate cement content and a low water cement ratio. By using strong dense, aggregates, sufficient low water cement ratio, ensuring thorough compaction and sufficient hydration of cement through proper curing methods, a sufficient low permeability is achieved. Therefore cement content shall be sufficient to provide adequate workability with a low water cement ratio so that concrete can be completely compacted with the means available.

The permissible limits of chlorides and sulphate in concrete shall be as per Table 1 of IS-456-2000.

6.3 CONCRETE MIX PROPORTIONING

The Concrete mix should be so proportioned that when the concrete is hardened it shall be of the required strength, durability and surface finish. For this purpose the Contractor shall establish a well equipped concrete testing laboratory at site. The results of these shall be sent to Consultant for their comments / approval / suggestion for modification of Design Mix.

- 6.3.1 Strength Requirement of Concrete :

Where ordinary Portland cement conforming to IS: 269 or Portland blast furnace cement conforming to IS:455 is used, the compressive strength requirements for various grades of concrete, controlled as well as ordinary shall be as given in Table-1. Where rapid hardening Portland cement is used, the 28 days compressive strength requirement specified in Table-1 shall be met at 7 days. For controlled concrete, the mix shall be so designed as to attain in preliminary tests, a strength at least 33 percent higher than that

required on work tests, for concrete mix upto and including M-30 and 25 percent higher for higher strengths. Preliminary tests need not be made in case of "ordinary concrete".

Grade of concrete	TABLE-1 Compressive work strength in Kg/cm ² on 150 mm cubes as per Testing conducted in accordance with IS:516.	
	min.at 7 days	min.at 28 days
M-10	70	100
M-15	100	150
M-20	135	200
M-25	170	250
M-30	200	300
M-35	235	350

Note: In all cases, the 28 days compressive strength specified in Table-1 shall be the criterion for acceptance or rejection of the concrete.

When the strength of a concrete mix as indicated by test, lies in between the strength for any two grades specified in Table-1 such concrete shall be classified for all purpose as concrete belonging to the lower of the two grades between which its strength lies.

Field Test cubes shall be taken as per IS 456 required / or directed by Engineer In Charge. The same shall be tested in approved laboratory & results shall comply with required strength of mix used. The cost of taking cubes and testing shall be included in rates quoted.

6.3.2 Nominal Mix Concrete:

Under special circumstances nominal mix concrete for grades of M20 or lower may be used with prior approval of Engineer-in-charge. Nominal Mix concrete shall be as per Table 9 of IS 456:2000

6.4 CONSTRUCTION TOLERANCES

- (a) Length
 - (i) Members upto 3 mt length + 3mm to -6mm
 - 3 mt to 4.5 mt length + 3mm to -8 mm
 - More than 4.5 mt length + 3 mm to -10mm
- (b) Cross-Sectional Dimensions
 - Dimensions up to 15 cm + 2mm
 - Dimensions between 15 cm and 23 cm + 3mm
 - Dimensions greater than 23 cm + 4mm

Straightness : When a straight edge or line is applied to the member it shall not show concavity or convexity exceeding.

For length upto 4.5 mt	4.5 mm
For length between 4.5 mt	6.0 mm
For length exceeding 6 mt	8.0 mm

Shape of Cross Section – No line on the cross section of a member shall deviate from its correct position by an angle exceeding 1 Degree. Vertical members shall not deviate in verticality from its true position by more than 5% of vertical length subject to maximum of 20 mm.

Member which do not confirm to above mentioned constructional tolerances shall be removed and redone or modified / strengthened as per instructions of Engineer-in-charge / Consultant.

6.5 SPECIFICATIONS FOR FORMWORK, CENTERING AND SCAFFOLDING

Materials :

Formwork shall be in plywood, sawn timber or steel as required for walls, stairs, slab, beams, columns, parapets, etc. for all concrete work.

Workmanship :

The formwork shall conform to the shape, lines and dimensions as shown on the drawings and shall be so constructed so as to remain sufficiently rigid and water-tight, during placement and compaction of the concrete. Adequate arrangement shall be made by the Contractor to safe guard against any settlements of the formwork during the course of concreting and after concreting.

Centering :

The centering, which has been got approved should be sufficiently strong and safe before, during and after pouring concrete and should be so erected that it would allow removal of forms in proper sequence without damaging either the concrete or the forms to be removed.

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

Scaffolding :

All scaffolding, hoisting arrangements and ladders etc, required for facilitating of concrete shall be provided and removed on completion work by Contractor, at his own expense. The scaffolding, hoisting arrangement, ladders etc shall be strong enough to withstand all live, dead and impact loads expected to act. The Contractor shall be solely responsible for the safety of the scaffolding, hoisting arrangement, ladders, work and workmen etc.

The scaffolding, hoisting arrangement and ladders shall allow easy approach to the work spot and afford easy inspection.

DTS :(7)

Providing, mixing, placing, compacting by machine vibrator, curing, testing Design mix concrete as per IS 456:2000 (latest revision) and tender specification in all items including cost of form work and excluding cost of reinforcement.

M:20 RCC concrete for, lintel, chajjas, gantry, roof slab, slab beam, footing, column above / below plinth, plinth beam at porch, wall, grade slab etc.

All specifications same as per DTS No. 6 except that concrete mix shall be M20 in place of M30

DTS :(7A)

Providing and laying Controlled Cement Concrete M-200 and curing complete excluding the cost of formwork and reinforcement for R.C.C. work in:

1) Foundations footing base of R.C.C. Wall & mass Concrete base of columns and mass conc.

All specifications same as per DTS No. 7.

DTS :(7B)

Providing, batching aggregates by Digital weigh batch mixer machine, placing, compacting by machine vibrator, curing, testing. Design mix concrete as per IS 456:2000 and tender specification (including plasticizer if needed) in all items including cost of form work and excluding cost of reinforcement. RCC M-20 for

(a)R.C.C. slabs and platform

(b)R.C.C. grade beam

All specifications same as per DTS No. 7.

DTS:(8)

Providing, cleaning, straightening cutting, bending, placing in position, binding with M.S. binding wires including providing concrete cover blocks, TMT Fe-500) deformed bars confirming to IS 1786 for various reinforced concrete members at all levels (yield strength 5000kg/cm²) for U.G. Tank & booster house

8.1.0 MATERIAL:

8.1.1 Mild steel bars shall conform to M-14 cold twisted steel bars (high yield strength deformed bars) shall conform to M-15, Mild steel binding wires shall conform to M-17.

8.2.0 WORKMANSHIP:

8.2.1 The work shall consist of furnishing and placing reinforcement to the shape and dimensions as shown on the drawings or as directed.

8.2.2 Steel shall be clean and free from rust and loose mill scale at the time of fixing in position and subsequent concreting.

8.2.3 Bars shall be bent cold to specified shape and dimensions as per IS:2502, using a proper bar bender, operated by hand or power to attain proper radius of bends. Bars shall not be bent or straightened in a manner that will injure the material. Bars bent during transportation or handling shall be straightened before being used on the work. They shall not be heated to facilitate bending. Unless otherwise specified for mild steel a "U" type hook at the end of each bar shall invariably be provided to main reinforcement. The radius of the bend shall not be less than twice the diameter of the round bar and the length of the straight part of the bar beyond the end of the curve shall be at least four times the diameter of the bar. In case of bars which are not round and in case of deformed bars, the diameter shall be taken as the diameter of the circle having an equivalent effective area. The hooks shall be suitably encased to prevent any splitting of the concrete. The cold twisted steel bars shall be used without hooks at the ends. Deformed bars without hooks shall, however, comply with relevant anchorage requirements.

8.2.4 All the reinforcement bars shall be accurately placed in exactly the same position as shown on the drawings, and shall be securely held in position during placing of concrete by annealed binding wire not less than 1.63 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 the concrete, except where shown on the drawings. Placing bars on layers of freshly laid concrete as the work progresses for adjusting bar spacing shall not be allowed. Pieces of broken stone or brick wooden blocks shall not be used. Layers of bars shall be separated by spacer bars, precast mortar blocks or other approved devices. Reinforcement after being placed in position shall be maintained in a clean condition until completely embedded in concrete. Special care shall be exercised to prevent any displacement of reinforcement in concrete already placed. To prevent reinforcement from corrosion, concrete cover shall be provided as indicated on drawings. All the bars are to be spliced and which are likely to remain exposed for a period exceeding 10 days shall be protected by a thick coat of neat cement grout.

- 8.2.5 Bars crossing each other where required shall be secured by binding wires (annealed) of size not less than 1.63 mm. in such a manner that they do not slip over each other at the time of fixing and concreting.**
- 8.2.6 As far as possible, bars of full length shall be used. In case this is not possible, overlapping of bars shall be done as directed. When practicable, overlapping bars shall not touch each other, but be kept apart by 25 mm or 1.25 times the maximum size of the coarse aggregate whichever is greater between them. Where not feasible, overlapping bars shall be bound with annealed wires, not less than 1.63 mm. thick, twisted tight. The overlaps shall be staggered for different bars and located at points, along the span where neither shear nor bending moment is maximum.
- 8.2.7 Wherever indicated on the drawings or desired by the Engineer-in-charge bars shall be joined 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 IS-226.
- 8.2.8 When permitted or specified on the drawings, joints of reinforcement bars shall be butt-welded so as to transmit their full stresses. Welded joints shall preferably be located at points where steel will not be subjected to more than 75% of the maximum permissible stresses and welds so staggered that at any one section not more than 20% of the bars are welded. Only electric welding using a process which excludes air from molten and conforms to any or all other special provisions for the work shall be accepted.

Suitable means shall be provided for holding bars securely in position during welding. It shall be ensured that no voids are left in welding and when welding is done in two or three stages, previous surface shall be cleaned properly. Ends of the bars shall be cleaned of all loose scale, rust, grease, 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.

8.3.0 MODE OF MEASUREMENT & PAYMENT:

- 8.3.1 For the purpose of calculating consumption, wastage shall not be permitted beyond 7.5%. Excess consumption over 7.5% will be charged at penal rates as per special condition of contract.
- 8.3.2 Reinforcement shall be measured in length including overlaps, separately for different diameters as actually used in the work. Where welding or coupling is resorted to, in place of 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-14 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.
- 8.3.3 The rate for reinforcement includes cost of steel binding wires, its transporting from departmental store to work site cutting, bending, placing 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.
- 8.3.4 The rate shall be for unit of one M.T.

Note: Read M.S. Binding wire instead of G.I. binding wire when and where specified.

DTS :(8A)

Conveying, cleaning, straightening, cutting, bending, placing in position, binding with M.S. binding 16SWG soft iron wires including providing concrete cover blocks, TMT Fe-415 bars conforming to IS 1786 (latest revision) and mild steel reinforcement (yield strength 2600 kg/cm²) conforming to IS:226 for various concrete members including freight, loading, unloading and labour work etc. complete.

All specifications same as per DTS No. 8.

DTS:(9)

Providing and applying 20 mm thick water proofing cement plaster in CM proportion 1:3 with neat cement slurry finish with approved water proofing compound in specified proportion as per specifications including scaffolding, curing etc. comp. as directed by Enigneer in charge.

A. To columns, capitals, inner surface of periphery walls .

B. To Outer surface of periphery of RCC wall periphery walls .

9.1.0 MATERIALS:

Water shall confirm to M-1 Cement mortar shall conform to M-8.

9.2.0 WORKMANSHIP.

- 9.2.1 The work shall be carried out in two coats. The backing coat (basecoat) shall be 12 mm. thick in C.M. 1:3. The relevant specifications of **DTS No.11** shall be followed except that the thickness of back coat shall be 12 mm. average and the proportion shall be of cement mortar 1:3 (1 cement : 3 sand). Before the first coat hardens its surface shall be beaten up by edges of wooden tappers and close dents shall be made on the surface. 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.

The second coat shall be completed to 8 mm thickness in C.M. 1:1 as described above, including raising, sand facing by brushing. The sample of sand face shall be got approved before the work is started. The whole work shall be carried out uniformly as per approved sample.

Water proofing materials to be mixed with 50kg. Bags shall be as recommended by the manufacturers of the water proofing material.

9.2.2 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.

9.3.0 MODE OF MEASUREMENT AND PAYMENT:

9.3.1 The relevant specifications of DTS **No. 11** shall be followed except that the sand face plastering for inside and outside surfaces of UG tank shall be measured and paid under this item.

9.3.2 The rate shall be for a unit of one sq. metre at any level with all lead and lift.

DTS:(10)

Providing and applying 10mm to 12mm thick water proofing cement plaster in cement mortar 1:2 with approved water proofing compound with neat cement slurry finish in specified proportion as per specification incl. Scaffolding curing etc. as directed to underneath of top slab of U.G. tank and booster house.

10.1.0 MATERIALS:

Water shall conform to M-1 Cement mortar shall conform to M-8.

10.2.0 WORKMANSHIP.

All specifications same as per **DTS No. 9.2.0** except the thickness of plaster shall be 10 mm thk. instead of 20 mm thk.

10.3.0 MODE OF MEASUREMENT AND PAYMENT:

10.3.1 The relevant specifications of DTS **NO. 11** shall be followed except that the sand face plastering for inside and outside surfaces of UG tank shall be measured and paid under this item.

10.3.2 The rate shall be for a unit of one sq. metre at any level with all lead and lift.

DTS:(11)

Providing and applying 15 mm thick cement plaster in cement mortar 1:3 with neat cement slurry finish including scaffolding, curing, etc. complete as directed. Internal plaster of Booster House, Parapet wall, stair cabin etc. complete.

11.1.0 MATERIALS

Water shall conform to M-1. The cement mortar of proportion 1:3 shall conform to M-8.

11.2.0 WORKMANSHIP

11.2.1 Scaffolding – Wooden ballies, bamboos, planks, treatles and other scaffolding shall be sound. These shall be properly examined before erection and use. Stages scaffolding shall be provided for ceiling plaster which shall be independent of the walls.

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

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

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

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

11.2.3 APPLICATION OF PLASTER

The plaster about 15 x 15 cms. shall be first applied horizontally and vertically at not more than 2 metres intervals over the entire surface to serve as gauge. The surface gauges shall be truly in place 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 of wooden flat according as 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. Rounding or chamfering, corners, junctions etc., shall be carried out with proper templates to the size required.

Cement plaster shall be used within half an hour after addition of water. Any mortar or plaster which is partially set shall be rejected and removed forthwith from the site. 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 scrapped 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 that 15 cms. 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 points in plaster work shall not also occur on parapet tops and copings as those invariably lead to leakage. No portion of the surface shall be left out initially to be packed up later on.

Each coat shall be kept damp continuously till the next coat is applied 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 to dry weather shall be prevented by hanging mattings or gunny bags on the outside of the plaster and keeping them wet.

11.3.0 MODE OF MEASUREMENTS & PAYMENT

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

11.3.2 All plastering shall be measured in square metre unless otherwise specified. Length, breadth or height shall be measured correct to a centimeter.

11.3.3 Thickness of the plaster shall be exclusive of the thickness of the key i.e. grooves or open joints in brick work, stone work etc. or space between laths. Thickness of plaster shall be average thickness with minimum 15 mm. at any point on this surface.

11.3.4 This item includes plastering at any level.

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

11.3.6 Soffits of stairs shall be measured as plastering on ceiling. Blowing soffits shall be measured separately.

11.3.7 For jambs, soffits, sills etc. for openings not exceeding 0.5 Sq. Mts. each in area for ends of joints, beams, posts, girders, step etc. not exceeding 0.5 Sq. Mts. each in area for and for openings exceeding 0.5 Sq. Mts. and not exceeding 3 Sq. Mts. in each area deductions and additions shall be made in the following manner –

- a) No deductions shall be made for ends of joints, beams, posts etc. and openings not exceeding 0.5 Sq.Mts. each and no addition shall be made for reveals, jambs soffits, sills etc. of these openings for finish to plaster around ends of joints, beams, posts etc.
- b) Deduction for openings exceeding 0.5 Sq.Mts. but not exceeding 3 Sq.Mts. each shall be made as follows and not additions shall be made for reveals, jambs, soffits sills etc. of these openings -
 - i) When both faces of 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 plaster 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 doors, windows etc. on which width of reveals is less than that on the other side. Where width of reveals on both faces of all are equal, deductions of 50% of area of opening on each face shall be made from areas of plaster and / or pointing as the case may be.

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

11.3.9 In case of opening of area above 3 Sq.Mts. each deductions shall be made for opening but jambs, soffits and sills shall be measured.

11.3.10 The rate shall be for a unit of one Sq. Mts.

DTS:(12)

Providing cement vata (10cm X 10cm size) quarter round in cement mortar 1:1 including neat cement finishing, watering etc. complete at any height as directed by the Engineer – in – charge.

12.1.0 MATERIAL:

Water shall conform to M-1, cement mortar shall conform to M-8.

12.2.0 WORKMANSHIP:

The work of cement vata of 10cm X 10cm size shall be carried out at junctions of parapets and terraces as directed by the Engineer – in charge. The vata shall be finished in quarter round shape. The work shall be carried out in the best work man like manner. The portion of vata around the inlet portion of rain water pipe shall be rounded off properly. The work shall be cured for 7 days.

12.3.0 MODE OF MEASUREMENT AND PAYMENT:

The work shall be measured per running meter and the rate shall also be on running meter basis.

DTS:(13)

Providing cement vata (75mm X 75mm size) quarter round in cement mortar 1:1 including neat cement finishing, watering etc. complete at any height as directed by the Engineer – in – charge. For UG.Tank & Booster house, Sky linght , porch etc.

All specifications same as per **DTS No. 12** except the size of vata 75mm x75mm instead of 10cm x 10 cm.

DTS:(14)

Providing throating or plaster drip and moulding to R.C.C. chhaja and projected slab etc. comp. for U.G tank & Booster house.

14.1.0 MATERIALS

Water shall conform to M-1. Cement shall conform to M-3. Sand conform to M-5. Cement mortar shall conform to M-8.

14.2.0 WORKMANSHIP

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

14.3.0 MODE OF MEASUREMENTS AND PAYMENT

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

14.3.2 The rate shall be for a unit of one R.M.

DTS:(15)

Providing and laying 7 (seven) layer tarfelt water proofing as per IS 1609:1966 to the underneath of bottom slab and outer side of peripheral RCC wall & top slab of Booster house etc. complete.

The water proofing treatment shall be provided and laid in seven layers i.e three layers of tarfelt and four layer of bitumen. It shall be of heavy type i.e. three layers of tarfelt as detailed in I.S. 1609 : 1966 and IS 1322 : 1965. The site to be prepared for the water proofing treatment shall be as detailed / provided in IS 3067 :1966 and IS 1609 : 1966.

The item includes the cost of all materials, scaffolding, necessary tools, plants and labour etc. required for the satisfactory completion of this item.

MODE OF MEASUREMENT AND PAYMENT

Item shall be measured and paid on square meter basis at any level with all lead and lift.

DTS:(16)

Providing and applying 20mm thick sand face cement plaster on walls above ground level consisting of 12mm thick backing coat of cement mortar 1:3 and 8mm thick finishing coat of cement mortar 1:1 including scaffolding, curing, etc. complete as directed.

16.1.0 MATERIALS:

Water shall confirm to M-1 Cement mortar shall conform to M-8.

16.2.0 WORKMANSHIP.

16.2.1 The work shall be carried out in two coats. The backing coat (basecoat) shall be 12 mm. Thick in C.M. 1:3. The relevant specifications of **DTS No. 11** shall be followed except that the thickness of back coat shall be 12 mm. average and the proportion shall be of cement mortar 1:3 (1 cement : 3 sand). Before the first coat hardens its surface shall be beaten up by edges of wooden tappers and close dents shall be made on the surface. 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.

The second coat shall be completed to 8 mm thickness in C.M. 1:1 as described above, including raising, sand facing by brushing. The sample of sand face shall be got approved before the work is started. The whole work shall be carried out uniformly as per approved sample.

16.2.2 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.

16.3.0 MODE OF MEASUREMENT AND PAYMENT:

16.3.1 The relevant specifications of **DTS No. 11** shall be followed except that the sand face plastering up to 10 mt. above ground level shall be measured and paid under this item.

16.3.2 The rate shall be for a unit of one sq. metre at any level with all lead and lift.

DTS:(17)

Providing and applying two coats of Super coat Semi Acrylic Exterior Paint (3 Coats may be required in case of darker colours) weather shield of ICI Dulux or Apex Of Asian Paint including applying exterior acrylic primer coat as per manufacturers specification and directions in shade and colour approved by architects, on exterior surface of the building including scaffolding ,preparing the surface, watering ,curing etc. complete and as directed by the site In -Charge.

17.1.0 WORKMANSHIP

17.1.1 The workmanship shall be in good manner and as directed by Engineer in charge. Preparation of base shall be as per engineer in charge and relevant DTS.

17.2.0 MODE OF MEASUREMENT AND PAYMENT:

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

DTS:(18)

Providing, mixing, laying 40mm thick IPS topping (1:1.5:3 – cement : sand : stone aggregate of size 20mm and below) by volume on bottom slab of under ground water tank and on top slab of UG tank as per IS 2571 with mixing of non metallic floor hardner of approved make as per manufacturer's specification including compacting, finishing curing etc. complete as directed by the Engineer – in – charge. For U.G.Tank & booster house etc.

18.1.0 MATERIAL:

1. Water shall confirm to M-1.
2. Cement shall confirm to M-3.
3. Sand shall confirm to M-5.
4. Stone aggregate of size 4.75mm and below shall confirm to M-9. Cement concrete of 1:1.5:3 proportion measured by volume shall confirm to relevant specifications of ordinary grade concrete.
5. water proofing compound.

18.2.0 WORKMANSHIP:

18.2.1 The IPS topping of 40mm thick (Average) is to be laid as per the site condition. The concrete shall be mixed in a mechanical mixer at site of work. Hand mixing may however be allowed for smaller quantities of work and in case of failure of machineries or as permitted by the Engineer – in – charge. It shall be carried out on a watertight platform and care shall be taken to ensure that mixing is continued until the mass is uniform in colour and consistency. However, in such cases 10% more cement than the otherwise required shall have to be used without any extra cost. The mechanical mixing shall be done for a period of 1.5 or 2 minutes. The quantity of water shall be just sufficient to produce dense concrete of required workability for the purpose. Flooring of specified thickness shall be laid in accordance with approved pattern or as directed. Finishing operation shall start shortly after the cessation of beating and shall be spread over period of one to six hours depending upon the temperature and atmospheric condition. The surface shall be left for sometime till moisture disappears from it. Fresh quantity of cement shall be mixed with water to form a thick slurry and spread over the surface while the concrete is still green. Use of dry cement or cement and sand mixture sprinkled on this surface to stiffen the concrete or absorb excessive moisture shall not be permitted. The cement slurry shall then be properly pressed twice by means of iron floats once when the slurry is applied and the second time when cement starts setting and finished floated smooth. The surface shall be marked with starting or B.R.C. fabric jali to make the surface non – slippery as and when directed. The junction of floors with wall plaster, dado or skirting shall be rounded off where so required upto 25mm radius.

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

Prior to the laying of cement concrete flooring, non metallic floor hardener of approved make shall be mixed / laid as per the instruction of the Engineer – in – charge.

The form work shall be provided if necessary as directed by the Engineer – in – charge. Concreting shall be done as per alternate by method with necessary centering either by mastic or cement mortar as directed.

The proportion of water proofing materials to be mixed shall be recommended by the manufacturers of the water proofing material.

18.3.0 MODE OF MEASUREMENT AND PAYMENT:

18.3.1 The rate shall include the cost of all materials and labour involved in all the operations described above. No deduction shall be made or extra paid for any opening upto 0.1 sq.mt. In area in the floor nothing extra shall be paid for laying the floor at different levels in the same room or the courtyard.

The rate shall be for a unit of one sq.mt. at any level with all lead and lift.

DTS:(19)

Providing and constructing brick Work Using 0.23 m thick Fly Ash Bricks Having Crushing Strength Not less Than 35 Kg /Sq.cm in CM 1:6 to retain tar-felt water proofing of peripheral walls of UGSR

19.1.0 MATERIALS

Water shall conform to M-1, Cement shall conform to M-3, Sand shall conform to M-5, Fly ash Bricks shall conform to IS 13757, IS 5454, IS 3495, IS 12894 Cement mortar shall conform to M-8.

19.2.0 WORKMANSHIP

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

19.2.2 Wetting of bricks : The bricks required for masonry work 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 an indication of thorough wetting of bricks.

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

A layer of mortar shall be spread on full width for suitable length of the lower course. Each brick shall first be properly bedded and set home by gently tapping with handle of trowel or wooden mallet. Its inside face shall be flushed with mortar before the next brick is laid and pressed against it. On completion of course, the vertical joints shall be fully filled from the top with mortar. The walls shall be taken up truly in plumb. All courses shall be 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. Thickness of mortar bed shall be 6 to 8mm.

The brick shall be laid with frogs up wards. A set of tools comprising of wooden straight edges, manson'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.

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 metre over the rest of the work. Where this is not possible, the work shall be raked back according to bond (and not left toothed) at an angle not steeper than 45 degrees.

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

19.2.4 Joints : Bricks shall be so laid that all joints are quite flush with mortar. Thickness of joints shall not exceed 12 mm. The face joints shall be raked out as directed by raking tool daily during the progress of work, when the mortar is still green so as to provide key for plaster or pointing to be done.

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

19.2.6 Preparation of Foundation Bed : If the foundation is to be laid, directly on the excavated bed, the bed shall be levelled, cleared of all loose materials, cleaned and wetted before starting masonry.

If masonry is to be laid on concrete footing, the top of concrete shall be cleaned and moistened. The Contractor shall obtain the Engineer's approval for the foundation bed, before foundation masonry is started. When puccas 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.

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

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

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

19.3.0 MODE OF MEASUREMENTS & PAYMENT:

19.3.1 The measurements of this item shall be taken for the brick masonry fully completed for limiting dimensions not exceeding those shown on the plans or as directed shall be final.

19.3.2 No deductions shall be made from quantity of brick work. No extra payment will be made for embedding in masonry holes in respect of the following items –

- i) Ends of joints, beams, posts, girders, rafters, purlins, trusses, corbel, steps etc. Sectional area does not exceed 500 Sq. cm.
- ii) Opening not exceeding 1000 Sq.cm.
- iii) Wall plate and bed plates, bearing of slab, chajjas and like whose thickness does not exceed 10 cms. and the bearing does not extend the full thickness of wall.
- iv) Drainage holes and recesses for cement concrete blocks to embed hold fasts for doors, windows etc.
- v) Iron fixtures : Pipes up to 300 mm. dia. hold fasts of doors and windows built into masonry and pipes etc. for concealed wiring.
- vi) Forming charges of section not exceeding 350 Sq.cm. in masonry.
- vii) Apertures for fire places, shall not be deducted nor shall extra labour required to make splaying of jumps, throating and making arches over the aperture be paid for separately.

19.3.4 The rate shall be for a unit of one cubic metre at any level with all lead and lift.

DTS:(20)

Providing and constructing brick Work Using 0.23 m thick Fly Ash Bricks Having Crushing Strength Not less Than 35 Kg/Sq.cm in CM 1:6 for booster house

All specifications same as per DTS No. 19 but for any level

DTS:(21)

Providing & constructing brick masonry as per detailed drawing using fly ash bricks confirming to IS-13757-1993, IS-5454, IS- 3495, IS - 12894 building bricks having crushing strength not less than 35 Kg/Sq.cm in cement mortar 1:6 (1 cement : 6 fine sand) and as per specifications for parapet wall in line level and plumb including curing, scaffolding etc. comp. of any level as directed by the Engineer-in-charge.

All specifications same as per DTS No. 19 but for any level.

DTS:(21A)

Providing and constructing Half Brick work using fly ash bricks having crushing strength not less than 35 kg/sq. cm in superstructure in cement mortar 1:4 (1 cement : 4 coarse sand)

1. MATERIALS

Fly ash Brick shall conform to M-12(A), Water shall conform to M-1, Cement shall conform to M-3, Sand shall conform to M-5, Cement mortar shall conform to M-8.

2. WORKMANSHIP

Relevant specifications of bricks, wetting and laying of bricks, joints, curing etc. shall conform to item No. 19 except the brick work of half bricks shall be carried out.

Cement mortar used in masonry work shall be in proportion of 1 part of cement and 4 parts of sand by volume.

All bricks shall be laid stretcher wise, breaking joints with those in the upper and lower courses. The wall shall be taken truly plumb. All courses shall be laid truly horizontal and all vertical joints shall be truly vertical. The bricks shall be laid with frogs upwards. A set of masons tools shall be maintained on work as required for frequent checking.

3. MODE OF MEASUREMENTS & PAYMENTS

The half brick masonry work in foundation and plinth shall be measured under this item, the limiting dimensions shall not exceed those shown in the plan or as directed. Any work done extra over the specified dimensions shall be ignored.

The relevant specifications of item No. 19 shall be followed. The length shall be measured nearest to 1 Cm.

The rate shall be for a unit of 1 Sq.Mts.

DTS:(22)

Providing and fixing 6 mm thick ribbed type or other approved type 150 mm. wide P.V.C. water stopper of approved quality in raft, walls etc as per details and / or as directed by the Engineer-in-charge.

22.1.0 The quality of water stoppers shall be approved by the Engineer-in-charge before bringing the same to the site of work. It shall be either "Omal" or "Chem Plast" or any other make as approved by the Engineer-in-charge.

22.2.0 WORKMANSHIP

22.2.1 At every horizontal & vertical joints of water retaining structure, water stopper of approved quality is to be provided as directed by the Engineer-in-charge.

22.2.2 The water stops shall be thoroughly examined before putting it to use. It shall be placed in position carefully so as not to damage the same. Half of the width shall be embedded on each side of the joints between the adjacent sections, when embedding the first half of the width of the water stops great care should be taken to protect the other half from coming into contact with concrete by means of a suitable covering. After the concrete on the first half of the water stop sets, the protecting cover on the other half shall be removed and concrete poured to embed it.

22.2.3 It is essential that the water stop is properly aligned and placed in position during embedding. Where necessary the water stops shall be welded so as to have water proof joints.

22.2.4 The instructions for welding and / or vulcanizing as prescribed by the manufacturer shall be strictly adopted. It shall be seen that during the welding and vulcanizing of two pieces alignment of the central bulb is taken care of as this is essential for the correct finishing of the water stop.

22.2.5 The concrete shall not be poured from excessive height so as not to damage the water stops to prevent bending of the water stops.

22.3.0 MODE OF MEASUREMENT & PAYMENT

22.3.1 This item includes all materials and labour required to carryout the work as detailed above including P.V.C. water stops, tools and materials for welding and / or vulcanizing the joints, plains and maintaining in position etc. complete.

22.3.2 The rate shall be for a unit of a running metre at any level with all lead and lift.

DTS:(23)

Providing and fixing G.I. Crimped mesh of 10 gauge (3.10mm thick) and having opening of 25mm x 25mm of each crimped mesh including fixing M.S. frame of 25mmx5mm on periphery of wooden frames including prime coat of approved quality and two coat of oil painting. Welding the frame with G.I. crimped mesh etc. comp. to the side of sky light of U.G. Water tank and as per instruction of the Engineer in charge.

23.1.0 MATERIAL

23.1.1 The Crimped mesh shall be of Galvanised iron (G.I) hot deep. It shall be of 3.10mm dia (10 gauge) each. G.I. crimped mesh shall have an opening of 25mm x 25mm

23.2.0 WORKMANSHIP

23.2.1 The G.I. Crimped mesh shall be fixed to the existing wooden frame with required battern / M.S. Flats.

23.3.0 MODE OF MEASUREMENTS AND PAYMENT

23.3.1 The item includes for all materials, labours, required to carry out the work as described above.

23.3.2 The measurement shall be paid on sq. metre basis at any level with all lead and lift.

DTS:(24)

Providing and fixing with wooden battens Netlon-type PVC net to the sides of skylight including Indian Teak wood frame of 75 mm x 35 mm using wooden battens of required size including one coat of primer and two coats of approved enamel paint as directed by the Engineer-in-charge.

The P.V.C. net shall be of approved quality (Netlon type). It shall be fixed on wooden frame by using Teak wood scantelling and / or battens of required sizes as directed by the engineer in charge.

The item includes for all materials, labours required to carry out the work as described above including P.V.C. net, scanteling, battens, making holes in R.C.C. or masonry as required the same etc. complete as directed.

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

DTS : (25)

Providing and fixing M.S manhole frame and cover of required size including necessary hold fast arrangement. The frame shall be grouted in the RCC slab at the time of casting the slab. The M.S cover shall not be less than 100 kg/mt2 The frame shall be of M.S angle of size 65 mm X 65 mm x 6 mm. For U.G.Tank & Booster house.

25.1.0 MATERIAL:

M.S. manhole frame and cover of required size shall be manufactured from the 20 mm thick M.S. plate as per instruction of Engineer-in-charge.

25.2.0 WORKMANSHIP:

The M.S. manhole cover shall be fixed as and where directed. The frame of manhole cover shall be embedded firmly in RCC slab while casting the R.C.C. slab. After completion of work, manhole covers shall be sealed by means of thick grease.

25.3.0 MODE OF MEASUREMENT AND PAYMENT:

The rate includes cost of all labour and materials required for satisfactory completion of this item.

The rate shall be for the unit of one kg.

DTS:(26)

Providing and fixing 35 mm thick Indian Teak wood shutters for doors, windows and clear story window including Sal wood frames of finished size 12 cm x 7 cm size including medium quality anodized aluminium fixtures and fastening etc. including primer coat of approved quality and two coats of oil paint etc. complete. For all floor

(a) Windows (partly paneled & partly glazed)

(b) Ventilators (fully glazed)

26.1.0 MATERIAL:

Wood in frame and shall conform to M-20.

26.2.0 WORKMANSHIP:

26.2.1 The item covers the requirement of frames for doors, windows, clearstory windows, their supply and fixing.

26.2.2 Frames:

26.2.2.1 All members of frames shall be exactly at right angles. The right angle shall be checked from inside surfaces of the frames of the respective members.

26.2.2.2 All members of frames shall be straight without any warp or bow and shall have smooth surface well planned on the three sides exposed at right angles to each other. The surfaces touching the wall may not be planed unless. It is required in order to straighten up the members or to obtain the overall sizes with the tolerance as specified.

26.2.2.3 Frame shall have dovetail joints. When clerestory windows is included, it shall be provided by having full length one piece post for door or windows and clerestory window extending the frame on top at the head to the required extent. Horns shall not be provided in the head of the frame, when no sills are provided, the vertical posts of the frame in the ground floor shall be embedded in the sill masonry for 10 cm on upper floor, the vertical posts shall be fixed in the floor or masonry by forming notches 10 mm deep. Slight adjustment of spacing as necessary shall be done to have the hold fasts in the joints of masonry course. The frame shall be erected in position and held plumb with strong support from north sides and built in masonry as it is being built. The transom shall be through tenoned into the mortices of the jamb post to the full width of the jamb post and thickness of the tenon shall be not less than 15 mm.

26.2.3 Tolerance : Unless specially mentioned otherwise tolerance of ± 1.5 mm shall be allowed for each wrought face.

26.2.4 The tenons shall be closely fitting into the mortices and suitably pinned with wood dowels not less than 10 mm dia metre. The depth of rebates for housing the shutter shall be as shown in the detailed drawing or as directed.

26.2.5 The contact surface of tenon and mortise shall be treated before putting together with an adhesive of approved make.

- 26.2.6 Minimum number of three hold-fasts shall be fixed on each side of door and windows frames, one at the center point and the other two at 30 cm from the top and the bottom of the frames. In case of windows and ventilators frames whose height is less than 1 mt. two hold fasts, in each side shall be fixed at quarter points of the frames. The size of each hold fast shall be 300 x 25 x 6 mm and of mild steel with split end. The hold fasts shall be with screws to frames.
- 26.2.7 Mild steel hold fasts shall be protected with coating of coal asphalt tar. The surface of frame abutting the masonry or concrete faces shall be properly treated by applying a coat of approved coating.

DTS: (27)

Providing and laying Green polished kota stone 22 mm thick Slab flooring at all floor levels, over 20 mm av.th. Based of CM (1:6) laid over & joined with grey cement slurry incl. Rubbing & polishing etc comp. for booster house. (Tolerance +/- 2 mm) For All.

27.1.0 MATERIALS

Water shall conform to M-1. Lime mortar shall conform to M-7 cement mortar shall conform to M-8 polished kota stone shall conform to M-32.

27.2.0 WORKMANSHIP

- 27.2.1 Each slab shall be cut to the required size and shape and fine chisel dressed at all the edges. The sides thus dressed shall have a full contact if a straight edge is laid along. The sides shall be table rubbed with on coarse sand before paving. All angles and edges of the slabs shall be true square and free iron chipping and giving a plane surface. The thickness shall be as specified in the item.
- 27.2.2 Bedding for the kotah stone slabs shall be cement mortar 1:6 (1 cement : 6 coarse sand) or L.M. 1:1.5 of thickness 20 mm as given in the description of the item. Subgrade shall be cleaned wetted and mopped. Mortar of the specified mix and thickness shall then be spread, on an area sufficient to receive one kotah stone slab. The slab shall be washed clean before laying. It shall be laid on top, pressed, tapped gently to bring it in level with the other slabs. It shall then be lifted and laid aside. Top surface of the mortar shall then be corrected by adding fresh mortar in hollows or depressions. The mortar 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 topped with wooden mallet till it is properly bedded in level with and close to the adjoining slab. The joint shall be as fine as possible. The slab fixed in the floor adjoining the wall shall enter not less than 10 mm. under the plaster, skirting or dado. The junction between the wall and floor shall be finished neatly. The finished surface shall be in true levels and slopes as directed.
- 27.2.3 The floor shall be kept wet for a minimum period of 7 days so that bedding and joints set properly.
- 27.2.4 Polishing shall be normally commenced after 14 days of laying the stone slab. First polishing shall be done with carborundum stone, of 120 grade grit fitted in the heavy machine and then second polishing shall be done with carborundum stone 220 to 350 grade grit fitted in heavy machine. Water shall properly be used during polishing. The stone shall then be washed clean with water. When directed by the Engineer-in-charge was polish of approved quality shall be applied on the surface with the help of soft cloth over clean and dry surface then the polishing machine fitted with beds shall be run over it.

27.2.5 The holes required for Nahni traps, pipes and any other fitting shall be made without extra cost.

27.3.0 MODE OF MEASUREMENTS OF PAYMENTS

27.3.1 The rate shall include the cost of all materials and labour involved in all the operations described above. The kotah stone flooring shall be measured in square metres correct to two places of decimal, length and breadth shall be measured correct to a centimeters and between the finished face of skirting dedo or mall plaster and no deduction shall be made nor extra paid for opening in floor of areas upto 0.1 Sq. Mt.

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

DTS: (28)

Providing and fixing in position Collapsible steel shutter with vertical channels 20mm x 10mm x 2mm braced with flat iron diagonal 20mm x 5mm size with top and bottom rails of T iron 40mm x 40mm x 6mm with 38mm dia steel pulleys comp. with hooks, nuts, locking arrangement stopper, handles, including applying a priming coat of red lead paint and applying two coats of approved enamel paints. For U.G.Tank & Booster House etc.

28.1.0 MATERIALS

28.1.1 The collapsible gate shall confirm to M-24.

28.2.0 WORKMANSHIP:

28.2.1 "T" Rails shall be fixed to the floor and to the lintel at top by means of anchor bolts, embedded in cement concrete of floor and lintels. The anchor bolts shall be placed approximately at 45 mm centers alternatively in the two flanges of the "T" iron. Iron bottom runner (T-Iron) shall be embedded in the floor and proper above shall be formed along the runner for the purpose. The collapsible gate shall be fixed at the sites by fixing the end double channels in the T-Iron rail and also by hold fasts bolted to the end double channel and fixed in the masonry at the side walls or the otherwise.

28.2.2 In case where the collapsible gage is not required at the lintel, beams a slope above T-Iron suitably designed may be fixed at the top embedded in masonry and provided masonry with necessary clamps and roller arrangement at the top.

28.2.3 All the adjoining work damaged while fixing at gate shall be made good to match the existing work without any extra payment.

28.2.4 All members of the collapsible gate including "T" – iron shall be thoroughly cleaned to rust, scales, dust etc. and given a primary coat of red lead, before fixing them in position, and after fixing two coats of approved quality oil paint shall be applied.

28.3.0 MODE OF MEASUREMENT AND PAYMENT:

28.3.1 The collapsible gate shall be measured in Sq. metre. The height of the gate shall measured as the length of double channels and breadth from outside to outside of the end fixed double channels in the open position of the gate. The rate includes providing handles, locking arrangements, stoppers etc. The rate also includes priming coat plus two coats of approved quality oil paint.

28.3.2 The rate shall be for a unit of one Sq. metre.

DTS:(29)

***Providing and fixing U-PVC pipes Confirming to IS no 13592 (type A) of Prince/Suprime /jain /Astral /Tulsi make for rain water at all Floor levels incl. Fixtures like Bends,tees,shoe etc jointed with resin of approved brand & manufacture etc.complete
(a) For 110 mm dia.***

29.1.0 MATERIALS:

The specified dia. PVC spigot and socket soil or waste pipe / Rain water pipe.

29.2.0 WORKMANSHIP:

29.2.1 The PVC spigot and socket soil or waste / rain water pipe shall be joined as following procedure. Cut the PVC pipe with a fine toothed saw to the required length pipe should be square.

Chamfer the edge of the pipe to be inserted at an angle of about 15 to about 1/3 the wall thickness, using a course file.

Make sure the spigot and socket are roughly clean and dry. Insert the pipe without the seal ring and mark along the pipe, when it is fully inserted. Fix the rubber ring into the groove without twisting it.

Apply jointing lubricant to the chamfered end of the pipe, mark made on spigot or to the socket end of the fitting. Push the pipe firmly into the socket till the gap between the mark on the spigot and socket is about 10 mm to allow for thermal expansion.

The pipe clips should be spaced at intervals of not more than ten times the outside diameter of the pipes for horizontal runs and for vertical lines are spaced at interval of one metre to a maximum of two metres according to pipe diameter.

All entry to main stacks should be protected with minimum 50 mm water seal traps, wherever there is a mixing of soil and waste lines. Smoke dust should be avoided and test plug or socket plug should be used for testing the lines.

All soil / Rain pipes shall be carried up above the roof and shall have a wire balloon guard or a cowl.

The ventilating pipe or shaft shall be carried out to a height of atleast one metre above the outer covering of the roof of the building or a case of windows in a global wall or a dormer windows. It shall be carried up to the ridge of the windows. In case of flat roof to which access for use is provided, it shall be carried up to a height of atleast two metres above the parapet or two metres measured vertically from the top of any windows or opening may be exits up to a horizontal distance of the five metres from the vent pipe in to such building and in no case shall be carried out to a height less than 3 metre.

The connection between the main pipe and branch pipes shall be made by using branches and bends with access doors for cleaning.

29.3.0 MODE OF MEASUREMENT AND PAYMENT:

The length of pipe shall be measured including all fittings along its length in running metre correct to a centimeter. No allowance shall be made for the portion of pipe length entered in the sockets of the adjacent pipe or fittings.

The rate includes all labour, tool and plant etc. required for satisfactory completion of this item.

The rate shall be or a unit of running meter.

DTS: (30)

Providing and fixing GI rain water spouts of 100 mm dia. of required length, line and level including one coat of primer and two coats of oil paint etc. complete as directed by engineer-in-charge.

G.I. .M.S tube of 100mm dia shall conform to M-34 . The GI pipe fixed as rain water pipe as directed. The pipe shall be fixed about ¼ th dia. Below the floor so as to make approach of water easy. The inlet of pipe shall be rounded of for easy entry of rain water. The pipe shall be fixed in CM 1:3.

The rate includes coat of all labour and materials required for satisfactory completion of this item.

The rate shall be for a unit of one number.

DTS:(31)

Filling the tank with potable water for testing purpose. Water charges will be charged as per GC-91 (Amount of water charges). After construction of the under ground sump is over, it shall be tested for its strength of water proofness with potable water. All the necessary arrangements for such a test shall be made by the Contractor at his cost, including filling the tank with water up to full depth etc. Testing will be carried out by the Contractor as directed by the Engineer. The Contractor shall arrange for required machinery, equipments and technical staff for testing the tank.

Contractor shall arrange for labour, other materials and tools required to attend the leakage etc. during the test. If any damage done to the tank, materials, the labour cost etc. incurred there under shall be recoverable from the Contractor either from his bill or deposit. All testing shall be done at the risk of the Contractor and he has to attend to all defects including repairing bursts, leakage etc.

If possible, water for filling the tank shall be supplied by the Corporation from the nearest available hydrant at the rates mentioned in memorandum. If it is not possible Contractor shall have to make his own arrangements for water from nearby well, canal etc.

The items include all materials and labour required to carry out the work as detailed above.

If due to any defect in the work executed by the Contractor, the leakage is noticed in the overhead tank the Contractor shall dewater the overhead tank and shall carry out necessary repair work to stop leakages and shall again refill the over head tank as detailed above without any extra cost. This procedure shall have to be repeated without any extra cost till satisfactory results are received for water tightness of the tank.

MODE OF PAYMENT:

The rate shall be paid as a job work.

DTS: (32)

Providing and fixing MS grills of required pattern to wooden frame of windows etc. with MS flats and frame alround square or round bars by screws and providing and fabricating MS structure like platform, cable tray, ladder etc. using angles, beams, channels including a primer coat of red lead and two coats of approved shed and quality enamel paint etc. complete.

32.1.0 MATERIALS

The structural steel shall conform to M-18

32.2.0 WORKMANSHIP

The M.S. Grill shall be prepared as per the drawings or as directed for fixing to wooden frames of windows etc. The grill shall be fabricated to the designs and pattern shown in the drawings and the weight shall be as directed, and the joints shall be revetted or welded as shown in the plan or as directed. The grill so formed shall be fixed in to the strip 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 in to 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 a minimum of 2 Nos. on such side of the frame or as indicated in the drawing or as directed.

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

32.3.0 MODE OF MEASUREMENT AND PAYMENT

No payment shall be made for weight of screws, bolts and nuts etc.

The rate shall be paid on unit of one kg.

DTS:(33)

Providing and fixing in position on bracket for rail 10mm thick M.S. insert plate with three rods of 12mm dia welded to plate as directed by the Engineer in charge. For U.G.Tank & Booster House.

M.S. Plate for insert plate shall be minimum 10 mm thick. It shall be tough enough to withstand the load of member. The insert plate shall be welded with minimum three rods of 12 mm dia. It shall be properly embedded in the concrete. Angle section or channel section as required for casting the platform slab shall be thoroughly fixed / erected or embedded in the concrete. The rate includes welding and labours required for executing the item. The clamps required for clamping the inlet, outlet and overflow pipe shall include all required nuts, bolts, and labour. All items include one coat of red oxide and two coats of oil paint.

The rate shall be paid for a unit of kg.

DTS:(34)

Providing, & fixing G.I. Railing of 25 mm dia for stair case & platform with three horizontal rows and post of angle iron of size 65mm x 65mm x 8mm and 1.15 mt height & placed at 1.85 mt c/c including one coat of red oxide and two coats of approved enamel paint as directed by the Engineer in charge. For U.G. Tank & Booster House.

G.I. pipe shall be of "B" class and of required diameter. The railing shall be fabricated as per design. The vertical post members shall be welded to the insert plates grouted in the R.C.C. floor. The railing shall be fixed in true plumb and line. After fixing welding joints shall be ground and made smooth.

After cleaning the surface and removing all dirt and welding drops primer coat of red oxide and two coats of oil paint of approved quality shall be applied.

The rate shall be for a unit of running meter.

DTS:(35)

Providing, fabricating, cutting and laying 7 mm thick MS chequered plate at the top of the cable trench as directed by Engineer-in-charge etc. complete including one coat of red oxide and two coats of oil paint etc. complete.

35.1.0 Structural Steel Work:

Supplying, Fabricating and Erecting in position Mild steel structures from angles, channels, flats, plates etc. including cost of steel, cutting to required size riveting bolting or welding, fixing in the line and level, painting with two coats of approved enamel paint, after applying one coat of red oxide.

35.2.0 General

1. Requirements specified in this section will form a part of detailed specifications for item of work falling under this category. Indian Standards shall apply as if included herein. Design of structure shall be in compliance with Indian Standards (IS) viz. for rivets IS:1148-1964 for Bolts IS: 1148 – 1964 and IS: 800-1962, for structural fabrication IS:800 1962 as and its latest edition.

Principal Items are :

- (a) Structural steel member (b) Steel joints (c) plates and connections (d) Steel chair assembling (e) Pipes supports and hangers for piping in all locations (f) Ladders and stairs (g) Miscellaneous metal work for water supply.

2. Quality Assurance:

Unless otherwise specified all work specified herein and shown on the drawings all conform to the applicable requirements of the following specifications and codes.

Fabrication and erection of structural steel shall be in accordance with IS: 800 – 1962.

Welding Inspection:

The contractor shall perform all structural field welding under continuous inspection of a special Inspector representative of the owner. Notice will be given at least 24 hours in advance of needed inspections.

3. Submittals:

Shop Drawings :

- (a) The contractor shall submit shop drawings for approval before fabrication of any of the work. Complete fabrication details with materials and specification lists showing all welds fabrication and finish details will be shown in the drawing. In approving shop drawings, the owner does not assume responsibility for accuracy of the work relative to other components as constructed.

4. Shop Fabrication :

(i) General :

- (a) The maximum possible fabrication of structural steel work shall be manufactured off-site in a fabrication shop.
- (b) Shop connections shall be welded, or bolted unless otherwise indicated.
- (c) As far as possible, all work shall be fitted and assembled in shop ready for erection.

(ii) Members :

- (a) All members shall be free from twists, kinks, buckles, or open joints.
- (b) All members, holes and their spacing shall be so accurately made that when assembled the parts shall come together and bolted without distortion.
- (c) Parts assembled with bolts shall be in close contact, except where separators are required where unlike metals are in contact to insulate as necessary to prevent corrosion.

(iii) Welding:

- (a) Welding in shop and field shall be done by qualified welders who have experience of similar work. The standard for welders will be as required by IS:817-1966.
- (b) All steel before being fabricated shall be thoroughly wire brushed, cleaned of all scale, and rust, and thoroughly straightened by approved methods that will not injure the materials being worked on.

(iv) Erection :

- (a) Erection shall include the installation and erection of all structural steel as called for in this section. The contractor shall verify correctness before starting erection.
- (b) As erection progresses, the work shall be securely bolted up to take-care of all dead load, wind, and erection stresses.
- (c) No final bolting or welding shall be done until each portion of the structure has been properly aligned and plumbed.

- (d) Bolts shall be drawn up tight and threads set so that nuts cannot become loose.
- (e) Damaged Members : During erection, member which are bent twisted, or damaged shall be straightened or replaced as directed.
- (f) Anchor bolts and Anchors : Anchor bolts and anchors shall be properly located and built into concrete work. Bolts and anchors shall be placed by the use of templates or such other locate the anchors and anchor bolts accurately.
- (g) Bearing plates: Bearing plates shall be provided under beams and columns resting on walls or footings, Bearing plates may be attached or loose and aligned by steel weldges or shims.
- (h) Substitutions : Unless otherwise directed, the exact sections, shapes, thickness, sizes, weights and the details of construction shown for the structural steel work shall be furnished. However, if the contractor because of his stock or shop practices, suggest change if the not area of section is not thereby reduced if the section properties are at least equivalent and if the overall dimensions are not exceeded the same may be approved by the Engineer-in-charge. All substitutions or other deviations from drawings and / or specifications shall be specially noted or quoted on the shape drawings submittals.
- (i) Flame cutting : Flame cutting by the use of a gas cutting torch in the field for correcting fabrication errors will not be permitted on any major member in the structural framing. The use of a flame – cutting torch will be permitted only on minor members, when the member is not under stress, and only after the approval of the owner has been obtained.
- (j) Storage of materials : Structural material, either plain or fabricated, shall be stored above ground upon platforms , skids or other supports. Materials shall be kept free from dirt, grease and other foreign matter and shall be protected from corrosion.
- (k) Steel stairs : To be fabricated true to size and details and provided complete with all attachments such as pipe rails and hand rails, checker plates grating type threads and landings. Shop and setting drawings shall be submitted before hand for approval of the engineer-in-charge.
- (l) Ladders :
 - (i) Contingent upon designated requirements for different locations, galvanized steel unit will be fabricated conforming to requirements. Rails where indicated will be provided.
 - (ii) M.S. Ladders : The M.S. Ladders with stringers as specified and the steps of M.S. bars of specified dia shall be curved. The size and dimensions shall be as specified or as shown in the drawings.
- (m) Steel chequered plate : The chequered plate (Size, location and type) shall be as shown in the drawing. Steel chequered plate and frames shall be galvanized from fabrication unless noted otherwise.]

- (n) Stair Abrasive safety Nosings : Extend nosings to within 150 mm of wall or stainer and equip each with embedded anchorage of secure attachment. Finish flush with concrete at all cast-in-place concrete.
- (o) Test Reports : Certified physical and chemical mill test reports is for material used for major structural members shall be furnished. All test shall be performed in accordance with applicable IS Standards.

35.3.0 MODE OF MEASUREMENT:

The payment shall be made on the Sq.Mtr. basis.

DTS:(36)

Supply, fabrication, delivery at site, transport, loading, unloading etc. and erection of structural steel work made up of rolled sections for fixed girder and insert plates. The rate should also include one shop coat of red and 3 coats of enamel paint etc. complete.

36.1 MATERIALS : STRUCTURAL STEEL

36.1.1 All structural steel shall be comply with the requirements of IS 226 and structural steel work IS 1915 (latest editions).

36.2 STEEL FOR PINS AND ROLLERS

36.2.1 Rolled steel pins and rollers, shall comply with requirements of the IS specifications appropriate for the work. Steel casting for cast steel pins shall conform to grade 1 or 3 of IS 1030 (latest edition).

36.3 BOLTS AND NUTS

36.3.1 Mild steel for bolts and nuts when tested shall comply with IS 1608 and shall have tensile strength of not less than 250 N/mm². Plan washers shall be made of steel.

36.4 WELDING ELECTRODE

36.4.1 Mild steel electrodes shall comply with requirements of IS 814.

36.5 WORKMANSHIP

36.5.1 All work shall be in accordance with the drawings and shall satisfy IS specification No. 1915. Care shall be taken to ensure that all parts in assembly fit accurately together. Notes or specifications on the drawings supplied by the Engineer-in-charge/Consulting Engineer, are to be construed as superseding or canceling any clause of this specifications with which they conflict. On all drawings dimensions shown in figures shall be acted in preference to measurement by scale.

36.6 STRAIGHTENING

36.6.1 All structural steel members and parts shall have straight edges. All straightening shaping and leveling etc. shall be done by pressure only and not by hammering. All joggles and knees shall be formed by pressure and where practicable in making these, the metal shall not be cut and welded.

36.7 CUTTING

36.7.1 All structural steel parts where required shall be sheared, cropped sawn or flame cut and ground accurately to the required dimensions and shape.

36.8 BOLTS HOLES

36.8.1 The diameter of bolts holes shall be 1.5 to 2.0 mm larger than the nominal diameter of bolt. All holes for bolts shall be drilled unless permitted by Engineer-in-Charge for punching the holes. Care shall be taken, such as surrounding material is not deformed or damaged in case of punching the hole is allowed.

36.9 WELDING

36.9.1 Welding of steel conforming to relevant IS specifications shall be in accordance with general requirements of metal are welding. In additional to general requirement the following care shall be taken.

- a) The welding shall be positioned for downward welding wherever practicable.
- b) The welding current shall conform with respect of voltage and ampere to the recommendations for the manufacturers of the electrode being used. The arc length voltage and ampere shall be suited to the thickness of material, type of groove and other circumstances of the work.
- c) The surface to be welded and surrounding material for a distance of at least 155 mm shall be free from scale, dirt, grease, paint, heavy rust or other surface deposit.
- d) Members to be welded shall be held in correct position by holes, clamps, wedges, jigs or other suitable devices or by tack welding until welding has been completed, such fastening as may be used shall be adequate to ensure safety. Suitable allowance shall be made for warp and shrinkage.
- e) Tack welds located where the final welds will later be made shall be subject to the same quality requirements as final welds. Defective and broken tack welds shall be removed before final welding.
- f) Fusion faces shall be made or cut by shearing, chipping, machining or by gas cutting.
- g) Exposed faces of welds shall be made reasonably smooth and regular so as to conform as closely as practicable to design requirements and shall not be of less than the required cross section.
- h) Finished welds and adjacent parts shall be protected with clean boiled linseed oil after all slag has been removed.

36.10 SAFETY PRECAUTIONS

36.10.1

- a) Operators of welding and cutting equipment shall be protected from the rays of the arc flame with gloves and by helmet, hand shields, or goggles equipped with suitable filter lenses.
- b) Closed space shall be ventilated properly while welding is being done therein.

- c) Welders shall be provided with such staging as will enable them to perform the welding operation. For site welding shelter should be provided to protect welders and the parts to be welded from the weather.

36.10.2 The contractor shall employ a competent welding supervisor to ensure that the standard of workmanship and the quality of materials comply with requirements laid in these specifications.

36.10.3 The contractor shall provide free access to the representative of Engineer-in-charge / Consulting Engineer to the work being carried out at all reasonable times and facilities shall be provided so that during the course of welding he may be able to inspect any layer of weld metal. He shall be at liberty to reject any material that does not conform to the terms of the specifications and to require any defective welds to be cut out and welded. The representative of the Engineer-in-charge / Consulting Engineer shall be notified in advance of any welding operations.

36.10.4 Inspection and testing of welds shall be done as laid down in IS 822 and IS 11024 of their latest edition.

36.10.5 No welder shall be employed in any position except those who are fully qualified to welding. Qualification for welders shall be as laid down in IS 817.

36.11 JOINTS

36.11.1 All steel work intended to be bolted together must be in contact over the whole surface. Joints which have to take compressive stress and the ends of all stiffeners shall meet truly over the whole of the butting surface.

36.12 ASSEMBLING

36.12.1 All member shall be so arranged that they can be accurately assembled, without being unduly packed, strained or forced into position and when built shall be true and free from twist kinks, buckles or open joints between component pieces. Work shall be kept properly bolted together and no drifting shall be allowed except for the purpose of drawing assembled sections together in accuracies in matching of holes may be corrected. But drifting to enlarge holes is prohibited. Failure in any of the above respect will involve the rejection of defective members.

36.13 MODE OF MEASUREMENT AND PAYMENT

36.13.1 Measurement of this item shall be as per IS 1200 (Part VIII).

36.13.2 The contract rate shall be suitable for unit of one metric ton of structural steel. The rates are inclusive of one coat of primer and two coats of anti corrosive paint as approved by the Engineer in Charge.

DTS:(37)

Providing and fixing electronic water level indicator showing digital display including all necessary accessories for RCC UGSR / Sump including fixing, fitting etc. complete.

37.1 WORKMANSHIP

The level indicator should be approved quality.

37.2 MODE OF MEASUREMENTS & PAYMENT

The payment shall be made as whole for complete job work and no extra payment will be made for any item related for the completion and working of this item. It shall includes all labour and material cost. Payment will be made only after the satisfactory working of level indicator and as directed by the Engineer-in-charge.

DTS:(38)

Providing and laying chequered precast concrete tiles 22 mm thick with aggregate of sizes upto 6 mm in floors treads of steps and landing on 20 mm thick bed of CM 1:6 (1 cement : 6 sand) or L.M. 1:1.5 (1 Lime putty : 1.5 sand) jointed with neat cement slurry with pigments to match the shade of the tiles.

Dark shades using ordinary grey cement

38.1.0 MATERIALS

Water shall conform to M-1 Cement shall conform to M-3. Lime Mortar shall conform to M-7. Cement mortar shall conform to M-8. the precast chequered tiles of 22 mm. thick shall be of Dark shade using white cement and conform to M-30 shall be approved from Engineer-in-charge.

38.2.0 WORKMANSHIP

The work shall be carried out as per I.S. 1443 – 1972.

38.2.1 Bedding:

Before spreading the mortar, the sub-base of the floor shall be cleaned of all dirt, scum and loose materials and then well wetted without forming any pools of water on the surface.

In case of R.C.C. floors, the top shall be left a little rough, all points of level for the finished surface shall be marked out. The lime water of proportion 1:6 (1 cement : 6 coarse sand) jointed with neat cement slurry mixed with pigment to match the shade of the tiles as directed shall be then evenly and smoothly spread over the base. Bedding layer or mortar shall be not less than 10 mm and average thickness of bedding shall be 12 mm.

38.2.2 Laying:

Before laying the terrazzo (Marble / Mosaic) tiles, the tiles shall be thoroughly wetted with water. Neat cement grout of required consistency at 4.4 kg cement / sq.mt. shall be spread on the mortar bed. The tiles shall be laid on the neat cement float and shall be evenly and firmly bedded to the required level and slopes. There shall be no hollows left. The joints shall be of uniform thickness and in straight line as per the pattern.

The surface of flooring shall be checked frequently with a straight edge at – least two metres long so as to obtain a true surface with required slope.

The tiles which are fixed in the adjoining the wall shall go about 10 mm under plaster. Skirting or dedo shall be left unfinished for about 50 mm above finished floor level and unfinished strip then left earlier shall be finished.

In places where full tiles can not be fixed. The tiles shall be cut to the size and smoothened at edges to give straight and true joints.

After the tiles have been laid, the surplus cement slurry and the joints shall be cleaned and washed fairly deep before cement hardens.

The day after tiles have been laid, the joints shall be cleaned of every cement grout with a wire brush to a depth of about 5 mm and then grouted with white cement with or without pigment to match the shade of the topping of tiler.

38.2.3 Curing:

The flooring shall be kept wet with damp sand or water for seven days. It shall be kept undisturbed atleast for 14 days. The grinding shall normally be commenced after 14 days.

38.2.4 Polishing:

After the tiles are properly cured, first grinding shall be done with carborundum stone of 48 to 60 grade grit fitted in machine. Water shall be properly used during grinding. When the chips show up and the floor has ben uniformly rubbed, it shall be cleaned with water, baring all pin holes. It shall then be covered with a thin coat of white cement mixed with or without pigments to match the colour of the topping of the tiles. Pin holes if any shall thus be filled. This grout shall be kept moist for a week. Thereafter second grinding shall be started with carboundum of 120 grit. Grouting and curing shall follow again. Final grinding shall be done when other works are finished. The machine shall be fitted with carborundum of grit 220 to 350 using water in abundance. The floor shall then be washed clean with water. Oxalic acid powder shall than be dusted at 33 grams per square metre on the surface and the surface rubbed with machine fitted with hessian bobs or rubbed hard with pad of wooden rags. The floor shall then be washed clean and dried with a soft cloth or Linen. The finished floor shall not sound hollow when tapped with a mallet.

If any tiles is disturbed or damaged it shall be refitted or replaced properly jointed and polished.

Testing of the tiles shall be carried out by the contractor at his own cost as per I.S. requirement for required tests.

38.3.0 MODE OF MEASUREMENTS AND PAYMENT

The terrazzo tiles flooring shall be measured in Sq. metre for visible area of work done.

No deductions shall be made nor extra paid for any opening in the floor area upto 0.1 Sq.mt. Nothing extra shall be paid for use of cut tiles or for laying the floors at different levels in the same room or court yard. Mosaic tiles laid in floor borders and bands etc. shall be measured in the same item and nothing extra shall be payable on account of these or similar bonds formed of half or multiples of half size, standard tiles or other uncut tiles.

The treads of stairs and steps paved with tiles without nosing shall also be measured under this item.

Extra rate shall however be paid for such area where width of threads does not exceed 30 cms.

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

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

DTS:(39)

Demolition and disposal of unserviceable material with all lead and lift.

(a) *Unreinforced cement concrete*

39.1.1 The relevant specifications of **DTS No. 40** shall be followed except that reinforced cement concrete work is to be demolished instead of brick masonry work.

39.2.0 MODE OF MEASUREMENT AND PAYMENTS:

39.2.1 The relevant specifications of **DTS No. 40** shall be followed.

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

DTS:(40)

Demolition of brick work and stone masonry including stacking of serviceable materials and disposal of unserviceable material with all lead and lift.

(i) *In cement mortar*

40.1.1 The demolition shall consist of demolition of one or more parts of the building as specified. Demolition implies taking up or down or breaking up. This shall consist of demolishing whole or part of work including all relevant item as specified and as directed by the Engineer-in-charge.

40.1.2 The demolition shall always be planned before hand and shall be done in reverse order of the one in which the structure was constructed. This scheme shall be got approved from the engineer-in-charge before starting the work. This however will not absolve the Contractor from the responsibility of proper and safe demolition.

40.1.3 Necessary dropping, shoring and under pinning shall be provided for the safety of the adjoining work or property, which is to be left intact, before dismantling and demolishing is taken up and the work shall be carried in such a way that no damage is caused to the adjoining property.

40.1.4 Wherever required, temporary enclosures or partitions shall also be provided. Necessary precautions shall be taken to keep the dust nuisance down as and where necessary.

40.1.5 Dismantling shall be commenced in a systematic manner. All materials which are likely to be damaged by dropping from a height or demolishing roof, masonry etc. shall be carefully dismantled first. The dismantled articles shall be properly stacked as directed.

40.1.6 All materials obtained from demolition shall be the property of Surat Municipal Corporation unless otherwise specified and shall be kept in safe custody until handed over to the Engineer-in-charge.

40.1.7 Any serviceable materials, obtained during dismantling, shall be separated out and stacked property as directed with all lead and lift. All unserviceable materials, etc. shall be stacked and disposed as directed by the Engineer-in-charge.

40.1.8 On completion of work, the site shall be cleared of all debris rubbish and cleaned as directed.

40.2.0 MODE OF MEASUREMENT AND PAYMENT:

40.2.1 Measurement of all work except hidden work shall be taken before demolition or dismantling and no allowance for increase in bulk shall be allowed. The demolition of lime concrete shall also be measured under this item. Specification for deduction for voids, openings etc. shall be on same basis as that employed for construction of work.

40.2.2 All work shall be measured in decimal system as fixed in its subject to the following limits, unless otherwise stated hereinafter (a) Dimensions shall be measured to the nearest 0.01 mt. (b) Area shall be worked out to the nearest 0.01 sq.mt. (c) Cubical connection shall be worked out to the nearest of 0.01 Cu.m.

40.2.3 The rate shall include cost of all labour involved and tools used in demolishing and dismantling including scaffolding. The rate shall also include the charges for separating out and stacking the serviceable materials property and disposing the unserviceable materials with all lead and lift. The rate also includes for temporary storing for the safety of the portion not required to be pulled down or of adjoining property and providing temporary enclosures or partition where considered necessary.

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

DTS:(41)

Providing and applying non-toxic anticorrosive epoxy paint with average 300 micron thickness including one coat of epoxy Zinc-rich primer of approved make etc. complete. to inner and or outer surfaces as directed by Engineer-in-charge.

41.0 Inner & outer surface of the pipes shall be prepared for the application of paint by first cleaning the surface with wire brush. Sand blasting shall be carried out in the presence of an authorised representative of SMC and as per the provisions of IS:1477 Part (I). All the mill scale and rust must be perfectly removed and inner bars metal surface of the pipe should appear neat, clean and fresh so that the paint applied afterwards should adhere it perfectly. Any trace of grease shall be removed carefully. Such clean, rough (roughness should be within 20 microns) bars metal surface will allow proper adhesion of the lining to the pipe. The Engineer-in-charge may exercise the right to examine the blast cleaned surface before application of priming coat. If the surface is rejected as not meeting the specification requirements, the contractor will be required to perform at his expense, such work as will be necessary to prepare the surface to the satisfaction of the Engineer-in-charge.

41.1 The compressed air used for blast cleaning shall be sufficiently free from oil or water contamination to ensure that preparation is not impaired. Adequate separators, traps and filters shall be provided which shall be cleaned and maintained regularly.

Inner & outer surface prepared as mentioned in (i) above shall immediately in no case beyond four hours be followed by an application of Zinc rich primer. The primer shall be applied by spray or brush. The application of the primer shall be as per the recommendation of the manufacturer.

The technical specifications of the primer shall be as under.

A two component heavy duty prefabricated primer based on Zinc Dust and epoxy resins shall be Di-ethylene glycol of Bisphenol A and hardner shall be Adduct Hardner of Basic Liquid resin and aromatic amine. The primer shall be non-phenolic.

The preparation of paint shall be carried out as below.

Part By Weight		
Base	:	100
Hardner/Hardners	:	50
Mixed paint(Primer) shall have properties:-		
(a)	Viscosity	:
(b)	Specific Gravity	: 1.70 + 3%
(c)	Pot Life mixture at 30 Degree	: 2 to 4 hours

(d)	Zinc dust content on D.F.T. base	:	92 +/- 3%
(e)	Finish	:	Smooth and matt.
(f)	Shade	:	Grey
(g)	Drying Time	:	Surface dry within 5 minutes and Hard dry within 1 hour. Overcoating can be done After 24 hours.
(h)	D.F.T.	:	25-30 microns
(i)	Compatiability	:	Compatible with all systems of paints like Bituminous, conventional and epoxy
(j)	Toxicity	:	Paints
(k)	Coverage	:	10 Sq.mt./kg.at 25 microns

41.2 Non-toxic anti corrosive Epoxy paint shall match the following

a)	Dry time	:	Surface dry not more than 4 hours. Hard dry not more than 18 hours.
b)	Covering capacity	:	2-2.5 Sq.mt. / Kg.
c)	Toxicity	:	Non-toxic
		:	300 micron (100 micron per coat).

Preparation may be carried out as under

Base	<u>Parts by weight</u>	
	100	
Hardner	60	(45 + 15)

In order to obtain satisfactory adhesion between subsequent coats, the previous coat may be lightly abraded with fine sand paper, if it is already set hard. The paint may preferably be applied with brush.

Approximate lengths of 0.50 at both the ends of pipe shall be left uncovered with paint application as these ends are to be cield welded. After laying the pipe in the trench and properly completing the welding joint. Painting work left earlier should be completed in the manner stated as above.

The mode of application and materials shall conform to the following I.S. Standards.

(a)	IS:1477	:	Code of practice for painting
(b)	IS:6049	:	Code of practice for application of temporary corrosion preventatives.
(c)	IS:9197	:	Code of practice for Epoxy resin and Hardner.

Unless otherwise specified here in the concerned Indian Standards shall be followed to its latest revision or amendments.

In general, the requirements of IS:1477 "Code of practice for painting of Ferrous metals in buildings and allied products" (Part-I & II) and IS:6049 "Code of practice for application of temporary corrosion preventives" shall be met in carrying out the painting and / or preparatory work.

The storage, mixing and application of paints shall strictly carried out in accordance with the paint manufacturer's printed recommendations very strictly, this is in addition to the fulfilling the specifications of this tender. Make of the paints / primer shall be Hindustan Ciba Geigy, Cibatul, SIP resins, or its equivalent companies only.

The thinning of all coatings shall only be carried when absolutely necessary, and then only in accordance with the paint manufacturer's instructions.

The painted surface shall be allowed to dry and cure in accordance with the paint manufacturer's open pot Life period and the required drying time between coats allowed in all cases. Under no circumstances shall the "Pot Life" be extended by the addition of new paint or other media.

The Consultant/Engineer-in-charge reserves the right to inspect the surface prepared and painting operations at any stage and to require any unsatisfactory workmanship to be remedied at the contractor's expenses.

Inadequate dry film thickness shall necessitate the application of a further coat or coats of paint to provide the full minimum dry film thickness specified.

An elcometer or similar instrument shall be used to determine dry film thickness. On micaceous from oxide coatings and on non-magnetic substrata, a non-magnetic measuring instrument shall be used.

The quality of the protective coating is impaired by excess dry film thickner showing wrinkling, cracking, or softness, the contractor shall reserve the defective coating and repaint the effected area to the satisfaction of the Engineer-in-charge.

Pipes when painted shall not be handled, stacked, or exposed to condensation, or rain, until the last applied coat is completely dry and in the case of two pack – materials the coating has thoroughly cured.

The contractor shall furnish and install the necessary scaffolding, runaways etc. required to complete the work include in this specified.

The painting shall be carried out against welding parts of piping after it is confirmed that all tests for piping have passed.

All paints in a particular paint system shall be from one paint manufacturer unless agreed otherwise.

Damaged areas shall be cleaned down and retouched with compatible primer before overpainting.

No surface preparation or painting shall be carried out in claimatic condition which will result in inferior protection to metal surface. The paint must be applied to dry surfaces in a dust-free atmosphere. Preparation and painting shall not take place in open during rain or fog or when condensation is likely to affect the paint film before it is dry.

41.3 SAFETY:

All safety regulations and requirements in force at the job site shall be adhered to by the contractor. Prior permission to proceed with the painting shall be obtained from the Consultant/Engineer-in-charge for coating areas in which painting work will be done.

Any spillage of volatiles shall be wiped up immediately, oily or solvent rags and waste shall not be allowed to accumulate, anywhere within the job site and shall be kept in closed containers and in minimum quantity.

No painting shall be done adjacent to fire hazard, such as welding, open flame or spark metal fabrication. No smoking shall be allowed within the plant premises.

Materials shall be stored in a location approved by the Consultant / Engineer-in-charge. Storage space shall be kept clean and free from fire hazards.

MODE OF MEASUREMENTS & PAYMENTS

The payment shall be made for each size of completed item per square meter of inner & outer surface area of pipes.

DTS:(42)

Fixing in position with grouting 300 mm dia. C.I. / D.I. barrel piece for overflow in required length as directed and instruction of the Engineer-in-charge.

- 42.1.0 The H.S. pipe / C.I. / D.I. pipe shall be fixed in RCC Top slab / wall during concreting and shall be fixed in true line and level with necessary fixtures. Welded with reinforcement item also include welding, cutting, brooming, bending and shaping of the pipe as per required shape and placing at required position. If any leakage is found it shall be removed by redoing the joint satisfactorily without any extra rate.

The item includes all labour as well as welding materials and welding machineries required to carry out the work as described above.

The rate shall be paid per a unit of no.

DTS:(43)

Providing and fixing M.S barrel piece with flange as directed by the engineer in charge for

- 1) ***For inlet and Inter connection***
- 2) ***For Overflow (300 mm dia. pipe)***

- 43.1.0 The M.S. pipe shall be fixed in RCC Top slab / wall during concreting and shall be fixed in true line and level with necessary fixtures. Welded with reinforcement item also include welding, cutting, brooming, bending and shaping of the pipe as per required shape and placing at required position. If any leakage is found it shall be removed by redoing the joint satisfactorily without any extra rate.**

The item includes all labour as well as welding materials and welding machineries required to carry out the work as described above.

The rate shall be paid per a unit of kilogram.

DTS:(44)

Bailing out sub soil or drainage water by pumps directed after excavation and during concreting work and keeping dry the area till the completion of work as required and as directed by the Engineer in charge Note: This item shall be included only when the bailing of drainage / subsoil water is more than 360Hp-hrs.

For dewatering of drainage water from storm line and subsoil water if any shall be diverted with the help of necessary tools, bibs, plants, equipments, diesel pump, fuel etc. All the equipments required for dewatering shall be provided operated and maintained by the contractor himself. The necessary suction and delivery pipe shall be of sufficient length to divert the sewage / subsoil water from the trenches.

The Contractor must repair the leakage joints of storm / private drainage as early as possible as per instruction of Engineer-in-charge.

The rate includes all the tools, plants, machineries, pipes, labour, fuel etc. require for satisfactory completion of this item.

The mode of payment shall be as per the H.P. hour of pump so run.

DTS:(45)

Providing and making aluminium (partly paneled & partly glazed) office cabin of size 3.05m x3.05m with aluminium door and windows (fully glazed) item also includes office chair (steel) 4nos. of model no. CHR-7(godrej), office table 2 nos. (steel) of model no. T-8 (Godrej), steel cupboard 1 no. of 1980mm height 1018mm width and 535mm depth of Godrej or equivalent as approved.

SELF EXPLANATORY AND AS DIRECTED BY ENGINEER IN CHARGE

The rate shall be paid per a unit of no.

DTS:(46)

Providing and applying two coats of weather shield max paint (3 coats may be required in case of darker colours) of ICI Dulux or Apex Ultima of Asian Paint including applying exterior acrylic primer coat as per manufacturers specification and directions in shade and colour approved by architects, on exterior surfaces of the building including scaffolding, preparing the surface, watering, curing etc. complete and as directed by the architects and manufacturers

Surface Preparation

Surface is thoroughly clean, dry and free from all loose dirt, chalk, grease, fungi, algae and flaking paint. This can be achieved by brushing with a wire / stiff coir brush, followed by water jetting if required. Fill up all minor cracks and defects with white cement and sand mixture in the ratio 1:3. For application on previously painted wall, previous coatings of paint must be thoroughly scraped off and clean the surface thoroughly using wire brushes.

Priming:

Apply a liberal coat of exterior acrylic primer and allow it to dry for 4-5 hours. Application of putty is not recommended. Minimum 4-6 hours duration is required between each coat of weather shield max paint.

46.1.0 MATERIAL

The water shall conform to M-1 weather shield max paint of approved from Engineer-in-charge.

46.2.1 WORKMANSHIP

46.2.1 Scaffolding

The relevant specification of **DTS no.50** shall be followed.

46.2.2 Preparation of surface : The relevant specification of DTS No. 50 shall be followed except that the work white wash shall be submitted with sandtex paint.

46.2.3 Application of paint:

No painting shall be done when the paint is likely to be exposed to a temperature of below 7 C within 48 hours after application.

When weather conditions are such as to cause be carried out "in the shadow" as far as possible. This helps the proper hardening of the paint film by keeping the surface moist for a longer period.

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

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

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

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

The sandtex paint shall be applied with a brush with relatively short stiff hog or fibre bristles. The paint shall be brushed in uniform thickness and shall be free from excessively heavy brush marks. The lamps shall not well brushed out.

46.2.4 Protection measures shall be taken as per **DTS No. 50**

46.3.0 MODE OF MEASUREMENTS AND PAYMENT

The relevant specification of **DTS No. 50** shall be followed. The rate shall be for a unit of one sq.metre.

DTS:(47)

Providing and applying painting two coats of approved synthetic enamel paint on new steel, metal or other surface including one coat of redoxide primer etc. Complete as directed by the Engineer in charge. For U.G.Tank & Booster House

47.1.0 MATERIALS:

The ready mixed primer, brussing red lead shall conform to I.S. 102 – 1972.

The thinner (linsed oil) shall conform to I.S.75- 1973 if for any reasons, thinning is necessary in case of ready mix paint, the brand of thinner recommended by manufacturer shall be used.

The enamel paints shall conform to M-27.

47.2.0 WORKMANSHIP

47.2.1 Preparation of surfaces:

The surfaces before painting shall be cleaned of all rust, scale, dirt and other foreign matter sticking to it with wire brushes, steel wool, scrapers, sand paper etc. This surface shall then be wiped finally with mineral turpentine which shall also removed grease and perspiration of hand marks. The surface shall then be allowed to dry.

47.2.2 Application of primer:

After the preparation of the surface, the priming coat shall be applied immediately. The brushing operations are to be adjusted to the spreading capacity advised by the manufacturer of the particular primer. The paint shall be applied evenly and smoothly by means of crossing and laying off. The crossing and laying of consists of covering the area over with paint, brushing alternately in opposite directions, two or three times and then finally brushing lightly in a direction at right angles to the same. In this process no brush marks shall be left after the laying off is finished. The full process of crossing and laying will constitute one coat.

During painting, every time, after the priming coat has been worked out of the brush bristles or after the brust has been unloaded the bristles of the brush shall be opened up striking the brush against portion of the unpainted surface with the end of the bristles held at right angles to paint when dipped again in to a paint container. The primary coat shall be allowed to dry completely before painting is started.

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

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

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

47.2.3 General

The materials required for painting work shall be obtained directly from approved manufacturers or approved dealer and brought to the site in maker's drums, bogs etc. with seal unbroken.

All materials not to actual use shall be kept properly protected lid 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 to improper and long storage shall not be used. The paint shall be stirred thoroughly in the container before pouring into and shall be continuously stirred in smaller container. No left over paint shall be put back into stock tins. When not in use, the containers shall be kept properly closed.

If for reasons, thinning is necessary, the brand of thinner recommended by the manufacturer shall be used.

The surface to be painted shall be thoroughly cleaned and dusted. All rust dirt and grease shall be thoroughly removed before painting is started. No painting on exterior or other exposed parts of the work shall be carried out in wet, damp or otherwise unfavorable weather and all the surface shall be thoroughly dried before work is started.

47.2.4 Application of paint:

Brushing operations are to be adjusted to the spreading capacity advised by the manufacturer 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 shall be left after the laying off is finished. The full process of crossing and laying off will constitute one coat.

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 the shade and shall be got approved from Engineer-in-charge before next coat is started.

Each coat except the last coat shall be lightly rubbed down with sand paper of fine pumice stone and cleaned of dust before the next coat is applied. No hair marks from the brush or clogging of paint puddles in the corners of panels, angles of moulding etc. shall be left on the work.

Special care shall be taken while painting over bolts, nuts, rivets, overlaps, etc. Approved quality brushes shall be used.

47.3.0 MODE OF MEASUREMENTS AND PAYMENT

The new steel and other metal surface shall be measured under this item.

All the work shall be measured net in the decimal system as executed subject to the following limits unless otherwise stated hereinafter.

- a) Dimensions shall be measured to the nearest 0.01 mtr.
- b) Areas shall be worked out to the nearest 0.01 sq.mtr.

No deductions shall be made for openings not exceeding 0.5 sq.m. each and no addition shall be made of painting to beadings mouldings, edges, jambs, soffits, sills etc. of such openings.

In case of fabricated structural steel and iron work, priming coat of paint shall be included with fabrication. In case of trusses if measured in sq.m. compound griders, stanchions, lattices, grider and similar work, actual area shall be measured in Sq.m. and no extra shall be paid for painting on bolts, heads, nuts, washers, etc. No addition shall be made to the weight calculated for the purpose of measurements of steel and iron works for paint applied on shop or at site.

The different surfaces shall be grouped into one general item.

The rate is for complete item as specified i.e. one primer coat and two coats of oil paint.

The rate shall be for a unit of one Sq. Metre.

DTS:(48)

Providing and laying integral cement based water Proofing treatment including preparation of surface as required for treatment of roofs balconies, terraces etc. consisting of following operations.

- (a) Applying and grouting a slurry coat of neat cement using 2.75kg/sqm of cement admixed with proprietary water proofing compound conforming to IS:2645 over the RCC slab including cleaning the surface before treatment.***
- (b) Laying cement concrete using broken bricks / brick bats 25mm to 100mm size with 50% of cement mortar 1:5 (1 cement : 5 Coarse sand) admixed with proprietary water proofing compound conforming to IS:2645, bricks bats is finally covered by jointless cement Plaster over 20 mm thick layer of cement mortar of Mix 1:4 (1 cement : 4 coarse sand) added with special water proofing compound conforming to IS : 2645 & Top smooth Finished with trowel either false chaquered making of 300 mm size. The treatment is carried along the vertical surface of The parapet & other adjoining wall up to height of about 300mm in a shape of quarter round vata including curing etc. comp . With average thickness of 120mm and minimum thickness at khura as 65mm.***
- (c) The whole terrace so finished shall be flooded with water for a minimum period of two weeks for curing and for final test. All above operations to be down in order and as directed and specified by the Engineer in charge. With average thickness of 120mm and minimum thickness at khura as 65mm. (Cement consumption 0.511bags/ S.M)***

Note :-

- (1) The Whole work is to be executed through Specialized agency with a guarantee of 10 (Ten) Years given on a prescribed proforma duly stamped***
- (2) The Rate shall include for work at all floors & Conducting water proof test as directed.***

The rate shall be include all labour and material.

The rate shall be for a unit of one Sq. Metre.

DTS:(49)

Providing and fixing on masonry or concrete block 1m x 0.9m size & 25mm thick Granite stone for foundation stone & inguration including engraving the approved mateers on the stone as directed by Engineer incharge etc. complete.

SELF EXPLANATORY AND AS DIRECTED BY ENGINEER IN CHARGE

The rate shall be paid per a unit of no.

DTS:(50)

Providing and applying 3 coats of white wash of approved make and shape including scaffolding, brushing and brooming the surface to remove all dust, dirt mortar dropping and other foreign matter and also including providing and mixing in required proportion binding agent like “Fevicol dh” or equivalent of approved brand etc. to the inside surface of U.G. water tank & Booster house & parapet wall, stair cabin etc. at any height as directed by the Engineer in Charge.

- A)Walls
- B)Ceiling

50.1.0 MATERIALS

- 50.1.1 The clear colour shall be made from glue and boiling water. The mixture shall be suitably tinted where required for use under coloured distemper if directed. Glue shall conform to I.S. 852-1969 (Specifications for animal glue).
- 50.1.2 Lime used shall be freshly burnt, class “C” lime (fat lime) and while in colour confirming to I.S. 712-1973. Water shall conform to M-1. Best quality of gum shall be used in the preparation of white wash. Ultramarine blue or indigo shall conform to I.S. 55-19770 for paints, and shall be used for preparation of white wash. Pigments, mineral colours, not affected by lime shall be used in preparing colour wash.

50.2.0 WORKMANSHIP

- 50.2.1 Preparation of white wash solution – The fat lime shall be slaked at site and shall be mixed and stirred with about five litres of water for 1 Kg. of unslaked lime to make a thin cream. This shall be allowed to stand for a period of 24 hours and then shall be screened through a clean coarse cloth. 4 Kg. of gum dissolved in hot water shall be added to each cubic metre of lime cream. Small quantity of ultramarine blue (upto 5 gms. Per Kg. of lime) shall also be used. The solution shall be stirred thoroughly before use.
- 50.2.2 Preparation of surface – The surface shall be thoroughly cleaned of all dust, dirt, mortar dropping and other foreign matter before white wash is to be applied.

The surface spoiled by smoke soot shall be scraped with steel wire brushes or steel scrapers or shall be rubbed with over burnt surkhi or brickbats. The surface shall be then broomed to remove all dust, dirt and shall be washed with clean water.

Oil or grease spots shall be removed by suitable chemical and smooth surface shall be rubbed with wire brushes.

All unsound portion of the surface plaster shall be removed to full depth of plaster in rectangular patches and plastered again after raking the masonry joints properly. Such

portion shall be wetted and allowed to dry. They shall then be given one coat of white wash.

All unnecessary nails shall be removed, the holes, cracks, patches etc. shall be made good with materials similar in composition to the surface to be prepared.

50.2.3 Scaffolding – Where scaffolding is necessary it shall be erected in such a way that as far as possible no 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.

50.2.4 Application of White / Colour Wash – On the surface so prepared the white wash shall be applied with “Moon” brush. The first stroke of the brush shall be from tip downwards, another from bottom upwards over the first stroke and similarly one stroke from the right another from the left, over the first stroke brush before it dries. This will form one coat. Each coat shall be allowed to dry before the next coat is applied. The number of coats as specified in item shall be applied. It shall present a smooth and uniform finish free from brush marks and it should not come off easily when rubbed with fingers.

Splashing and dropping, if any, on the doors and windows, ventilators etc. shall be removed and the surface cleaned.

Priming and alkali resistant treatments, scrapping of surface, washing etc. surface spoiled by smoke & soot, removing of oil and grease spots treatment for infection with efflorescence moulds, moss, fungi, algae and lichen and patch repairs to plaster wherever done shall not be paid extra.

50.3.0 MODE OF MEASUREMENTS & PAYMENTS:

50.3.1 All the works shall be measured in the decimal system as under –

- a) Dimensions shall be measured to the nearest 0.01 M.
- b) Area in individual items shall be worked out to the nearest 0.01 Sq. M.

All the works shall be measured in Sq. Mts. Deductions for jambs, soffits, sills etc. for openings not exceeding 0.5 Sq. Mts. each in area for ends of joints, posts, beams girders, steps etc. not exceeding 0.5 Sq. Mts. each in area and for openings exceeding 0.5 Sq. Mts. but not 3.0 Sq. Mts. each in area deductions and additions shall be made as under.

50.3.2 No deductions shall be made for ends of joints, beams, posts, etc. and openings not exceeding 0.5 Sq. Mts. each. No additions shall be made for reveals, jambs, soffits, sills etc. of these openings nor for finish around ends of joints, beams, posts, etc.

50.3.3 Deductions of openings exceeding 0.5 Sq. Mts. but not exceeding 3 Sq. Mts. each shall be made as follows and no additions shall be made for reveals, jambs, soffits etc. of these openings –

- a) When both the faces of walls are provided with finish, deduction shall be made for one face only.
- b) When each face of wall is provided with a different finish deduction shall be made for that side of frame for door, windows etc. on which width of reveals is less than

that of the other side. Where width or reveals on both faces of wall are equal, deduction of 50% of area of opening on each face shall be made from total area to finish.

- c) When only one face of wall is treated and the other face is not treated, full deduction shall be made if the width of reveal on the treated side is less than that on the untreated side, but if the width of the reveal is equal or more than on the untreated side neither deductions nor additions to be made for reveals, jambs, soffits, sills etc.

50.3.4 In case of area of openings exceeding 3 Sq. Mts. each deduction shall be made for openings but jambs, soffits, sills shall be measured.

50.3.5 No deductions shall be made for attachments such as casing, conduits, Pipe electric wiring and the like.

50.3.6 Cornices and all other features, when they are not picked out in a different finish colour shall be girthed and included in the general area.

50.3.7 The rate shall include the cost of all materials, labour scaffolding, protective measures etc. involved in all the operations described above.

50.3.8 The rate shall be for a unit of one Sq. Mts.

DTS:(51)

Providing and applying 2 coats of Colour wash of approved make and shade including scaffolding, brushing and brooming the surface to remove all dust, dirt mortar dropping and other foreign matter and also including providing and mixing in required proportion binding agent like "Fevicol dh" or equivalent of approved brand etc. inside surface Booster house & parapet wall, stair cabin, etc. at any height as directed by the Engineer in charge.

A) Walls

B) Ceiling

All specifications same as per DTS No. 50 for any level.

DTS:(52)

Boring holes 3.5 mt. deep in ordinary soil (for cast in situ piles) and getting out the soil and disposal of the surplus excavated soil as directed within a lead of 50 metre following diameter of piles.

300 mm

52.1 Piles may be constructed by selecting suitable installation techniques at a given site depending on sub soil strata condition and type of pile.

52.2. Bore hole may be made by EARTH AUGERS. In case of manual boring, an auger boring guide shall be used to keep the bores vertical or to the desired inclination and in position.

52.3. After the bore is made to the required depth i.e 3.5 m. , enlarging of the base shall be carried out by means of an under reaming tool.

52.4. The payment shall be made on Running meter basis.

DTS:(52A)

Extra for under reaming inside the bore holes for under reamed piles of 300 mm diameter.

1. Under reaming in bore hole shall be made as detailed in drawings & as directed by Engg.-in.charge.
2. The payment shall be made on No. basis.

DTS:(52B)

**Boring holes 3.0 mt. deep in ordinary soil (for cast in situ piles) and getting out the soil and disposal of the surplus excavated soil as directed within a lead of 50 metre following diameter of piles.
250 mm**

- 52A.1 Piles may be constructed by selecting suitable installation techniques at a given site depending on sub soil strata condition and type of pile.
- 52A.2. Bore hole may be made by EARTH AUGERS. In case of manual boring, an auger boring guide shall be used to keep the bores vertical or to the desired inclination and in position.
- 52A.3. After the bore is made to the required depth i.e 3.0 m, enlarging of the base shall be carried out by means of an under reaming tool.
- 52A.4. The payment shall be made on Running meter basis.

DTS:(53)

Providing and filling polysulphide sealent material of approved make for expansion joint including polythene backup rod of 25mm dia as directed by the Engineer in Charge.

- 53.1 All the materials required shall be as per relevant IS specifications.
- 53.2 Material for the Polysulphide sealent shall be as GE/PIDILITE/ CHOKSI Chemical or any other shall be approved from the Engineer-in-charge.
- 53.2 The measurement for payment shall be on running meter basis

DTS:(54)

Providing and fixing Bitumen fibre board for expansion joint etc. complete as directed by the Engineer in Charge.

- 54.1 All the materials required shall be as per relevant IS specifications.
- 54.2 Material for the Bitumen fiber board shall be as STP limited and shall be approved from the Engineer-in-charge.
- 54.3 The measurement for payment shall be on square meter basis

DTS:(55)

Providing and fixing FRP FRAME size 125 x 65 mm and 35 mm thick FRP Depress pannel shutter having extra reinforcement on sides and edges and in gel coat finish. The core of the shutter is to be filled up with injected fire retardent grade polyurethane foam done in situ alongwith embedded wooden places for stiffening and also for taking hinges and fixture. The whole FRP frame and shutter is to be water proof, weather proof, termite proof and resistance to mild acid/ Alkail. Rates are to be inclusive of S.S. hinges with necessary screws and alluminium fixtures and fastening. Product should have 3 years performance guarantee and company have ISO 9001-2000 certificate. (For W.C. & bathroom frame)

- 55.1. The material shall be of approved make.
- 55.2. The workmanship shall be in good manner and as directed by Engineer in charge.
- 55.3. The payment shall be made on Square meter basis.

DTS:(56)

Providing and fixing standared extruded of aluminium section of size 63 x 38.10 x1.20 mm (of Jindal section no.2434, @ Wt. 0.643Kg per mt) with colour powder coated alluminium frame for ventilation with 5 mm thick frosted glass as details etc. complete for ventilation.

- 56.1. The material shall be of approved make.
- 56.2. The workmanship shall be in good manner and as directed by Engineer in charge.
- 56.3. The payment shall be made on square meter basis.

DTS:(57)

Providing and fixing alluminium louvered glass ventiilators of adjustable type including with frames having section 50 mm x 25 mm (weight 0.50kg./mtr.) glazing cleat section (weight 0.096kg./mtr.) with colour anodized 20 micron and fixing 4 mm thick bajari/cl,ear glass etc. for all floor

- 57.1. The material shall be as per the general specification of material.
- 57.2. The workmanship shall be in good manner and as directed by Engineer in charge.
- 57.3. The payment shall be made on square meter basis.

DTS:(58)

Providing and laying Colour glazed tiles 6 mm th. of Orient, Kajaria, Jhonson, Nitco, Somani, Bell make at all floor levels, in flooring, treads of steps and landings laid on a bed of 12mm. Av Th.C.M. 1:3 (1 cement : 3 coarse sand) finished with flush pointing in Colour cement etc. completed. For all floors

58.1. MATERIALS

Water shall conform to M-1. Cement mortar shall conform to M-8. Colour glazed tiles shall conform to M-33.

58.2. WORKMANSHIP

Bedding - The sub-grade shall be cleaned, wetted and mopped. The bedding shall then be laid evenly over the surface tamped and corrected to desired levels and allowed to harden enough to offer a rigid cushion to tiles and to enable the mason to place wooden planks across and squat on it.

The colour glazed 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 spread in thickness not less than 10mm. any place and on an average 12mm. thickness. The proportion of the cement mortar shall be as specified in the item.

Fixing Tiles - The tiles before laying shall be soaked in water for at least two hours. Neat grey cement grout at 3.3 Kgs./Cement/Sq.Mts. of honey like consistency shall be spread over the mortar bedding as directed. The edges of 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.

The tiles shall not have staggered joints. The joints shall be thereto centre line both ways. The nahn 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 edge rubbed smooth to ensure straight and true joints. The joints shall be filled with grey cement grout with wire, brush or trowel to a depth of 5 mm. and loose material removed. White cement shall be used for pointing the joints. After fixing the tiles finally in an even plane the flooring shall be kept wet and allowed to stay undisturbed for 7 days.

Cleaning - The surplus cement grout that may have come out of the joints shall be cleared 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.

58.3. MODE OF MEASUREMENTS & PAYMENTS

The work done shall be measured in Sq.Mts. for visible area of work done. The length and width of the flooring shall be measured not between the faces of skirtings or dados or plastered face of wall as the case may be. The paving under dedo or skirting shall not be measured. No deductions shall be made for extra paid for any opening in the floor of are upto 0.1 Sq.Mts. Nothing extra shall be paid for laying the floors at different levels in the same rooms.

58.4 The rate shall be for a unit of one Sq.Mts.

DTS:(59)

Providing and laying Colour glazed tiles 6 mm th. of Orient, Kajaria, Jhonson, Nitco, Somani, Bell make at all floor levels, in floor levels in skirting risers of steps & dado on 10 mm. th. C.M. 1:3 (1 cement : 3 coarse sand) including necessary cement paste for fixing and jointed with Colour cement slurry. etc . completed. For all floors

59.1. MATERIALS

Water shall conform to M-1. Cement mortar shall conform to M-8. Colour glazed tiles shall conform to M-33.

59.2. WORKMANSHIP

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

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

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

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

59.3. MODE OF MEASUREMENTS & PAYMENTS

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

59.4 The rate shall be for a unit of one Sq.Mts.

DTS:(60)

Providing & Fixing water closet squatting pan (Orissa type W.C.pan) at all floor levels.size 580 mm size "P" or "S" trap for water closet squatting pan joining trap with the pan & soil pipe in C.M.1 :1 (1 cement :1 fine sand) etc. Comp. (A) Vitreous china long pattern of approved colour. For all Floor

60.1. MATERIALS:

Water closet squatting pan (Indian type W.C. Pan) and 'P' Trap shall conform to M-43, foot rests shall conform to M-43, Cement mortar shall conform to M-8.

60.2. WORKMANSHIP

The pan shall be sunk into the floor and embedded in a cushion of average 15 cms. cement concrete 1:5:10 (1 cement; 5 fine sand; 10 graded stone aggregate or brick aggregate 40 mm. nominal size) or as specified. This concrete shall be left 115 mm. below the top level of the pan so as to allow for flooring and its bed concrete. The floor should be suitably sloped so that the waste water is drained into the pan. The pan shall be provided with 100 mm. 'P' or 'S' trap as specified in the item with approximately 50 mm. seal. The joints between the pan and the trap shall be made leak-proof with cement mortar 1:1 (1 cement; 1 fine sand).

The 'P' or 'S' trap shall be fixed with pan and cast iron pipe with C.M. 1:1. The pan shall be provided with a 100 mm. 'P' or 'S' trap as specified in the item with an approximately 50 mm. seal. The joint between the pan and the trap shall be made leak proof with cement mortar 1:1 (1 cement; 1 fine sand).

After laying the floor, the floor shall be suitably sloped so that the waste water is drained into the pan. A pair of foot-rests of size 250 mm x 130 mm x 30 mm of white vitreous china shall be set in cement mortar 1:3 (1 cement; 3 coarse sand). The foot rests shall be fixed at a distance of 175 mm. from the inner edge of the back side of the pan and shall be fixed at convenient angle.

60.3. MODE OF MEASUREMENT

The rate shall include the cost of all materials and labours involved in all the operations described under workmanship.

60.4 The rate shall be for a unit of one number.

DTS:(61)

Providing and fixing wash basin with single hole for pillar tap at all floor levels with C.I. Or M.S. Brackets painted white incl. Cutting holes & making good the same incl. Fitting such a pillar tap, capstan head screw down high pressure with screws, shanks & back nuts. C.P. brass waste trap, screw down stop tap 15mm dia. etc. comp.. (A) Vitreous china flat back wash basin 550mm x 400mm size in approved colour for all floor lvls...etc. comp...

61.1. MATERIALS

The white glazed earthenware wash basin shall be 550 mm. x 400 mm. of 1st quality and make as approved by the Engineer-in-charge. The wash basin shall conform to M-37. The capstan head pillar tap of specified dia. of C.P. over brass shall be of best quality and shall conform to I.S. 1795-1961. The pillar taps shall be of tested quality. The C.P. brass trap and union shall be of 32 mm.dia. and of best quality and make as approved by the Engineer-in-charge. The brass screw down stop cock of specified dia. shall conform to I.S. 781-1977. The stop sock shall be of tested quality.

61.2. WORKMANSHIP

The wash basin shall be fixed on the wall as and where directed. The wash basin shall be supported on a pair of R.S. or C.I. brackets fixed in C.M. 1:3 (1 cement; 3 sand). The bracket shall conform to I.S. 775-1962. The wall plaster on the rear shall be cut to rest the top edge of the wash basin. After fixing the basin, plaster shall be made good and surface finished to match with the existing one.

The bracket shall be painted white with ready mixed paint. The C.P. brass trap and union shall be connected to 32 mm.dia. waste pipe which shall be suitably bent towards the wall and which shall discharge into an open drain leading to a gully trap or direct into the gully trap on the ground floor and shall be connected to a waste pipe through a floor trap on the upper floors. C.P. brass trap and union may not be provided where the surface drain or a floor trap is placed directly under the basin and the waste is discharged into vertically.

The height of the front edge of the wash basin from the floor level shall be 80 cms.

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

C.P. brass waste trap and union shall be connected to 32 mm.dia. waste pipe which shall be connected suitably towards the wall and which shall discharge into the drain through a floor trap. The C.P. brass waste trap shall be provided for wash basin or sink as the case may be.

The stop cock shall be fixed in position by means of jam, nut & socket. The stop cock shall be fixed near the inlet of the water metre or as directed. The joints shall be done with white zinc and spun yarn. The joint shall be tested for leak proofing.

The necessary inlet, outlet connections and fittings such as pillar coasks, C.P. brass waste trap, waste pipe, stop cock etc. shall be fixed as specified above.

The payment of fittings shall be made under this item.

61.3. MODE OF MEASUREMENTS & PAYMENTS

The rate includes cost of all labour, materials, tools and plant etc. required for satisfactory completion of this item as specified in workmanship.

The rate shall be for a unit of one number.

DTS:(62)

Providing and fixing urinal of approved quality including connection with trap and with integral longitudinal flush pipe.

a) Squating plate pattern white earthenware 550 mm x 300 mm.

62.1. MATERIALS

The white earthenware flat back or corner type urinal of size 430mm. x 260mm. x 350mm. shall conform to M-45.

62.2. WORKMANSHIP

The urinals shall be fixed in position by using wooden plugs and screws and shall be at a height of 65 cms. from the floor level to the top of the lip of urinal, unless otherwise directed. The wooden plug shall be 50mm. x 50mm. at base lapping to 38mm. x 38mm. at top and 50mm. in length shall be fixed in wall in cement mortar 1:3 (1 cement; 3 coarse sand). The urinal shall be connected to a 32mm.dia. galvanised mild steel waste pipe which shall discharge in the channel or after tap. The connection between the urinal and flush or waste pipe shall be made by means of putty or white lead mixed with chopped hemp.

62.3. **MODE OF MEASUREMENTS & PAYMENTS**

The rate includes cost of all labours, materials, tools and plants etc. required for satisfactory completion of this item.

62.4 The rate shall be for a unit of one number.

DTS:(63)

Providing and fixing 600 mm x 450 mm Bevelled edge mirror of superior glass mounted on 6 mm thick A C Sheet or plywood sheet and fixed to wooden plug with CP Brass screws and washers.

63.1. The material shall be of approved by the Engineer in charge.

63.2. The workmanship shall be in good manner and as directed by Engineer in charge.

63.3. The payment shall be made per number basis.

DTS (64)

Providing and fixing CP brass towel rail complete with CP brass brackets fixed to wooden plugs with CP brass screws.

64.1. The material shall be of approved by the Engineer in charge.

64.2. The workmanship shall be in good manner and as directed by Engineer in charge.

64.3. The payment shall be made per number basis.

DTS:(65)

Providing and fixing chromium plated brass half turn flush cock of approved quality including fixing in pipe line etc. complete.

a) 25 mm dia.

65.1. **MATERIALS**

Chromium plated brass half turn flush cock shall conform to M-58.

65.2. **WORKMANSHIP**

The half turn flush cock of specified diameter shall be fixed as directed. The flush cock shall be fixed in G.I. pipe line with necessary fittings. The joints shall be made leak proof by using spun yarn and white zinc. The fixing work shall be carried out as per relevant specifications of Item No. 34.

65.3. **MODE OF MEASUREMENTS & PAYMENTS**

The rate includes cost of all materials and labour required for satisfactory completion of this item including fittings.

65.4 The rate shall be for a unit of one number.

DTS:(66)

Providing and fixing to wall, ceiling and floor galvanised M. S. pipes (medium grade) TATA /ZENITH / ZINDAL/ ASIAN make of the following nominal diameters with pipe fittings and clamps including making good the wall, ceiling and floor. Pipes to be tested for a pressure as specified.

- a) 15 mm dia.
- b) 25 mm dia.
- c) 40 mm dia.

66.1 MATERIALS

Galvanised mild steel tubes of specified dia. nominal bore shall conform to I.S. 1239-1961. The galvanised fittings, clamps, etc. required for specified dia. bore pipes shall be of best quality and make as approved by the Engineer-in- charge.

66.2 WORKMANSHIP

Cutting, Laying & Jointing - When the tubes are to be cut or rethreaded, the ends shall be carefully filed out so that no obstruction to bore is offered. The ends of the tubes shall then be threaded conforming to the requirements of I.S. 554-1955 with pipe dies and taps carefully in such a manner as will not result in slackness of joints when the two pieces are screwed together.

The taps and dies shall be used only for straightening screw threads which have become bent or damaged and shall not be used for turning of the threads so as to make them slack as the latter procedure may not result in a water tight joint. The screw threads for the tube and fittings shall be protected from edge until they are fitted.

In jointing the tubes, the inside of the socket screwed end of the tubes shall be oiled and smeared with white or red lead and wrapping around with a few turns of fine spun yarn round the screwed end of the tube. The end shall then be tightly screwed in the socket, tees, etc. with a pipe wrench. Care shall be taken that all pipes and fittings are properly jointed so as to make the joints completely water tight and pipes are kept at all times free from dust and dirt during fixing. Burr from the joints shall be removed after screwing. After laying the open ends of the pipes shall be temporarily plugged to prevent access of water, soil or any other foreign matter.

Any threads exposed after 3 jointing shall be painted or in the case of underground piping thickly coated with approved anti-corrosive paint to prevent corrosion.

66.3 Laying in Trenches - The width and depth of the trenches for different diameters of the tubes shall be as - For 15 to 80 mm. dia. tube width of trenches shall be 30 cms. and depth of trenches 60 cms.

At joints, the trench width shall be widened where necessary. The work of excavation and refilling shall be done true to line and gradient in accordance with general specifications of earth work in trenches.

The pipes shall be painted with two coats of anti-corrosive bitumastic paint of approved quality. The pipe shall be laid on a layer of 75mm. sand filled upto 150mm. above the pipe if so specified. The remaining portion of trench shall be then filled with excavated earth. The surplus earth shall be disposed of as directed.

When the excavation is done in rock the bottom shall cut deep enough to permit the pipe to be laid and cushion of sand 75mm. In case of bigger diameter of tube where pressure is very high, thrust block of cement concrete 1:2:4 (1 cement; 2 coarse sand; 4 graded stone aggregate of 20 mm. nominal size) shall be constructed on all bends to transmit the hydraulic thrust without impairing the ground and spreading it over a sufficient area if so specified.

- 66.4 Fixing of Tube Fittings to wall ceiling & floors - In case of fixing of tubes and fittings to the walls or ceilings, these shall run on the surface of the wall or ceiling (not in chase) unless otherwise specified. The fixing shall be done by means of standard pattern, holder clamps keeping the pipes about 15mm. clear of the wall. When it is found necessary to conceal the pipe and when specified so, chasing may be adopted or pipe fixed in ducts or recesses etc. provided that there is sufficient space to work on the pipe with usual tools. The pipe shall not ordinarily be buried to walls or solid floors, where unavoidable, pipes may be buried for short distances provided that adequate protection is given against damage and where so required joints are not buried. Where required M.S. tube sleeves shall be fixed at a place a pipe is passing through a wall or floor for expansion and contraction and other movements. In case the pipe is embedded in walls or floors, it should be painted with anti-corrosive bitumastic paint of approved quality. The pipe should not come in contact with lime mortar or lime concrete as the pipe is affected by lime, under the floors, the pipe shall be laid in layer of sand filling.

All pipes and fittings shall be fixed truly vertical and horizontal unless unavoidable. The pipes shall be fixed to walls with standard pattern clamps or required size and shape, one end of which shall be properly plugged or cemented into walls with cement mortar 1:3 (1 cement; 3 coarse sand) and the other tightened round the pipes to hold it securely. These clamps shall be spaced at regular intervals in straight lengths at 2 M c/c interval in horizontal run and 2.5 M. intervals in vertical run. For pipe of 15 mm. dia. upto 25 mm. dia. the holes in the walls and floors shall be made by drilling with chisel or jumper and not by dismantling the brick or concrete. However, for higher diameter pipes and holes shall be carefully made of the smallest required size. After fixing the pipe holes shall be made good with cement mortar 1:3 (1 cement; 3 coarse sand) and properly finished to match the adjacent surface.

- 66.5 Testing of Joints - After laying and jointing, the pipes and fittings shall be inspected under working conditions of pressure and flow. Any joint found leaking shall be redone, and all leaking pipes removed and replaced without extra cost.

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

66.6 **MODE OF MEASUREMENTS & PAYMENTS**

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

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

All the work shall be measured in decimal system as fixed in its place, subject to tolerance for.

In case of fittings of unequal bore, the largest bore shall be measured for the test.

Testing of pipe lines, fittings and joints included for providing all plant and appliances necessary for obtaining access to the work to be tested and carrying out the tests.

The rate includes galvanised steel tubing with screwed socket joints, together with all fittings (such as bends, sockets, springs, elbows, tees, crosses, short pieces, clamps and plug unions etc.) and fixing complete with clamping wall-hooks, wooden plugs etc. and also cutting screwing and waste and for making forged (or hand made) bends on piping as required. The rate also includes cutting through walls, floors etc. and their making good and painting exposed threads with anti-corrosive paint as above and testing. Where tubes are to be fixed to wall, ceiling and flooring, the rates shall not include painting of pipes, providing sleeves and sand filling under floor for which separate payment shall be made.

Where the tubes are lain in trenches, the work of excavation and refilling shall not be paid separately. The rate also include painting of pipes and sand filling all round tubes for which separate payment shall not be made. The length shall be measured on running metre basis.

66.7 The rate shall be for a unit of one running metre.

DTS:(67)

Providing and fixing C.P. brass screws down stop tap 15 mm dia. Polished bright, conforming to and tested as per IS : 781 of approved make and design , with all necessary fittings.

Same as per the Item No. 76

DTS:(68)

Providing and fixing C.P. brass screws down bib taps polished bright of 15 mm dia. conforming to and tested as per IS : 781 of approved make and design , with all necessary fittings.

68.1. MATERIALS

15mm. dia. brass screw down with bright polished finish shall conform to I.S. 781-1977. The bib cock shall be best Indian make and quality.

68.2. WORKMANSHIP

The screw down bib cock 15mm. dia. as specified above shall be fixed as directed. The threaded portion shall be smeared with white or lead, lead and around with a few turns of fine spun yarn round the screwed end of the pipe. The bib cock shall be then screwed and fixed to water tight position.

68.3. **MODE OF MEASUREMENTS & PAYMENTS**

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

68.4. The rate shall be for a unit of one number.

DTS:(69)

Providing and fixing U-PVC pipe (SWR) confirming to IS : 13592 (type B) of prince/ supreme/ jain/Astral/Tulsi/Finolex make for soil & waste discharge system at all floor levels incl. All fixtures like bends, tees, shoe. Etc. jointed with resin of approved brand & manufacture etc. comp.

(a) 75mm dia.

69.1. The material shall be of approved by the Engineer in charge.

69.2. The workmanship shall be in good manner and as directed by Engineer in charge.

69.3. The payment shall be made on running meter basis.

DTS:(70)

Providing & Constructing simple chamber of 23 C.M. thick B.B.Masonry in C.M. 1:5 with cement plaster 14 mm thick in C.M. 1:3 inside & outside to exposed faces, bedding concrete 1:5:10 & fixing C.I. Cover with frame to be not less than 38 kg. On top etc. comp. Inside dimension 455 x 610 mm & 450 mm deep for single pipe.

70.1 **MATERIALS**

Water shall conform to M-1. Cement shall conform to M-3. Coarse sand shall conform to M-5. Brick shall conform to M-12. Stone aggregate shall conform to M-9. M.S. bar shall conform to M-14.

70.2 **WORKMANSHIP**

The chamber shall be of size 455mm. x 610mm. internal clear dimensions between the masonry wall faces. The height of 600mm. shall be measured from the top of the bed concrete to the top of the C.I. frame.

The excavations shall be done true to dimensions and levels shown on the plans or as directed.

Bed concrete shall be 15 cms. thick C.C. 1:5:10 (1 cement; 5 coarse sand; 10 grade stone aggregates). The projection of bed concrete beyond the masonry walls shall be 10 cms.

The walls of chamber shall be constructed in brick work with C.M. 1:5 and 23 cms. thick as per relevant specifications of brick masonry works.

The walls and bed concrete of chamber shall be plastered inside with 12mm. thick cement plaster 1:3 (1 cement; 3 fine sand) finished smooth.

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

70.3 MODE OF MEASUREMENTS & PAYMENTS

The earth work and excavation, providing and construction complete chamber, cost of connecting pipes with the chamber etc. included in the rate of the item.

The rate includes all labour and materials required for the satisfactory completion of this item as described above.

The rate shall be for a unit of one number.

DTS:(71)

Providing and fixing 10 cm x 15 cm (4" x 6") S.W. trap with inside dimension 455 x 610 mm & 450mm deep sewer trap chamber with 23 C.M. thick B.B.Masonry walls in C.M. 1:5 with cement plaster 15 mm thick in C.M. 1:3 inside and outside to exposed faces, bedding concrete 1:5:10 & fixing C.I. cover with frame to be not less than 38 Kg. On top etc. comp. for single pipe.

General:

The item refers to provide and fix 10cms. x 15cms. S.W. trap with 0.45 x 0.60 mts. clear opening sewer trap chamber with 23 cms. thick B.B. masonry walls in C.M. 1:5 with cement plaster inside and outside to exposed faces including fixing C.I. cover of 50 Kgs. on top sewer trap.

1.0 MATERIALS

The stone wall sewer trap shall be of 10cms. x 15cms. size conforming to relevant I.S.

2.0 WORKMANSHIP

2.1 Necessary excavation shall be done as required. The foundation cement concrete of 1:4:8 shall be laid for a thickness of 15cms. The S.W. trap shall be fixed into the position on the main sewer side of the chamber as directed. Brick masonry chamber of one brick thickness in C.M. 1:5 shall be constructed with the inside dimensions 60cms.x 45cms.

2.2 The inside of the chamber shall be plastered in 12mm. thick C.M. 1:3 and shall be finished smooth with cement slurry. The outside of the chamber shall be plastered to a depth of 30 cms. from the top of the chamber. The item also includes providing and laying 1:2:4 cement concrete for fixing the C.I. frame and cover. The C.I. frame and cover shall be of the specified size and it shall not weigh less than 50 Kgs. including frame and cover.

3.0 MODE OF MEASUREMENTS & PAYMENTS

3.1 The rate includes costs of all materials, labour, tools, plants, etc. required for carrying out satisfactory completion of items.

3.2 Rate shall be as per number basis.

DTS:(72)

Providing and fixing in position PVC cowl vent to pipes of prince / supreme / jain / Astral / Tuisi/Finolex make etc. comp.

(a) 110 mm dia.

- 72.1. The material shall be of approved by the Engineer in charge.
- 72.2. The workmanship shall be in good manner and as directed by Engineer in charge.
- 72.3. The payment shall be made per number basis.

DTS:(73)

Providing and fixing PVC nahni trap 3.5 inch height of prince/ supreme/ jain make at all floor lvls. Of self cleaning design with screwed down or hinged grating incl. Cost of cutting making good the walls & floors etc. for all floor etc. comp..

- 73.1. The material shall be of approved by the Engineer in charge.
- 73.2. The workmanship shall be in good manner and as directed by Engineer in charge.
- 73.3. The payment shall be made per number basis.

DTS:(74)

Prov. & Fixing S.W. Gully trap with C.I.grating brick masonry (C.M 1:5)chamber & water tight Pre cast R.C.C. cover of 300mmx300mm size (inside) includ. plastering smooth inside & outside 15mm. th' in C.M.1:3 etc. comp.

(i) Square mouth traps---(A) 150 mm x 100 mm size - P type

74.1. MATERIALS

Gully trap shall conform to M-48.

74.2. WORKMANSHIP

The gully trap shall be set in c.c. 1:4:8 extending 30 cms. beyond the trap on the three sides over which shall be constructed one brick masonry chamber of suitable size with C.I. cover in top. The lid of cast iron along with C.I. frame of size 300mm. x 300mm. inside shall be of approved quality and fixed in c.c. 1:2:4 75mm. thick at top. The trap shall have C.I. gratings on top. The C.I. cover shall be painted with two coats of anti-corrosive paint of approved make.

74.3. MODE OF MEASUREMENTS & PAYMENTS

The rate includes all cost of all labours, materials, tools and plant etc. required for satisfactory completion of this item including jointing and testing.

The rates shall be for a unit of one number.

DTS:(75)

Providing and fixing 100 mm size P or S trap for water closet squatting pan including jointing the trap with the pan and soil in @ mortar 1:1 (1 cement : 1 coarse sand)

a) Vitreous China

- 75.1. The material shall be of approved by the Engineer in charge.
- 75.2. The workmanship shall be in good manner and as directed by Engineer in charge.
- 75.3. The payment shall be made per number basis.

DTS:(76)

Providing, laying and jointing R.C.C NP2 CLASS pipe In C.M. 1:1 of following nominal internal diameters Including testing of pipes and joints complete.150 mm dia.

76.1. MATERIALS

Water shall conform to M-1. Cement mortar of proportions 1:1 shall conform to M-8. 150 mm. dia. RCC NP-2 class pipe shall conform to IS-458-2003-

76.2. WORKMANSHIP

The width and depth of the trenches for 150 mm. dia. pipe shall be 60 cms. width and depth of trenches as required. At joints, the trench width shall be widened where necessary. The work of excavation and refilling shall be done true to line, and gradient in accordance with general specifications of earth work in trenches. The remaining portion of trench shall be then filled with excavated earth. The surplus earth shall be disposed off as directed.

The pipes shall be laid accurately and perfectly true to line, levels and gradients. Great care shall be taken to prevent sand etc. from entering the pipes. The pipes between two manholes shall be laid truly in a straight line without vertical or horizontal undulation. All junctions and change in direction and diameter shall be made inside manhole by means of curved tapered channels formed in cement concrete finished smooth and benched on both sides. The body of the pipe shall rest for its entire length, on an even level bed grips being made on left on the bed to receive the sockets of the pipes.

MODE OF MEASUREMENTS & PAYMENTS

The measurements shall not be without any allowance for cutting and waste. The length of bends, junction and other connections shall be included in the total length of the drain pipes. Nothing extra shall be paid for the same. The rate includes necessary excavation, refilling trenches etc. complete.

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

DTS:(77)

Providing and fixing double coated syntex or equivalent PVC (ISI) mark water tank of required capacity each with all necessary Fitting & connection etc. complete on terrace.

77.1. The material shall be of approved by the Engineer in charge.

77.2. The workmanship shall be in good manner and as directed by Engineer in charge.

77.3. The payment shall be made per litre basis.

DTS:(78)

Providing Aluminium pole ladder made from channel size 44 mm x 25 mm x 3 mm (1.314 x 1 x 1/8") and step made from non sleep corrugated aluminium pipe 25 mm dia. complete with rubber shoes at top and bottom available in aluminium for any height.

The material shall be of approved make and of good workmanship.
The payment shall be made on running meter basis.

DTS:(79)

Providing, manufacturing and supplying at site the MS special with one end plain and one end flanged suitable for field welding at site. The size and dimensions shall be confirming to IS : 7322, with providing and applying on outer. (minimum 3 nos.)

The material shall be of approved make and of good workmanship.
The payment shall be made on kilogram basis.

DTS:(80)

Providing and laying cement concrete 1:1.5:3 (1 cement : 1.5 sand : 3 graded stone agg.20 mm nominal size) & curing comp... incl. cost of formwork but excluding cost of reinforcement for reinforced conc.work in (A) foundation, footing,base of columns and mass conc.

80.1.0 MATERIALS:

80.1.1 Water shall conform to M-1, Cement shall conform to M-3. Sand shall conform to M-5
Stone aggregate 40-mm nominal size shall conform to M-9.

80.2.0 WORKMANSHIP:

80.2.1 General :

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

80.3.1 Proportion of Mix:

The proportion of cement, sand coarse aggregate shall be 1 part of cement, 1.5 parts of sand 3 parts of stone aggregate measured by volume.

80.3.2 Mixing:

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 Engineer-in-charge. When hand mixing is permitted by The Engineer-in-charge in case of break down of machinery 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 required shall have to be used without any extra cost. The mixing in mechanical mixer shall be done for a period of 1 ½ to 2 minutes. The quantity of water shall be just sufficient to produce dense concrete of required workability for the purpose.

80.3.3 Transporting and placing the concrete:

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

Compacting : The concrete shall be rammed with heavy iron rammer and rapidly to get the required compaction and to allow the interstices to be filled with mortar.

80.3.4 Curing:

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

80.4 MODE OF MEASUREMENT AND PAYMENTS:

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

DTS:(81)

Providing interlocking type Rubber moulded cement concrete paver block of approved shape, design & colour having 60 mm thickness(M-35) purchased from SMC's approved paverblock manufacturer only & fixing of fine sand bedding. Item also includes levelling by using vibratory plates compacted machine. item also includes all material, labour, equipments,tools, plants, watering, cleaning etc. complete.(with colour)

The pattern and colour of pave block shall be as per the prior approval and direction of engineer in charge.

81.1 RAW MATERIALS

81.1.1 Cement

The cement used in the manufacture of high quality precast concrete paving block shall be conforming to IS 12269 (53 grade) ordinary Portland Cement or IS 8112 (43 grade ordinary Portland cement). The minimum cement content in concrete used for making paver blocks should be 310 kg/Cu.M. And the upper limit of cement shall not be more than 425kg/Cu.M. Entire quantity of cement required to manufacture paving blocks shall be procured by contractor at his own cost.

81.1.2 Aggregates

The fine and coarse aggregates shall consist of naturally occurring crushed or uncrushed materials which, apart from the grading requirements comply with IS 383-1970. The fine

aggregates used shall contain a minimum of 25% natural silicon sand. Lime stone aggregates shall not be used. Aggregates shall contain no more than 3% by weight of clay and shall be free from deleterious salts and contaminants.

81.1.3 Water

The water shall be clean and free from any deleterious matter. It shall meet the requirements stipulated in IS:456-2000.

Other materials

Any other material/ingredients used in the concrete shall conform to latest IS specifications.

81.1.4 PAVER BLOCKS CHARACTERISTICS

The concrete pavers should have perpendicularities after release from the mould and the same should be retained until the laying.

The surface should be of anti-skid and anti glare type.

The paver should have uniform chamfers to facilitate easy drainage of surface run off.

The pavers should have uniform interlocking space of 2 mm to 3 mm to ensure compacted sand filling after vibration on the paver surface.

The concrete mix design should be followed for each batch of materials separately and automatic batching plant is to be used to achieve uniformity in strength and quality.

The pavers shall be manufactured in single layer only.

Skilled labour should be employed for laying blocks to ensure line and level for laying, desired shape of the surface and adequate compaction of the sand in the joints.

The pavers are to be skirted all round with kerbing using solid concrete blocks of size 100 mm x 200 mm x 400 mm or as directed by the Engineer. The kerbing should be embedded for 100 mm depth. The concrete used for kerbing shall be cured properly for 7 days minimum.

Laying of Paver Blocks

Priming

It will be responsibilities of the Contractors to ensure that the manhole/pipeline cable trenches/circular drainage system etc. raised to driveway level using the requisite materials as per instruction of Engg. The areas of potholes/deep depressions at the isolated locations also have to be filled up before laying the paver blocks. No extra pavements will be made for this purpose.

It will be the responsibility of the Contractors to ensure that undulations on the paver blocks are eliminated after the traffic is allowed on it. Proper slope for drainage of water needs to be ensured by the Contractor. All necessary materials, tools, tackles are required to be arranged by the Contractor.

81.1.5 **Bedding sand course**

The bedding sand of minimum 200 mm shall consist of a clean well graded sand passing through 4.75 mm sieve and suitable for concrete. The bedding should be from either a single source or blended to achieve the following grading.

In sieve size	% passed
9.52 m	100
4.75 mm	95-100
2.36 mm	80-100
1.18 mm	60-100
600 microns	25-60
300 microns	10-30
150 microns	5 – 15
75 microns	0 – 10

Contractor shall be responsible to ensure that single-sized, gap graded sands or sands containing an excessive amount of fines or plastic fines are not used. The sand particles should preferably be sharp not rounded as sharp sand possess higher strength and resist the migration of sand from under the block to less frequently areas even though sharp sands are relatively more difficult to compact than rounded sands, the use of sharp sands is preferred for the more heavily trafficked driveways. The sand use for bedding shall be free of any deleterious soluble salts or other contaminants likely to cause efflorescence.

The sand shall be of uniform moisture content and within 4% - 8% when spread and shall be protected against rain when stock piled prior to spreading. Saturated sand shall not be used. The bedding sand shall be spread loose in a uniform layer as per drawing. The compacted uniform thickness shall be of 200 mm and within +/- 5 mm. Thickness variation shall not be used to correct irregularities in the base course surface.

The spread sand shall be carefully maintained in a loose dry condition and protected against pre-compaction both prior to and following screeding. Any precompacted sand or screeded sand left overnight shall be loosened before further laying of paving blocks take place.

Sand shall be slightly screeded in a loose condition to the predetermined depth only slightly ahead of the laying of paving unit.

Any depressions in the screeded sand exceeding 5 mm shall be loosened, raked and rescreeded before laying of paving blocks.

Sand filling shall be paid separately per cubic meter. **(Refer Item No.13)**

81.1.2 **Laying of interlocking Paver Blocks**

Paver blocks shall be laid in herringbone laying pattern throughout the pavement. Once the laying pattern has been established, it shall continue without interruption over the entire pavement surface. Cutting of blocks, the use of infill concrete or discontinuities in laying pattern is not be permitted in other than approved locations.

Paver blocks shall be placed on the uncompacted screened sand bed to the nominated laying pattern, care being taken to maintain the specified bond through out the job. The first row shall be located next to an edge restraint. Specially manufactured edge paving blocks are permitted or edge blocks may be cut using a power saw, a mechanical or hydraulic guillotine, bolster or other approved cutting machine.

Paver blocks shall be placed to achieve gaps nominally 2 to 3 mm wide between adjacent paving joints. No joint shall be less 1.5 mm not more than 4 mm. Frequent use of string lines shall be used to check alignment. In this regard the “laying face” shall be checked at least every two meters as the face proceeds. Should the face become out of alignment, it must be corrected prior to initial compaction and before further laying job is proceeded with.

In each row, all full blocked shall be laid first. Closure blocks shall be cut and fitted subsequently. Such closer blocks shall consist of not less than 25% of a full blocks.

To infill spaces between 25 mm and 50 mm wide concrete having screened sand, coarse aggregate mix shall be used. Within such mix the nominal aggregate size shall not exceed one third the smallest dimension of the infill space. For smaller spaces dry packed mortar shall be used.

Except where it is necessary to correct any minor variations occurring in the laying bond, the paver blocks shall not be hammered into position. Where adjustment of paver blocks necessary care shall be taken to avoid premature compaction of the sand bedding.

81.2.1 Initial Compaction

After laying the paver blocks, they shall be compacted to achieve consolidation of the sand bedding and brought to design levels and profiles by not less than Two (2) passes of a suitable plate compactor.

The compactor shall be a high-frequency, low amplitude mechanical flat plate vibrator having plate area sufficient to cover a minimum of twelve paving blocks. Prior to compaction all debris shall be removed from the surface.

Compaction shall proceed as closely as possible following laying and prior to any traffic. Compaction shall not, however, be attempted within one metre of the laying face. Compaction shall continue until lipping has been eliminated between adjoining blocks. Joints shall then be filled and recompactd as described in Cl. 3.5.

All work further than one metre from the laying face shall be left fully compacted at the completion of each day’s laying.

Any blocks that are structurally damaged prior to our during compaction shall be immediately removed and replaced.

Sufficient plate compactors shall be maintained at the paving site for both bedding compaction and joint filling.

81.2.3 Joint filling and final compaction

As soon as possible after compaction and in any case prior to the termination of work on that day and prior to the acceptance of vehicular traffic, sand for joint filling shall be spread over the pavement.

Joint sand shall pass a 2.36 mm (No.8) sieve and shall be free of soluble salts or contaminants likely to cause efflorescence. The same shall comply with the following grading limits.

In sieve size	% passed
---------------	----------

2.36 mm	100
1.18 mm	90-100
600 microns	60-90
300 microns	30-60
150 microns	15-30
75 microns	10-20

The Contractor shall supply a sample of the jointing sand to be used in the contract prior to delivering any such materials to site for incorporation into the works. Certificates of test results issued by a recognized testing laboratory confirming that the samples conform to the requirements of this specifications shall accompany the sample.

The jointing sand shall be broomed to fill the joints. Excess sand shall then be removed from the pavement surface and the jointing sand shall be compacted with not less than one (1) Pass by the plate vibrator and joints refilled with sand to full depth. This procedure shall be repeated until all joints are completed filled with sand. No traffic shall be permitted to use the pavement until all joints have been completely filled with sand and compacted.

Both the sand and paver block shall be dry when sand is spread and broomed into the joints to prevent premature setting of sand.

The difference in level (lipping) between adjacent blocks shall not exceed 3 mm with not more than 1% in any 3 m x 3 m area exceeding 2 mm. Pavement which is deformed beyond above limits after final compaction shall be taken out and reconstructed to the satisfaction of the Engineer.

81.2.4 Edge Restraint

Edge restrains need to be sufficiently robust to withstand override by the anticipated traffic, to withstand thermal expansion and to prevent loss of the laying course material from beneath the surface course. The edge restraint should present a vertical face down to the level of the underside of the laying course.

The surface course should not be vibrated until the edge restraint, together with any bedding or concrete haunching, has gained sufficient strength. It is essential that edge restraints are adequately secured.

Sampling and Testing Procedures for Paver Blocks

Sample Size

Internal – Average of minimum 3 samples per 5000 blocks – for paver block manufacturers.

External – Minimum 2 blocks per 10000 blocks. Average of minimum 8 blocks per site – for captioned contractors.

Sampling for Testing

Sampling for testing of paver blocks shall be done in accordance with Appendix-A.

Compressive Strength

Testing for compressive strength shall be undertaken in accordance with Appendix-B. The average compressive strength of the 80 mm thick paver block tested shall be 50 N/Sq mm and average compressive strength of the 60 mm thick paver blocks tested shall be 45 N/Sq mm

Water Absorption

Testing for water absorption shall be in accordance with IS 2185:1979:Part I (Specifications for concrete masonry blocks) Appendix C

The rate shall be for unit of one Sq.mtr.

81.4 Appendix –A Sampling of Paver Blocks

Method of Sampling

Before laying paver blocks, each designated section comprising not more than 50000 blocks, shall be divided into ten approximately equal groups. Three blocks shall be drawn from each group.

Marking and Identification

All samples shall be clearly marked at the time of sampling in such a way that the designated section of Part thereof and the consignment represented by the sample, are clearly defined.

The sample shall be dispatched to the approved test laboratory taking precaution to avoid damage to the paving in transit. Protect the paving from damage and contamination until they have been tested. The samples shall be stored in water at $20^{\circ}\text{C} + 5^{\circ}\text{C}$ for 24 hours prior to testing.

81.5 Appendix – B Procedure for Testing of Compressive Strength for Paver Blocks

Reference: BS 6717 Part I (1993) Specification for Paver Blocks

- B-1 Testing Machine: The testing machines shall be of suitable capacity for the test and capable of applying the load at the rate specified. It shall comply, as regards repeatability and accuracy with the requirements of relevant IS specification.
- B-2 Procedure – The sample specimens shall be tested in wet condition after being stored at least 24 hours, in water maintained at a temperature of $20^{\circ}\text{C} + 5^{\circ}\text{C}$ before the specimens are submerged in water, the necessary area shall be determined.

The plates of the testing machine shall be wiped clean and any loose grit or other material removed from the contact faces of the specimen. Plywood nominally 4 mm thick, shall be used as packing between the upper and lower faces of the specimen and the machine plates, and these boards shall be larger than the specimen by a margin of at least 5 mm at all points. Fresh packing shall be used for each specimen tested. The specimen shall be placed in the machine with the wearing surface in a horizontal plane and in such a way that the axes of the specimen are aligned with those of the machine's plates. The load shall be applied without shock and increased continuously at the rate of approximately 15 N/sq. mm per minute until no greater load can be sustained. The maximum load applied to the specimen shall be recorded.

- B-3 Calculation of Corrected Strength: The compressive strength of each block specimen shall be calculated by dividing the maximum load by full cross section area and multiplying by an appropriate factors.

Thickness and Chamfer Correction Factors

For Compressive Strength

Work Size Thickness in mm	Correction Factors	
	Plain Block	Chamfered Block
60	1.00	1.06
80	1.12	1.18
100	1.18	1.24

B-4 Compressive Strength Calculation: The average corrected compressive strength for the designed block section shall be calculated.

81.6 APPENDIX –C

Method for the Determination of Water Absorption

The test specimens shall be completely immersed in water at room temperature for 24 hours.

The specimens shall then be weighed, while suspended by a metal wire and completely submerged in water

They shall be removed from the water and allowed to drain for one minute

Visible surfaces water being removed with a damp cloth and immediately weighed

Subsequent to saturation, all specimens shall be dried in a ventilated oven at 100 to 115oC for not less than 24 hours and until two successive weightings at intervals of 2 hours show an increment of loss not greater, than 0.2 percent of the last previously determined mass of the specimen.

Calculate the absorption as follows:

Absorption, kg/m³

Absorption percent

Where

A = wet mass of unit in kg

B = dry mass of unit in kg. And

C = suspended immersed mass of unit in kg.

DTS NO. 82

Providing and fixing G.I. Chain link or 50 mm x 50 mm size x 10 gauge thick with nuts, bolts, washer or G.I. pins etc. complete as per relevant I.S. Specification. (TATA or equivalent brand)

The wire shall be of galvanised steel it shall conform to I.S. specification, wire may be galvanised, as indicated. All finished steel, wire shall be well cleanly drawn to the dimensions and size of wire as specified in item. The wire shall be sound, free from splits, surface flaws rough jagged and imperfect edges and other harmful surface defects shall conform I.S. 280-1978. G.I. wire for chain line mesh shall be of perfectly 10 gauge thickness size of chain link wire mesh shall be clear 50 mm x 50 mm at inside gap all wire shall be perfectly bounded/tead with each other by making chain shape.

Item include all materials, labours, equipment etc. complete.

Payment shall be made on square metre basis for actual fixed chain link mesh.

DTS:(83)

Providing 100 mm thick readymade c.c. kerb of strength M-20 (size 300 mm x 380 mm) purchased from SMC's approved paverblock manufacturer only & setting in line, level and in truly certical position, including filling joints in CM. 1:1 (1 part of cement: 1 part of stone dust) smooth pointing in C.M.1:1 (1 part cement : 1 part coarse sand) including watering etc. complete and directed by engineer in charge.

83.1. The material shall be of approved by the Engineer in charge.

83.2. The workmanship shall be in good manner and as directed by Engineer in charge.

83.3. The payment shall be made per running metre basis.

DTS:(84)

Extra for under reaming inside the bore holes for under reamed piles of 300mm diameter

DTS:(85)

Providing and fixing standared extruded of aluminium section of size 61 x 37.0 x0.90 mm (of Jindal section no.14080, @ Wt. 0.471 Kg per mt) with colour powder coated alluminium frame for Loved Glass ventilation with 4 mm thick Figured glass as details Etc. complete for ventilators

85.1. The material shall be of approved make.

85.2. The workmanship shall be in good manner and as directed by Engineer in charge.

85.3. The payment shall be made on square meter basis.

DTS:(86)

Providing and fixing extruded aluminium window having extruded aluminium Powder Coated section frame main outer size 127 mm x 38.10 mm x 1.35 mm (of Jindal section no.2443, @ Wt. 1.384Kg/mt) horizontal Four track member size 122.20 mm x 31.75 mm x 1.10 mm (of jindal section no:8935, @ Wt. 1.398 Kg/mt.) with sliding shutters of horizontal member size 40 mm x18 mm x 1.29 mm (of jindal section no:8949, @ Wt. of .456 Kg/mt) vertical member of size 40 mm x 18 mm x 1.29 mm (of jindal section no:8947, @ Wt. of 0.456 Kg/mt/section 8948, @ Wt. of 0.457 Kg/mt) with 5 mm thick transparent bronze colour tinted float glass with powder coated aluminium fittings and fixtures and transparent silicon sealant glass fixing to frame as per details etc. complete for window.

86.1. The material shall be as per the general specification of material.

86.2. The workmanship shall be in good manner and as directed by Engineer in charge.

86.3. The payment shall be made on square meter basis.

DTS:(87)

Providing & fixing 35mm.th. Flush Door Solid Double Core type Both Face water proof Ply Vennered & 1.5 mm th.laminate shall be pasted on both side with adhesives as specified by the manufacturers. The laminate shall be as per approved shade & texture, of make incl. Sal wood frames of finished size 12cm x 7cm.incl. S.S. Hinges with nessary screws & Anodized aluminum fixtures & fastenings For all Floor

(a) Flush Door

- 87.1 The material shall be approved by the Engineer in charge.
- 87.2 The workmanship shall be in good manner and as directed by Engineer in charge.
- 87.3 The payment shall be made per square meter basis.

DTS:(88)

Providing and fixing window having extruded aluminium colour anodized section frame main outer size 95 mm x 24 mm x 1.17 mm (of jindal section no:2459 @ Wt. of 0.738 Kg/mt), horizontal Three track member size 92 mm x 31.75 mm x 1.30 mm (of jindal section no;8688, @ Wt. 1.07 Kg/mt), vertical member of size 92 mm x 31.75 mm x 1.50 mm (of jindal section no:8933, @ Wt. 1.06 Kg/mt) with sliding shutters of horizontal member size 40 mm x 18 mm x 1.29 mm (of jindal section no:8947 @ wt. of 0.456 kg/mt), vertical member of size 40 mm x 18 mm x 1.29 mm (of jindal section no:8949 @ wt. of 0.456 kg/mt) with 5 mm thick transparent bronze colour tinted float glass with powder coated aluminium fittings & fixtures and transparent silicon sealant glass fixing to frame as per details etc.

Aluminium Window

- 88.1 The material shall be approved by the Engineer in charge.
- 88.2 The workmanship shall be in good manner and as directed by Engineer in charge.
- 88.3 The payment shall be made per square meter basis.

DTS No. 89

Providing & laying cement concrete 1:4:8 (1 cement, 4 Coarse sand, 8 graded stone aggregate 20 mm nominal size) and curing complete excluding cost of form work in foundation and plinth (- Wall/ column footing base

- 89.1 Detailed specifications shall be as per DTS No. 5 but the concrete grade is C.C. 1:4:8 in stead of C.C 1:3:6.
- 89.2 The payment shall be made on Cu.mt basis

DTS No. 90

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

(A) COLUMNS:

- 1) Having cross sectional area up to 0.085 sq.mt.
- 2) Having cross sectional area more than 0.085 to 0.12 sq. mt .

(B) BEAM:

- 1) Having cross sectional area up to 0.085 sq.mt .

2) Having cross sectional area more than 0.085 to 0.12 sq. mt .

90.1. MATERIALS:

Water shall conform to M-1, Cement shall conform to M-3. Sand shall conform to M-5
Stone aggregate 40-mm nominal size shall conform to M-9.

Nominal Mix Concrete : Nominal Mix concrete may be used for concrete of grades M5, M7.5, M10, M15 & M20. The proportions of materials for nominal mix concrete shall be in accordance with Table 3.

TABLE 3 PROPORTIONS FOR NOMINAL MIX CONCRETE

Grade of Concrete	Total Quantity of dry aggregates by mass per 50 kg cement, to be taken as the sum of the individual masses of fine and coarse aggregates	Proportion of fine aggregate to coarse aggregate (by mass)	Quantity of water per 50 kg of cement , max
(1)	(2) kg.	(3)	(4) litres
M5	800	Generally	60
M7.5	625	1:2 but subject to an	45
M10	480	Upper limit of 1:11	34
M15	350	And a lower limit of	32
M20	250	1:2	30

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

Example : for an average grading of fine aggregate (that is zone II of Table 4 of IS:383-1970*), the proportions shall be 1:11, 1:2 and 1:21 for maximum size of aggregates 10 mm, 20 mm and 40 mm respectively.

* Specifications for coarse and fine aggregates from natural sources for concrete (used revision)

90.2. The cement content of the mix specified in Table 3 for any nominal mix shall be proportionately increased if the quantity of water in a mix has to be increased to overcome the difficulties of placement and compaction, so that the water-cement ratio as specified is not exceeded.

Note-1 : In the case of borated concrete, the limit specified may be suitably reduced to avoid aggregation,

Note -2 : The quantity of water used in the concrete mix for reinforced concrete work workability for its purpose, which will surround and properly grip all the reinforcement workability of the concrete should be controlled by maintaining a water content that is found to give a concrete which is just sufficiently wet to be placed and compacted without difficulty with the means available.

- i) If nominal mix 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. Nominal mix concrete proportioned for a given grade in accordance with Table 3 shall not be, however, be placed in higher grade on the ground that the test strengths are higher than the minimum specified.

DTS No. 91

Providing 10 mm thick cement plaster in 1:3 C.M. (1 cement : 3 fine sand) in single coat for B.B. masonry and R.C.C. surface for plastering level and finished even and smooth with a floating coat of neat cement slurry as directed by Engineer-in-charge.

91.1 MATERIALS

Water shall conform to M-1. The cement mortar of proportion 1:3 shall confirm to M-8.

91.2 WORKMANSHIP

Scaffolding – Wooden ballies, 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.

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

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

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

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

91.3 APPLICATION OF PLASTER

The plaster about 15 x 15 cms. shall be first applied horizontally and vertically at not more than 2 metres intervals over the entire surface to serve as gauge. The surface gauges shall be truly in place 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 of wooden flat according as a smooth or a sandy granular texture is required. Excessive trowelling or overworking the float shall be avoided. All corners, rises, angles and junctions shall be truly vertical or horizontal as the case may be and shall be carefully finished. Rounding or chamfering corners, junctions etc., shall be carried out with proper templates to the size required.

Cement plaster shall be used within half an hour after addition of water. Any mortar or plaster which is partially set shall be rejected and removed forthwith from the site. In suspending the work at the end of the day, the plaster shall be left out clean to the line both horizontally and vertically. When recommending the plaster, the edges of the old work shall be scrapped 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 that 15 cms. to any corners or arises. It shall not be closed on the body of features such as plaster bands and cornices nor at the corners or rises. Horizontal points in plaster work shall not also occur on parapet tops and copings as those invariably lead to leakage. No portion of the surface shall be left out initially to be packed up later on.

Each coat shall be kept damp continuously till the next coat is applied for a minimum period of 7 days. Moistening shall commence as soon as plaster is hardened sufficiently. Soaking or 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 to dry weather shall be prevented by hanging mattings or gunny bags on the outside of the plaster and keeping them wet.

91.4 MODE OF MEASUREMENTS & PAYMENT

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

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

Thickness of the plaster shall be exclusive of the thickness of the key i.e. grooves or open joints in brick work, stone work etc. or space between laths. Thickness of plaster shall be average thickness.

This item includes plastering at any level.

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

Soffits of stairs shall be measured as plastering on ceiling. Blowing soffits shall be measured separately.

For jambs, soffits, sills etc. for openings not exceeding 0.5 Sq. Mts. each in area for ends of joints, beams, posts, girders, step etc. not exceeding 0.5 Sq. Mts. each in area for and for openings exceeding 0.5 Sq. Mts. and not exceeding 3 Sq. Mts. in each area deductions and additions shall be made in the following manner –

No deductions shall be made for ends of joints, beams, posts etc. and openings not exceeding 0.5 Sq.Mts. each and no addition shall be made for reveals, jambs soffits, sills etc. of these openings for finish to plaster around ends of joints, beams, posts etc.

Deduction for openings exceeding 0.5 Sq.Mts. but not exceeding 3 Sq.Mts. each shall be made as follows and no additions shall be made for reveals, jambs, soffits sills etc. of these openings -

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

When two faces of wall are plastered with different types of plaster 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 doors, windows etc. on which width of reveals is less than that on the other side but no deduction shall be made on the other side. Where width of reveals on both faces of all are equal, deductions of 50% of area of opening on each face shall be made from areas of plaster and / or pointing as the case may be.

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

In case of opening of area above 3 Sq.Mts. each deductions shall be made for opening but jambs, soffits and sills shall be measured.

The rate shall be for a unit of one Sq. Mt.

DTS No. 92

Providing and fixing and fitting TATA or equivalent make GI barbed wire fencing with necessary barbed wire (12 x 14 guage, weight not less than 0.14 kg/mt) pins, hooks, excluding M.S. angles etc. complete as per relevent IS specification & directed by engineer In charge.

- 92.1 The material shall be of approved by the Engineer in charge.
- 92.2 The workmanship shall be in good manner and as directed by Engineer in charge.
- 92.3 The payment shall be made per kilogram basis

DTS No. 93

Steel work welded in built up sections, framed work for M.S. gate including cutting, hoisting, fixing in position and applying a priming coat of red lead paint.

93.1 MATERIALS:

The structural steel shall conform to M-18.

93.2 WORKMANSHIP:

The gate shall be fabricate and fixed as per the drawing and in good workmanship as directed by Engineer in charge.

All items include one coat of red oxide and two coats of oil paint.

93.3 MODE OF MEASUREMENT AND PAYMENT:

No payment shall be made for weight of screws, bolts and nuts etc.

The rate shall be paid on kg. basis.

DTS No. 94

Providing 20mm deep finished groove in plaster in line and level etc. comp. For all Floor.

- 94.1 The material shall be of approved by the Engineer in charge.

94.2 The workmanship shall be in good manner and as directed by Engineer in charge.

94.3 The payment shall be made per running meter basis

DTS:(95)

Providing and applying painting two coats of approved synthetic enamel paint on new steel, metal or other surface including one coat of redoxide primer etc. Complete as directed by the Engineer in charge. For U.G.Tank & Booster House

95.1.0 MATERIALS:

The ready mixed primer, brussing red lead shall conform to I.S. 102 – 1972.

The thinner (linsed oil) shall conform to I.S.75- 1973 if for any reasons, thinning is necessary in case of ready mix paint, the brand of thinner recommended by manufacturer shall be used.

The enamel paints shall conform to M-27.

95.2.0 WORKMANSHIP

95.2.1 Preparation of surfaces:

The surfaces before painting shall be cleaned of all rust, scale, dirt and other foreign matter sticking to it with wire brushes, steel wool, scrapers, sand paper etc. This surface shall then be wiped finally with mineral turpentine which shall also removed grease and perspiration of hand marks. The surface shall then be allowed to dry.

95.2.2 Application of primer:

After the preparation of the surface, the priming coat shall be applied immediately. The brushing operations are to be adjusted to the spreading capacity advised by the manufacturer of the particular primer. The paint shall be applied evenly and smoothly by means of crossing and laying off. The crossing and laying of consists of covering the area over with paint, brushing alternately in opposite directions, two or three times and then finally brushing lightly in a direction at right angles to the same. In this process no brush marks shall be left after the laying off is finished. The full process of crossing and laying will constitute one coat.

During painting, every time, after the priming coat has been worked out of the brush bristles or after the brust has been unloaded the bristles of the brush shall be opened up striking the brush against portion of the unpainted surface with the end of the bristles held at right angles to paint when dipped again in to a paint container. The primary coat shall be allowed to dry completely before painting is started.

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

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

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

95.2.3 General

The materials required for painting work shall be obtained directly from approved manufacturers or approved dealer and brought to the site in maker's drums, bogs etc. with seal unbroken.

All materials not to actual use shall be kept properly protected lid 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 to improper and long storage shall not be used. The paint shall be stirred thoroughly in the container before pouring into and shall be continuously stirred in smaller container. No left over paint shall be put back into stock tins. When not in use, the containers shall be kept properly closed.

If for reasons, thinning is necessary, the brand of thinner recommended by the manufacturer shall be used.

The surface to be painted shall be thoroughly cleaned and dusted. All rust dirt and grease shall be thoroughly removed before painting is started. No painting on exterior or other exposed parts of the work shall be carried out in wet, damp or otherwise unfavorable weather and all the surface shall be thoroughly dried before work is started.

95.2.4 Application of paint:

Brushing operations are to be adjusted to the spreading capacity advised by the manufacturer 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 shall be left after the laying off is finished. The full process of crossing and laying off will constitute one coat.

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 the shade and shall be got approved from Engineer-in-charge before next coat is started.

Each coat except the last coat shall be lightly rubbed down with sand paper of fine pumice stone and cleaned of dust before the next coat is applied. No hair marks from the brush or clogging of paint puddles in the corners of panels, angles of moulding etc. shall be left on the work.

Special care shall be taken while painting over bolts, nuts, rivets, overlaps, etc. Approved quality brushes shall be used.

95.3.0 MODE OF MEASUREMENTS AND PAYMENT

The new steel and other metal surface shall be measured under this item.

All the work shall be measured net in the decimal system as executed subject to the following limits unless otherwise stated hereinafter.

- a) Dimensions shall be measured to the nearest 0.01 mtr.
- b) Areas shall be worked out to the nearest 0.01 sq.mtr.

No deductions shall be made for openings not exceeding 0.5 sq.m. each and no addition shall be made of painting to beadings mouldings, edges, jambs, soffits, sills etc. of such openings.

In case of fabricated structural steel and iron work, priming coat of paint shall be included with fabrication. In case of trusses if measured in sq.m. compound griders, stanchions, lattices, grider and similar work, actual area shall be measured in Sq.m. and no extra shall be paid for painting on bolts, heads, nuts, washers, etc. No addition shall be made to the weight calculated for the purpose of measurements of steel and iron works for paint applied on shop or at site.

The different surfaces shall be grouped into one general item.

The rate is for complete item as specified i.e. one primer coat and two coats of oil paint.

The rate shall be for a unit of one Sq. Metre.

DTS No. 96

Providing and fixing concertina coil fencing with punched tape concertina coil 600 mm dia 10 metre openable length (total length 90 m), having 50 nos rounds per 6 metre length, upto 3 m height of wall with existing angle iron 'Y' shaped placed 2.4 m or 3.00 m apart and with 9 horizontal R.B.T. reinforced barbed wire, stud tied with G.I. staples and G.I. clips to retain horizontal, including necessary bolts or G.I. barbed wire tied to angle iron, all complete as per direction of Engineer-in-charge, with reinforced barbed tape (R.B.T.) / Spring core (2.5mm thick) wire of high tensile strength of 165 kg/ sq.mm with tape (0.52 mm thick) and weight 43.478 gm/ metre

96.1. MATERIALS

Angle iron post and strut shall be as specified in IDTS-22.

Concertina coil fencing shall be dia 610 mm (having 15 Nos. round per 6 m length), spring core (2.5 mm thick) wire of high ensile strength of 165 kg/sq.mm with tape (0.52 mm thick) and weight 43.478 gm/metre.

96.2. SPACING OF POSTS AND STRUTS

The spacing of posts shall be 2.4 m or 3.00 m apart centre to centre, unless otherwise specified or as per Engineer-in-charge to suit the dimension of the area to be fenced. Every 15th last but one end posts and corner posts shall be strutted on both sides and end posts on one side only.

96.3. FIXING OF POSTS AND STRUTS

As specified in the IDTS-22.

Fixing Concertina coil fencing shall be fixed on angle iron shaped with 9 horizontal reinforced barbed tape (RBT) stud tied with GI staples and GI clips to retain horizontal including necessary bolts or GI barbed wire tied to angle iron all complete as per directions of Engineer-in-charge with reinforced barbed tape.

96.4. MEASUREMENTS

The length of fencing shall be measured correct to a Rmt for finished work.

96.5. RATE

The rate shall include the cost of labour and materials involved in all the operation described above but excluding the cost of M.S. angle and excavation and concrete in foundation for which separate payment shall be made under respective items.

DTS:(97)

Demolition and disposal of unserviceable material with all lead and lift.

(a) Unreinforced cement concrete

97.1.1 The relevant specifications of **DTS No. 40** shall be followed except that reinforced cement concrete work is to be demolished instead of brick masonry work.

97.2.0 MODE OF MEASUREMENT AND PAYMENTS:

97.2.1 The relevant specifications of **DTS No. 40** shall be followed.

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

DTS:(98)

Demolition of brick work and stone masonry including stacking of serviceable materials and disposal of unserviceable material with all lead and lift.

(i) In cement mortar

98.1 The demolition shall consist of demolition of one or more parts of the building as specified. Demolition implies taking up or down or breaking up. This shall consist of demolishing whole or part of work including all relevant item as specified and as directed by the Engineer-in-charge.

98.2 The demolition shall always be planned before hand and shall be done in reverse order of the one in which the structure was constructed. This scheme shall be got approved from the engineer-in-charge before starting the work. This however will not absolve the Contractor from the responsibility of proper and safe demolition.

98.3 Necessary dropping, shoring and under pinning shall be provided for the safety of the adjoining work or property, which is to be left intact, before dismantling and demolishing is taken up and the work shall be carried in such a way that no damage is caused to the adjoining property.

98.4 Wherever required, temporary enclosures or partitions shall also be provided. Necessary precautions shall be taken to keep the dust nuisance down as and where necessary.

98.5 Dismantling shall be commenced in a systematic manner. All materials which are likely to be damaged by dropping from a height or demolishing roof, masonry etc. shall be carefully dismantled first. The dismantled articles shall be properly stacked as directed.

98.6 All materials obtained from demolition shall be the property of Surat Municipal Corporation unless otherwise specified and shall be kept in safe custody until handed over to the Engineer-in-charge.

98.7 Any serviceable materials, obtained during dismantling, shall be separated out and stacked property as directed with all lead and lift. All unserviceable materials, etc. shall be stacked and disposed as directed by the Engineer-in-charge.

98.8 On completion of work, the site shall be cleared of all debris rubbish and cleaned as directed.

98.9 MODE OF MEASUREMENT AND PAYMENT:

- 98.9.1 Measurement of all work except hidden work shall be taken before demolition or dismantling and no allowance for increase in bulk shall be allowed. The demolition of lime concrete shall also be measured under this item. Specification for deduction for voids, openings etc. shall be on same basis as that employed for construction of work.
- 98.9.2 All work shall be measured in decimal system as fixed in its subject to the following limits, unless otherwise stated hereinafter (a) Dimensions shall be measured to the nearest 0.01 mt. (b) Area shall be worked out to the nearest 0.01 sq.mt. (c) Cubical connection shall be worked out to the nearest of 0.01 Cu.m.
- 98.9.3 The rate shall include cost of all labour involved and tools used in demolishing and dismantling including scaffolding. The rate shall also include the charges for separating out and stacking the serviceable materials property and disposing the unserviceable materials with all lead and lift. The rate also includes for temporary storing for the safety of the portion not required to be pulled down or of adjoining property and providing temporary enclosures or partition where considered necessary.
- 98.9.4 The rate shall be for a unit of one cubic metre.

DTS:(99)

Construction of 7.5 m wide metal grouted internal road by providing laying 100 mm thick Quarry spall, 100 mm thick Metal layer Grade II, 100 mm thick metal layer Grade III and grouting 3kg/sqm asphalt with grit @0.03 Cum/Sqm including box cutting, rolling, consolidation, all material, labour etc complete as directed by engineer in charge.

The work shall be carried out as per Item Description. MORTH specifications (fourth revision) shall be follows for detailed specifications.

The item shall be measured in Running Meter (with 7.5 m width).

The contract unit rate for road shall be payable in full for carrying out the required operations including full compensation for all labour, material and equipment.

HYDRAULIC ENGINEER
SURAT MAHANAGAR SEVA SADAN
SURAT.

SIGNATURE AND SEAL OF THE CONTRACTOR:
NAME AND ADDRESS:
DATE:

6.20.5 ITEMWISE DETAILED TECHNICAL SPECIFICATIONS OF RCC ELEVATED SERVICE RESERVOIR (6 NOS.)

DTS No. 1

Clearing the site and setting out of the layout of the structure as per the drawing and making approach to the construction site and maintaining it for the entire construction period and restoring it after completion of the project including filling and levelling with the surplus excavated soil etc complete as directed by the Engineer-in-charge.

The site shall be cleared of all trees having a girth of 60 cm or less, brushwood, loose stone, vegetations, bushes, stump and other objectionable materials. The roots of trees shall be removed to full depth below the required foundation level. All the materials cleared will be the property of the Corporation. Useful materials shall be arranged in convenient stacks. Unsuitable materials shall be burnt or otherwise disposed off by the Contractor at his own cost as directed by Engineer without causing any nuisance, inconvenience or damage to the work, property or people in the neighborhood.

All holes existing or produced by digging up roots, shall be carefully filled up with earth, well watered after ramming and leveled off.

After clearing the site, the line out shall be properly set out in true line, level and corners as shown in the plans and as directed by the Engineer. The Contractor shall provide all labour and materials such as lines, strings, pegs, nails, stones, mortar, concrete etc. required for fixing and maintaining the bench marks and other marks as long as they are required for the work in the opinion of the Engineer.

The center line should be marked on masonry pillar which must remain in position till the superstructure starts. The Contractor shall provide all necessary labours, pegs, string and other necessary materials.

If the Contractor defaults in fixing and maintaining bench marks and other marks as directed within the specified time they may be restored by the Engineer at the cost of the Contractor. Levels of the ground shall be taken and recorded in the presence of the Contractor or his authorized representative before the excavation is started to serve as the basis of measurement. If there is any disagreement the Contractor shall inform in writing to the officer concerned with specific reference, before starting further work. Once further work is started no cognizance of any complaint shall be taken. Merely not signing the book shall not be deemed as disagreement.

The permission will be given after the checking of layout and no work can be started without sanctioning the correct layout by the Engineer-in-charge. The Contractor is bound to correct all errors of setting out at his own expense.

The item includes all necessary labour, materials and tools required for carrying out the work as described above.

The rate shall be paid on a lump sum basis.

DTS No. 2A

Excavation for foundation up to 1.5m depth includes sorting out and stacking of useful materials and disposing the excavated stuff up to 500mt lead including shorting, strutting and dewatering if necessary. All excavated material will be property of SMC

a) For ESR

b) For Valve Chamber

GENERAL

Any soil which generally yields to the application of pick axes and shovels or jumpers scarifiers phawaras, rakes or any such excavation equipment or organic soil, gravel, silt, sand turf loam, clay, peat etc. fall under this category.

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 shuttering at his own cost and as approved by the Engineer – in – charge. The payment for such precautionary measures shall be included in this work. 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 other reason excavation is made deeper or wider than that shown on the plan or as directed. The extra depth or width shall be made up with concrete of the same proportion as specified for the foundation concrete at the cost of the Contractor. The excavation up to 1.5 mts depth shall be measured under this item. The site conditions may require excavation in parts as per schedule of excavation. No extra payment will be claimed for this operation schedule.

DISPOSAL OF EXCAVATED MATERIALS :

No material excavated from the foundation trenches, of whatever kind they may be are to be placed even temporarily upto 1.5 mts or at the distance prescribed by the Engineer, from the outer edge of excavation. All materials excavated shall remain the property of the Corporation. Rate of excavation shall include sorting out of useful materials and stacking them separately as directed within the specified lead. Materials suitable and useful for back filling or other use shall be stacked in convenient places but not in such a way as to obstruct free movement of men, animals and vehicles or encroach upon the area required for constructional purposes. The site shall be left clean of all debris on completion.

Materials suitable for backfilling shall be stacked at convenient places within a lead of 50 Mts.

DISPOSAL OF EXCAVATED MATERIALS IS SUBJECT TO THE FOLLOWING:

Unsuitable materials obtained from clearing site and excavation shall be disposed off within a lead of 500 mts. as directed. Useful materials obtained from cleaning site and excavation shall be stacked within lead of 50 mts and will be allowed to be used by the Contractor on payment at rates laid down in the contract or is not so laid down, at scheduled rates of the Division or at mutually agreed rates if there are no such rates in the schedule of rates.

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

conditions of soil and requirements of safety or construction schedule requiring excavation to be done in parts.

No extra payment shall be made for temporary pumping of water / sewage due to abnormal adverse conditions / climate.

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

NOTE:

Excavation shall be in 5:1 slope (five vertical and one horizontal). These slopes shall be maintained after 30 CM from the edge of P.C.C. without any extra cost. This shall be applicable at all depth.

DTS No. 2(B)

Excavation for foundation for depth from 1.5m to 3.0m includes sorting out and stacking of useful materials and disposing the excavated stuff up to 500mt lead including shoring, strutting and dewatering if necessary. All excavated material will be property of SMC

a) For ESR

b) For Valve Chamber

WORKMANSHIP

The relevant specification of Item No.2 (A) shall be followed except that the excavation work shall be carried out in all sorts of soil with lift 1.5 Mts. to 3.0 Mts.

MODE OF PAYMENT

The relevant specification of DTS No.2(A) shall be followed.

The excavation work of lift 1.5 Mts. to 3.0 Mts. shall be measured under this item.

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

DTS No. 2(C)

Excavation for foundation for depth from 3.0m to 5.0m including sorting out and stacking of useful materials and disposing the excavated stuff upto 500mt lead including shoring, strutting and dewatering if necessary. All excavated material will be property of SMC

WORKMANSHIP

The relevant specifications of Item No.2(A) shall be followed except that the excavation work shall be carried out from 3.0 Mts. to 5.0 Mts. lift in all sorts of soil.

MODE OF MEASUREMENTS & PAYMENTS

The relevant specifications of DTS No.2(A) shall be followed.

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

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

DTS No. 2(D)

Excavation for foundation for depth from 5.0m to 6.0m including sorting out and stacking of useful materials and disposing the excavated stuff upto 500mt lead including shoring strutting and dewatering if necessary. All excavated material will be property of SMC

WORKMANSHIP:

The relevant specifications of DTS No.2(A) shall be followed except that the excavation work shall be carried out from 5.0 Mts. to 6.0 Mts. lift in all sorts of soil.

MODE OF MEASUREMENTS & PAYMENT:

The relevant specification of DTS No.2(A) shall be followed.

The rate shall be paid for carrying out excavation work for depth from 5.0 Mts. to 6.0 Mts. under this category.

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

DTS No. 3

Filling with the selected excavated earth (excluding rock) intrenches, plinth/sides of foundations/side of walls etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering etc. complete as directed by the Engineer - in - charge.

WORKMANSHIP:

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

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 and filled with earth in layers not exceeding 20 cms. Layers 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 butt ends of crowbars where rammer cannot be used.

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 finishing level, the surface shall be flooded with water for at least 24 hours and allowed to dry and then consolidated.

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

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

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.

MODE OF MEASUREMENTS AND PAYMENT:

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

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

DTS No. 3A

Providing and filling sand/Pano sand below PCC for foundation including watering, ramming and compacting etc. if needed as per the site condition

WORKMANSHIP

The relevant specifications of Item No.3 shall be followed.

MODE OF MEASUREMENTS AND PAYMENT:

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

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

DTS No. 4

Providing & laying cement concrete 1:2:4 (1 cement, 2 Coarse sand, 4 graded stone aggregate 20 mm nominal size) and curing complete excluding cost of form work in foundation and plinth

a) For ESR

b) For Valve Chamber

MATERIALS:

Water shall conform to M-1, Cement shall conform to M-3. Sand shall conform to M-5 Stone aggregate 40-mm nominal size shall conform to M-9.

NOMINAL MIX CONCRETE:

Nominal Mix concrete may be used for concrete of grades M5, M7.5, M10, M15 & M20. The proportions of materials for nominal mix concrete shall be in accordance with Table below

TABLE PROPORTIONS FOR NOMINAL MIX CONCRETE

Grade of Concrete	Total Quantity of dry aggregates by mass per 50 kg cement, to be taken as the sum of the individual masses of fine and coarse aggregates	Proportion of fine aggregate to coarse aggregate (by mass)	Quantity of water per 50 kg of cement, max
(1)	(2) Kg.	(3)	(4) Litres
M5	800	Generally 1:2 but subject to an upper limit of 1:11 and a lower limit of 1:2	60
M7.5	625		45
M10	480		34
M15	350		32
M20	250		30

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

Example : for an average grading of fine aggregate (that is zone II of Table 4 of IS:383-1970*), the proportions shall be 1:11, 1:2 and 1:21 for maximum size of aggregates 10 mm, 20 mm and 40 mm respectively.

* Specifications for coarse and fine aggregates from natural sources for concrete (used revision) The cement content of the mix specified in Table for any nominal mix shall be proportionately increased if the quantity of water in a mix has to be increased to overcome the difficulties of placement and compaction, so that the water-cement ratio as specified is not exceeded.

Note-1: In the case of borated concrete, the limit specified may be suitably reduced to avoid aggregation,

Note -2: The quantity of water used in the concrete mix for reinforced concrete work workability for its purpose, which will surround and properly grip all the reinforcement workability of the concrete should be controlled by maintaining a water content that is found to give a concrete which is just sufficiently wet to be placed and compacted without difficulty with the means available.

If nominal mix 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. Nominal mix concrete proportioned for a given grade in accordance with Table shall not be, however, be placed in higher grade on the ground that the test strengths are higher than the minimum specified.

DTS No. 5

Providing, batching aggregates by digital weight batch mixer machine, placing, compacting by machine vibrator, curing testing. Design mix concrete as per IS: 456 : 2000, IS:10262 : 1982 and SP:23 and tender specification (incl plasticizer if needed) in all items with smooth finishing incl. cost of form work and excluding cost of reinforcement.

5(A) M: 300 RCC Controlled concrete

For ESR

- (i) For Bottom Raft
- (ii) For top dome & Bottom dome
- (iii) For Conical Slab
- (iv) For beam and bracing beam
- (v) For Shaft with platform
- (vi) For cylindrical wall
- (vii) For column
- (viii) For Precast Steps

5B M-200 RCC Controlled Concrete

- (a) For Slab of Valve Chamber & Plinth
- (b) For Thrust Block
- (c) For Lintel Beam at Plinth

The intent of this module is to bring out only the special requirements associated with the design and concrete work.

Any approval, instructions, permissions, checking, review etc., whatsoever by the Engineer, shall not absolve the Contractor of his responsibility and obligation towards the adequacy, correctness, completeness, safety, strength, workmanship, quality, target dates etc. of the work.

REINFORCED CEMENT CONCRETE (RCC) MIX DESIGN (M:30 & M:25)

The Contractor shall get the concrete mix designed confirming to various design parameters given in these specifications and latest revision of IS:10262 and SP: 23 for each grade of concrete mentioned above by a Government approved laboratory. The cost / charge of the MIX DESIGN work shall be borne by the Contractor.

The MIX DESIGN shall be got approved from the Structural Consultant. **No volume batching shall be allowed at site. The concrete mix at site shall be done by Digital batch mixer only.** The proportion of cement, sand and coarse aggregates, water and admixtures if any shall be determined by weight. The Contractor shall make arrangements to weigh water by an electronic device at the site.

The Contractor shall follow the following specifications for mix design reinforced cement concrete work.

Proportioning Mix:

The mix of fine and coarse aggregate, cement and water as per the DESIGN MIX shall give the most dense concrete confirming to minimum quantity of cement paste and maximum water cement ratio for binding the materials to give required strength, Water content and the water cement ratio shall give the specified strength with the materials proposed for use in actual work carried out before the work is started, adopting the consistency suitable for the work and method of compaction that will be actually used on site subject to the water cement Ratio as Tabulated separately.

Target strength for M20, M25 and M30 shall be as specified in the IS 456:2000 or it's latest edition.

Test:

Tests shall confirm to the specifications laid down in I.S. 456 – 2000. These tests shall be got done in an approved laboratory at the cost of Contractor.

a) Preliminary tests:

In preliminary test, three separate tests shall be carried out on samples collected from different stacks. Each test shall be carried out with six samples of 15 cm. (About 6”) cubes and 3 of these shall be tested at 7 days and 3 at 28 days. In preliminary tests the average crushing strength attained shall be 33 percent higher than that required on work tests.

b) Work test:

For each of the work test, 6 samples shall be prepared from the concrete being used on the site, 3 samples being tested at 7 days and the remaining 3 samples at 28 days. Work tests shall be carried out on each of the first six days and subsequently once in three working days or for every 60 cu.m. of concrete which ever is less and also whenever the quality or grading of the materials is changed. When a relation between the strengths at 7 days and 28 days is established, only 3 samples may be prepared and tested at 7 days only. This number of controlled specimen tests may be increased if the Engineer-in-charge considers it necessary.

Field Mix :

In the work tests, bulkage of sand due to moisture, if any, should be allowed for different batches according to the moisture actually present at the time of mixing. The moisture will be taken into account in controlling the mixing water also. The proportions once fixed by preliminary tests shall not be changed so long as the materials are the same, subject only to the quantities of fine aggregate and water being adjusted to compensate for bulkage due to the moisture in sand and free water in fine aggregate at the time of use.

No change of materials shall be allowed unless fresh tests with new materials show satisfactory results.

Water and cement content per batch or concrete as determined MIX DESIGN shall be maintained constant except for suitable allowances to be made for surface moisture of the aggregates at the time of actual use. Immediately upon the receipt of the award of the contract, the Contractor shall inform the Engineer-in-charge the exact location of the sources of the acceptable materials which he proposes to use and get approved materials to be used. The CONCRETE MIX shall be got designed in an approved laboratory by the Contractor with minimum water cement ratio to give specified strength in the preliminary tests and the proportions got approved by the Engineer-in-charge in writing. These proportions shall be used so long as the materials contains to be of the same quality and from the same source subject only to slight changes in the relative quantities of fine and coarse aggregates for the purpose of promoting workability provided the works tests require the same. If during the progress of the work, the Contractor wishes to change the materials, the proportion shall be fixed on the basis of fresh MIX DESIGN to give the required strength after the Engineer-in-charge is satisfied that the materials satisfy the specifications. No adjustment of cost shall be made for change of proportions of cement fixed in the original preliminary tests.

DETAILED SPECIFICATONS FOR CONCRETE:**INGREDIENTS****Cement :**

The cement shall be ordinary Portland Cement confirming to IS:269 / IS:12269. Under special circumstances other cements may be used with prior approval of Engineer-in-charge. Cement shall conform to M-3

Aggregate:

Aggregates shall comply with the requirements of IS:383. Generally aggregates having a nominal size of 20 mm shall be used. Coarse and Fine aggregate shall be weigh batched separately. Sand shall conform to M-5, Grit shall conform to M-6, Graded stone aggregate of design size shall confirm to M-9

Water :

Water shall conform to M-1. Water used for mixing and curing shall be as per Clause 5.4 of IS:456-2000.

Admixtures:

Admixtures such as plasticizer / super plasticizer shall be used with prior approval of the Engineer-in-charge.

PLASTICIZER

Providing and mixing approved quality of plasticizer compound in the concrete mix.

General :

It should be Naphthalene formaldehyde base high early strength super plasticizer admixture free from chlorides and other corrosive ingredients. It should be suitable for usage in R.C.C., prestressed concrete, ready mix concrete etc. It should be insensitive and unaffected by changes in environmental and fresh concrete temperatures. It should give homogeneous, segregation and bleeding free concrete.

It should give monolithic concrete texture, higher compressive and flexural strengths, higher resistance to penetration of water, lower creep and shrinkages stresses, improved resistance to aggressive attacks and chemical influences after its uses with concrete properties.

The list of brand name of plasticizers shall be as below –

- 1) Pidilite Industries
- 2) Krishna Conchem
- 3) ROFF
- 4) Fosroc

Dosages : 1.5% by weight of cement or as per manufacturer's specifications or as per instruction.

Super Plasticizer of expiry date shall not be used.

No extra payment shall be made for using plasticizer. It is included in the concrete item.

Grades of concrete to be used shall be M10, M15, M20, M25, M30.

The Minimum cement content and maximum water cement ratio and min. grade of concrete shall be as follows :

Table-A		
Concrete Grade	Minimum Cement (in Kg)	Maximum Water Cement Ratio
M15	250	0.60
M20	325	0.55
M25	380	0.50
M30	410	0.45

For concrete with volumetric / nominal mix and other items with use of cement the same shall be as per prevailing standards of SMC.

Note:

1. The contractor shall have to carry out mix design with cement content for the relevant grade as per above table.
2. The contractor shall have to carry out mix design, for the relevant grades keeping in view the maximum cement content level (i.e. as far as possible the cement level shall be between the min. and max. cement content as above).
3. contractor will be allowed to use any admixtures of approved quality to achieve required strength and workability and up to maximum cement content.

All reinforcement shall be free from loose mill scale, loose rust, and coats of paints, oil, mud or other coatings. The Contractor shall get the reinforcement cleaned by using wire brush, rubbing with gunny bags, light acid itching etc. as required.

Workability of concrete shall be as per Clause 7.0 of IS:456-2000.

Durability:

In order to provide / produce durable concrete with low permeability, it must have adequate cement content and a low water cement ratio. By using strong dense, aggregates, sufficient low water cement ratio, ensuring thorough compaction and sufficient hydration of cement through proper curing methods, a sufficient low permeability is achieved. Therefore cement content shall be sufficient to provide adequate workability with a low water cement ratio so that concrete can be completely compacted with the means available.

The permissible limits of chlorides and sulphate in concrete shall be as per Table 1 of IS-456-2000.

CONCRETE MIX PROPORTIONING

The Concrete mix should be so proportioned that when the concrete is hardened it shall be of the required strength, durability and surface finish. For this purpose the Contractor shall establish a well equipped concrete testing laboratory at site. The results of these shall be sent to Consultant for their comments / approval / suggestion for modification of Design Mix.

Strength Requirement of Concrete:

Where ordinary Portland cement conforming to IS:269 or Portland blast furnace cement conforming to IS:455 is used, the compressive strength requirements for various grades of concrete, controlled as well as ordinary shall be as given in Table-1. Where rapid hardening Portland cement is used, the 28 days compressive strength requirement specified in Table-1 shall be met at 7 days. For controlled concrete, the mix shall be so designed as to attain in preliminary tests, strength at least 33 percent higher than that required on work tests, for concrete mix up to and including M-250 and 25 percent higher for higher strengths. Preliminary tests need not be made in case of "ordinary concrete".

TABLE-1

Grade of concrete	Compressive work strength in Kg/cm ² on 150 mm cubes as per Testing conducted in accordance with IS:516.	
	min.at 7 days	min.at 28 days
M-100	70	100
M-150	100	150
M-200	135	200
M-250	170	250
M-300	200	300
M-350	235	350

Note: In all cases, the 28 days compressive strength specified in Table-1 shall be the criterion for acceptance or rejection of the concrete.

When the strength of a concrete mix as indicated by test, lies in between the strength for any two grades specified in Table-1 such concrete shall be classified for all purpose as concrete belonging to the lower of the two grades between which its strength lies.

Nominal Mix Concrete:

Under special circumstances nominal mix concrete for grades of M20 or lower may be used with prior approval of Engineer-in-charge. Nominal Mix concrete shall be as per Table 9 of IS 456:2000

CONSTRUCTION TOLERANCES FOR ALL THE ELEMENTS OF WATER TANK EXCEPT VERTICAL SHAFT

- (a) Length
 - (i) Members upto 3 mt length + 3mm to -6mm
 - 3 mt to 4.5 mt length + 3mm to -8 mm
 - More than 4.5 mt length + 3 mm to -10mm
- (b) Cross-Sectional Dimensions
 - Dimensions up to 15 cm + 2mm
 - Dimensions between 15 cm and 23 cm + 3mm
 - Dimensions greater than 23 cm + 4mm

Straightness: When a straight edge or line is applied to the member it shall not show concavity or convexity exceeding.

For length upto 4.5 mt	4.5 mm
For length between 4.5 mt	6.0 mm
For length exceeding 6 mt	8.0 mm

Shape of Cross Section – No line on the cross section of a member shall deviate from its correct position by an angle exceeding 1 Degree. Vertical members shall not deviate in verticality from its true position by more than 5% of vertical length subject to maximum of 20 mm.

Member which do not confirm to above mentioned constructional tolerances shall be removed and redone or modified / strengthened as per instructions of Engineer-in-charge / Consultant.

SPECIFICATIONS FOR FORMWORK, CENTERING AND SCAFFOLDING

Materials:

Formwork shall be in plywood, sawn timber or steel as required for shaft, container walls, stairs, slab, beams, columns, parapets, etc. for all concrete work.

Workmanship:

The formwork shall conform to the shape, lines and dimensions as shown on the drawings and shall be so constructed so as to remain sufficiently rigid and water-tight, during placement and compaction of the concrete. Adequate arrangement shall be made by the Contractor to safe guard against any settlements of the formwork during the course of concreting and after concreting.

Centering:

The centering, which has been got approved should be sufficiently strong and safe before, during and after pouring concrete and should be so erected that it would allow removal of forms in proper sequence without damaging either the concrete or the forms to be removed.

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

Scaffolding:

All scaffolding, hoisting arrangements and ladders etc, required for facilitating of concrete shall be provided and removed on completion work by Contractor, at his own expense. The scaffolding, hoisting arrangement, ladders etc shall be strong enough to withstand all live, dead and impact loads expected to act. The Contractor shall be solely responsible for the safety of the scaffolding, hoisting arrangement, ladders, work and workmen etc.

The scaffolding, hoisting arrangement and ladders shall allow easy approach to the work spot and afford easy inspection.

MODE OF MEASUREMENT AND PAYMENT

The consolidated cubical contents of concrete work as specified in item shall be measured. The concrete laid in excess of section shown or drawing or as directed shall not be measured. No deductions shall be made for.

- [a] Ends of dis-similar materials such as joints, beams, posts, girders, rafters, purlins, trusses, corbels and steps etc. up to 500 Sq. Cm. in section.
- [b] Opening up to 0.1 Sq.m.
- [c] The volume occupied by reinforcement shall not be deducted from R.C.C. work.

The rate includes cost of all materials labour, tools and plant required for mixing, placing imposition vibrating and compacting, finishing as directed, curing and all other incidental expenses as well as test charges for producing concrete of specified strength. The rate includes the cost of formwork but excluding the cost of reinforcement.

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

DTS No. 6

Conveying, cleaning, straightening, cutting, bending, placing in position, binding with M.S. binding wires including providing concrete cover blocks, TMT Fe- 500 bars conforming to IS 1786 (latest revision) and mild steel reinforcement (yield strength 2600 kg/cm²) conforming to IS:226 for various concrete members including freight, loading, unloading and labour work etc. complete.

GENERAL: Contractor has to procure steel at his own cost from open market.

MATERIAL:

Mild steel bars shall conform to M-14 cold twisted steel bars (high yield strength deformed bars) shall conform to M-15, Mild steel binding wires shall conform to M-17.

WORKMANSHIP:

The work shall consist of furnishing and placing reinforcement to the shape and dimensions as shown on the drawings or as directed.

Steel shall be clean and free from rust and loose mill scale at the time of fixing in position and subsequent concreting.

Bars shall be bent cold to specified shape and dimensions as per IS:2502, using a proper bar bender, operated by hand or power to attain proper radius of bends. Bars shall not be bent or straightened in a manner that will injure the material. Bars bent during transportation or handling shall be straightened before being used on the work. They shall not be heated to facilitate bending. Unless otherwise specified for mild steel a "U" type hook at the end of

each bar shall invariably be provided to main reinforcement. The radius of the bend shall not be less than twice the diameter of the round bar and the length of the straight part of the bar beyond the end of the curve shall be at least four times the diameter of the bar. In case of bars which are not round and in case of deformed bars, the diameter shall be taken as the diameter of the circle having an equivalent effective area. The hooks shall be suitably encased to prevent any splitting of the concrete. The cold twisted steel bars shall be used without hooks at the ends. Deformed bars without hooks shall, however, comply with relevant anchorage requirements.

All the reinforcement bars shall be accurately placed in exactly the same position as shown on the drawings, and shall be securely held in position during placing of concrete by annealed binding wire not less than 1.63 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 the concrete, except where shown on the drawings. Placing bars on layers of freshly laid concrete as the work progresses for adjusting bar spacing shall not be allowed. Pieces of broken stone or brick wooden blocks shall not be used. Layers of bars shall be separated by spacer bars, precast mortar blocks or other approved devices. Reinforcement after being placed in position shall be maintained in a clean condition until completely embedded in concrete. Special care shall be exercised to prevent any displacement of reinforcement in concrete already placed. To prevent reinforcement from corrosion, concrete cover shall be provided as indicated on drawings. All the bars are to be spliced and which are likely to remain exposed for a period exceeding 10 days shall be protected by a thick coat of neat cement grout.

Bars crossing each other where required shall be secured by binding wires (annealed) of size not less than 1.63 mm. in such a manner that they do not slip over each other at the time of fixing and concreting.

As far as possible, bars of full length shall be used. In case this is not possible, overlapping of bars shall be done as directed. When practicable, overlapping bars shall not touch each other, but be kept apart by 25 mm or 1.25 times the maximum size of the coarse aggregate whichever is greater between them. Where not feasible, overlapping bars shall be bound with annealed wires, not less than 1.63 mm. thick, twisted tight. The overlaps shall be staggered for different bars and located at points, along the span where neither shear nor bending moment is maximum.

Wherever indicated on the drawings or desired by the Engineer-in-charge bars shall be joined 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 IS-226.

When permitted or specified on the drawings, joints of reinforcement bars shall be butt-welded so as to transmit their full stresses. Welded joints shall preferably be located at points where steel will not be subjected to more than 75% of the maximum permissible stresses and welds so staggered that at any one section not more than 20% of the bars are welded. Only electric welding using a process which excludes air from molten and conforms to any or all other special provisions for the work shall be accepted.

Suitable means shall be provided for holding bars securely in position during welding. It shall be ensured that no voids are left in welding and when welding is done in two or three stages, previous surface shall be cleaned properly. Ends of the bars shall be cleaned of all loose scale, rust, grease, 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.

MODE OF MEASUREMENT & PAYMENT:

For the purpose of calculating consumption, wastage shall not be permitted beyond 7.5%. Excess consumption over 7.5% will be charged at penal rates as per special condition of contract.

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 of 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-14 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.

The rate for reinforcement includes cost of steel binding wires, its transporting from departmental store to work site cutting, bending, placing 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.

The rate shall be for unit of one M.T.

Note: Read M.S. Binding wire instead of G.I. binding wire when and where specified.

DTS No. 7

Grouting with 1:3 cement, sand mortar for anchor bolt pockets, machine bases, pipe sleeves, pockets holes etc. including roughening and cleaning of concrete surfaces, curing, etc. complete, as directed.

GROUTING

The proportion of standard Grout shall be such as to produce a flowable mixture consistent with minimum water content and shrinkage. Surface to be grouted shall be thoroughly roughened and cleaned. All structural steel elements to be grouted, shall be cleaned of oil, grease, dirt etc. The use of hot, strong caustic solution for this purpose will be permitted. Prior to grouting, the hardened concrete shall be saturated with water and just before grouting water in all pockets shall be removed. Grouting once started shall be done quickly and continuously. Variation in grout mixes and procedures shall be permitted if approved by ENGINEER. The grout proportions shall be limited as follows :

	Use	Grout Thickness	Mix Proportions	W/C Ratio (max.)
a)	Fluid mix	Under 25 mm	One part Portland cement to one part sand.	0.44
b)	General mix	25 mm and over but less than 50 mm	One part Portland cement to 2 part sand.	0.53
c)	Stiff mix	50 mm and over	One part Portland cement to 3 part sand.	0.53

Non Shrink Grout

Non-shrink grout where called for in the Schedule of Quantities or specified on the drawings shall be provided in strict accordance with the manufacturer's instructions/ specifications.

DTS No. 8

Providing and fixing thick ribbed type or other approved type 150 mm. wide P.V.C. water stopper of approved quality etc as per details in the container / vertical wall and / or as directed by the Engineer-in-charge.

The quality of water stoppers shall be approved by the Engineer-in-charge before bringing the same to the site of work. It shall be of either "Sinecos Profiles Pvt. Ltd." or "Aarti" or equivalent make as approved by the Engineer-in-charge.

WORKMANSHIP

At every horizontal & vertical joints of water retaining structure, water stopper of approved quality is to be provided as directed by the Engineer-in-charge.

The water stops shall be thoroughly examined before putting it to use. It shall be placed in position carefully so as not to damage the same. Half of the width shall be embedded on each side of the joints between the adjacent sections, when embedding the first half of the width of the water stops great care should be taken to protect the other half from coming into contact with concrete by means of a suitable covering. After the concrete on the first half of the water stop sets, the protecting cover on the other half shall be removed and concrete poured to embed it.

It is essential that the water stop is properly aligned and placed in position during embedding. Where necessary the water stops shall be welded so as to have water proof joints.

The instructions for welding and / or vulcanizing as prescribed by the manufacturer shall be strictly adopted. It shall be seen that during the welding and vulcanizing of two pieces alignment of the central bulb is taken care of as this is essential for the correct finishing of the water stop.

The concrete shall not be poured from excessive height so as not to damage the water stops to prevent bending of the water stops.

MODE OF MEASUREMENT & PAYMENT

This item includes all materials and labour required to carryout the work as detailed above including P.V.C. water stops, tools and materials for welding and / or vulcanizing the joints, plains and maintaining in position etc. complete.

The rate shall be for a unit of a running metre at any level with all lead and lift.

DTS No. 9

Providing cement vata (10 cm x 10 cm size) quarter round incement mortar 1:1 including neat cement finishing, watering etc.complete at any height in the container as directed by theEngineer-in-charge.

MATERIAL:

Water shall conform to M-1, cement mortar shall conform to M-8.

WORKMANSHIP:

The work of cement vata of 10cm X 10cm size shall be carried out at junctions of parapets and terraces as directed by the Engineer – in charge. The vata shall be finished in quarter round shape. The work shall be carried out in the best work man like manner. The portion of vata around the inlet portion of rain water pipe shall be rounded off properly. The work shall be cured for 7 days.

MODE OF MEASUREMENT AND PAYMENT:

The work shall be measured per running meter and the rate shall also be on running meter basis.

DTS No. 10A

Providing and applying 20 mm to 25 mm thick waterproofing cement plaster in cement mortar 1:3 with neat cement slurry finish with approved water proofing compound in specified proportion inside of container at any height proportion as per specification including scaffolding, curing etc. complete as directed.

Material: Water shall conform to M-1, the cement mortar of proportion 1:3 shall conform to M-8.

Following water proofing compounds are recommended:

1. Hydra proof for Krishna Concare P. Ltd. Ahmedabad.
2. Impermo for Killick Nixon Ltd.,
3. PIDILITE
4. ROFF

Workmanship:

The relevant specification shall be followed as per DTS No.31.1, 31.2 with proportion and thickness as specified in relevant item. The proportion of water proofing materials to be mixed with 50 kg. bags shall be as recommended by the manufacturers of the water proofing material.

Application of plaster: The relevant specification of DTS No.31.4 shall be followed.

Mode of measurement and payment:

The relevant specification of DTS No.31.5 shall be followed.

DTS No. 10B

“do” but 10mm to 12mm thk. water proofing plaster at ceiling of top dome.

All specifications same as per DTS No.10A except the thickness of plaster shall be 10 mm to 12 mm thk. instead of 20 to 25 mm thk.

DTS No. 10C

Providing and applying Epoxy paint of approved make to concrete surface for RCC ESR (inside the container) or any other structure including clearing the surface by scrapping and air blowers to the satisfaction of Engineer-in-charge necessary scaffolding etc. complete with all leads. Including necessary testing as per IS code For new surface - 2 coats.

Providing and applying 2 coats of Epoxy paint to the interior surface of shaft, container and on top dome etc. as directed by engineer in charge.

Rate shall include for supply of materials, equipments, labours, necessary scaffolding and removal thereof, supply of brushes, etc as necessary.

The work shall include for cleaning the surfaces, removal of dirt, dust, etc to prepare the surface for receiving the paint. Samples of the paint shall be got approved from the Engineer – in – charge before taking up the execution.

Payment for this item shall be made on the basis of square meter of actual area painted.

DTS No. 11

Providing and applying 20 mm to 25 mm thick outside cement plaster in cement mortar 1:3 with neat cement slurry finish with approved water proofing compound in specified proportion at any height proportion as per specification including scaffolding, curing etc. complete as directed.

a) With Water proofing material (outside the container)

b) Without Water proofing material (column & beams)

Same as DTS No.10A.

DTS No. 12

Providing, mixing, laying 40mm thick IPS topping (1:1.5:3 - 1 cement : 1.5 sand : 3 stone aggregate 4.75 mm and below) by volume on bottom dome of container, above top dome slab and on precast steps as per IS: 2571 with mixing of water proofing compound of approved make as per manufacturers specification including compacting, finishing, curing etc. complete as directed by Engineer in charge.

MATERIAL:

Water shall confirm to M-1.

Cement shall confirm to M-3.

Sand shall confirm to M-5.

Stone aggregate of size 4.75mm and below shall confirm to M-9. Cement concrete of 1:1.5:3 proportion measured by volume shall confirm to relevant specifications of ordinary grade concrete.

Water proofing Compound

Following water proofing compounds are recommended:

1. Hydraproof for Krishna Concare P. Ltd. Ahmedabad.
2. Impermo for Killick Nixon Ltd.,
3. PIDILITE
4. ROFF

WORKMANSHIP:

The IPS topping of 40mm thick (Average) is to be laid as per the site condition. The concrete shall be mixed in a mechanical mixer at site of work. Hand mixing may however be allowed for smaller quantities of work and in case of failure of machineries or as permitted by the Engineer – in – charge. It shall be carried out on a watertight platform and care shall be taken to ensure that mixing is continued until the mass is uniform in color and consistency. However, in such cases 10% more cement than the otherwise required shall have to be used without any extra cost. The mechanical mixing shall be done for a period of 1.5 or 2 minutes. The quantity of water shall be just sufficient to produce dense concrete of required workability for the purpose. Flooring of specified thickness shall be laid in accordance with approved pattern or as directed. Finishing operation shall start shortly after the cessation of beating and shall be spread over period of one to six hours depending upon the temperature

and atmospheric condition. The surface shall be left for sometime till moisture disappears from it. Fresh quantity of cement shall be mixed with water to form thick slurry and spread over the surface while the concrete is still green. Use of dry cement or cement and sand mixture sprinkled on this surface to stiffen the concrete or absorb excessive moisture shall not be permitted. The cement slurry shall then be properly pressed twice by means of iron floats once when the slurry is applied and the second time when cement starts setting and finished floated smooth. The surface shall be marked with starting or B.R.C. fabric jali to make the surface non – slippery as and when directed. The junction of floors with wall plaster, dado or skirting shall be rounded off where so required up to 25mm radius.

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

The proportion of water proofing materials to be mixed shall be as recommended by the manufacturers of the water proofing material.

The form work shall be provided if necessary as directed by the Engineer – in – charge. Concreting shall be done as per alternate by method with necessary centering either by mastic or cement mortar as directed.

MODE OF MEASUREMENT AND PAYMENT:

The rate shall include the cost of all materials and labour involved in all the operations described above. No deduction shall be made or extra paid for any opening upto 0.1 sq.mt. In area in the floor nothing extra shall be paid for laying the floor at different levels in the same room or the courtyard.

The rate shall be for a unit of one sq.mt. at any level with all lead and lift.

DTS No. 13

Providing and laying 25 mm thick Rough chiseled dressed (kotah stone green) stone flooring over 20 mm thick base of cement mortar 1:5 (1 cement: 5 coarse sand) or L.M. 1:1.5 including pointing with cement mortar 1:2 (1 cement :2 stone dust) etc. complete at any height on platforms & plinth area.

MATERIALS:

Water shall conform to M-1. Lime mortar shall conform to M-7 cement mortar shall conform to M-8. Rough chiseled dressed stone shall conform to M-31.

WORKMANSHIP:

The rough chisel dressed stone of 40 mm. thickness of approved quality are to be fixed in cement mortar bedding in C.M. 1:5 or L.M. 1:1.5 of 25 mm. average thickness.

RESSING OF STONE SLAB:

Every stone slab shall be cut to the required size and shape and rough chisel dressed on top as required, so that the dressed surface shall not be more than 6 mm. from straight edge placed on it. The sides shall also be chisel – dressed to a minimum depth of 20 mm so that the dressed edge shall at no place be more than 30 mm. from straight edge huttet against it. Beyond this depth, the sides may be dressed slightly splayed so as to form an inverted “V” shaped joint with adjoining slab. The surface shall be reasonably true and plane and all the angles and edge shall be square and free from chipping. Where the stone slabs are to be

used for nosing, stone shall be rough chisel dressed to full depth and cut to the uniform thickness.

The thickness of the stone slab shall be 40 mm with permissible tolerance of + 2mm.

LAYING:

The surface of the sub-grade concrete shall be cleaned, wetted and mopped. The bedding of specified mortar mix shall be spread under each slab to the specified thickness. The slab shall be washed clean before laying. It shall then be laid on top, pressed so that all hollows underneath filled with surplus mortar works up through the joints. The top shall be tapped and brought level to the adjoining slab. The thickness of the joints shall not exceed 5 mm. Subsequent slabs shall be laid in the same manner.

CURING AND FINISHING:

Any surplus mortar on the surface of the slab shall be cleaned off and joints finished flush. The joints shall be raked out uniformly to a minimum depth of 12 mm when the mortar is still green. The slabs which are fixed in the floor adjoining the wall shall enter not less than 12 mm under the plaster, skirting or dado neatly and without waviness. The pointing shall be done with CM 1:2. The pointing shall be cured for a minimum period of seven days. The finished floor shall not sound hollow when tapped with wooden mallet and the finished surface shall be true to level and slopes as directed.

MODE OF MASUREMENT AND PAYMENTS:

The rate shall be for a unit of one Sq.Mt.

DTS No. 14

Providing & applying two coats of weather shield max paint (3coats may be required in case of darker colours.)of ICI Dulux orApex Ultima of Asian Paint including applying exterior acrylicprimer coat as per manufacturers specification and directions inshade and colour approved by architects, on exterior surfaces ofthe external surface of tank, beams & column at any Heightincluding scaffolding, preparing the surface, watering, curingetc. complete and as directed by the Engineer-in-charge andmanufacturers.

Surface Preparation :

Surface is thoroughly clean, dry and free from all loose dirt, chalk, grease, fungi, algae and flaking paint. This can be achieved by brushing with a wire/ stiff coir brush, followed by water jetting if required. Fill up all minor cracks and defects with white cement and sand mixture in the ratio 1:3. For application on previously painted wall, previous coatings of paint must be thoroughly scraped off and Clean the surfacethoroughly using wire brushes.

Priming:

Apply a liberal coat of exterior acrylic primer and allow it to dryfor 4-5 hours. Application of putty is not recommended. Minimum 4-6 hours duration is required between each coat ofweather shield max paint Samples shall be got approved beforeactual execution of work.

Payment for this item shall be made on the basis of square meter of actual area painted.

DTS No. 15**Providing and Filling the tank with potable water for testing purpose of ESR.**

After construction of the over head tank is over, it shall be tested for its strength of water-proofness with potable water. All the necessary arrangements for such a test shall be made by the Contractor at his cost, including filling the tank with water up to full depth etc. Testing will be carried out by the Contractor as directed by the Engineer. The Contractor shall arrange for required machinery, equipments and technical staff for testing the tank.

Contractor shall arrange for labour, other materials and tools required to attend the leakage etc. during the test. If any damage done to the tank, materials, the labour cost etc. incurred there under shall be recoverable from the Contractor either from his bill or deposit. All testing shall be done at the risk of the Contractor and he has to attend to all defects including repairing bursts, leakage etc.

If possible, water for filling the tank shall be supplied by the Corporation from the nearest available hydrant at the rates mentioned in memorandum. If it is not possible Contractor shall have to make his own arrangements for water from nearby well, canal etc.

The items include all materials and labour required to carry out the work as detailed above.

If due to any defect in the work executed by the Contractor, the leakage is noticed in the overhead tank the Contractor shall dewater the overhead tank and shall carry out necessary repair work to stop leakages and shall again refill the over head tank as detailed above without any extra cost. This procedure shall have to be repeated without any extra cost till satisfactory results are received for water tightness of the tank.

MODE OF PAYMENT:

The rate shall be paid as a job work.

DTS No. 16

Bailing out sub soil or drainage water by pumps directed after excavation and during concreting work and keeping dry the area till the completion of work as per information given by the Engineer-in-charge if required.

Note: - This item shall be included only when the bailing of drainage/subsoil water is more than 360 Hp.- Hrs.

For dewatering of drainage water from storm line and subsoil water if any, it shall be diverted with the help of necessary tool, bibs, plans, equipments, diesel pump, fuel etc. All the equipment required for dewatering shall be provided operated and maintained by the Contractor himself. The necessary suction and delivery pipe shall be of sufficient length to divert the sewage, subsoil water from trenches.

MODE OF MEASUREMENT AND PAYMENT:

The rate includes all the tools, plants, machinery, pipes, labour, fuels required for satisfactory completion of this item. The payment will be made on horse power used of the engine and for number of hours this horse power used.

DTS No. 17

Providing and fixing in position 150 mm diameter CI cowl air ventilators including fixing of air filter and jali etc. complete (weight 25 Kg. approx.)

Cowl ventilators shall be placed at such places as shown on drawing (the detailed drawing will be furnished during the execution of work) and as directed by the Engineer.

Cast Iron cowl ventilators shall have 610 mm height with 150 mm dia at bottom and a flange of 330 mm dia at top. A cast iron jali grating of 250 mm dia shall be placed and over it a cast iron cover of 460 mm dia having four legs of 50 mm square shall be bolted. The air ventilators shall be painted with two coats of anti-corrosive paint. The weight of the cowl ventilator shall be approximately 25 Kg.

Cowl ventilators shall be measured in numbers installed.

DTS No. 18

Providing and fixing Fiber reinforced seat and cover in line and level in C.C. 1:2:4 and finishing smooth etc. complete as directed. Fiber reinforced Seat and cover Medium duty.

FIBER REINFORCED MANHOLE & COVER

The frame shall be fixed in cement concrete of M15 grade all around and finished with neat cement. The cover shall have a minimum thickness of 100 mm and weighing 78 kg. The fibers shall constitute 1% of the weight of the concrete in the form of 50 mm to 100 mm long high tensile steel wires. For the cover, MS sheet lapping of 3 gauge shall be provided to avoid damage to the edges. Similarly for frame, MS angle/flat shall be provided along the edge. Both MS sheet and angle shall be painted with black bituminous paint. The cover should have suitable lifting arrangement. The fiber reinforced frame and cover shall be manufactured as per the drawing approved by Owner/Engineer. The size, type, weight, and locking arrangement for frame and cover shall be as specified. The fibre reinforced seat and cover shall be medium duty.

Mode of Measurement

The rate includes cost of all labour, materials, tools and plant etc. required for satisfactory completion of this item as described above. The rate shall be for a unit of one number basis.

DTS No. 19

Manufacturing, supplying and delivery of submerged Arc welded M.S. pipe, inside and outside 406 micron solvent free food grade epoxy painting, having bevelled end plate or coil conforming to IS-3589 - 2001 or its latest revision / ammendment of following thickness,outside diameter including all taxes insurance, transporation freight charge, octroi, inspection charge, loading, unloading, conveyance at site etc. complete. The item also includes lowering, laying, jointing, vertically M.S. pipes and specials inclusive of hydro testing etc. complete as directed by Engineer in charge.

508 mm OD - 5.6 mm. thickness pipes (inlet & overflow pipe)

508 mm OD - 5.6 mm. thickness pipes (outlet pipe)

323.9 mm OD - 4.5 mm. thickness washout pipes

1.0 All the pipes are intended to be used for transmission of water.

2.0 Material:-

2.1 Spirally submerged arc Welded Pipes shall be manufactured from steel produced by the open hearth or electric or one of the basic oxygen process.

- 2.2** Steel(H.R. Coil) to be used in manufacture of spiral welded pipe shall be conforming to IS:2062:2006 or As per I.S.-10748: and to its latest amendments also. Steel should be of Grade-`B, designated as Fe 410 W B in IS:2062: 2006 or As per I.S.-10748,Gr.III SK/K.
- 2.3** Sampling of pipes shall be as per IS:4711:1994./As per Relevant I.S.
- 3.0 Manufacture :-**
- 3.1 QAP:-**
The successful tenderer must get approved quality Assurance Plan (QAP) before starting, manufacturing the ordered pipes.
- 3.2** The pipes shall be manufactured from steel strips by spirally submerged arc welding. The weld must be automatic and continuous. All the edges of the plates/strips should be prepared suitable prior to the welding of pipes. Welding joints and its manufacturing process shall conform to IS:3589:2001.
- 3.3 Length :-**
The Corporation intends a speedy as well as easy laying work of the pipes procured through this tender. Accordingly, the pipes shall be supplied in single length of 6.00mt only. As required by S.M.C. However irrespective of the length payment shall only be done on the single per Rmt. rate only.
- 3.4 Size:-**
The term dia expresses the clear outside (external) diameter of the pipes.
- 3.5 Wall Thickness :-**
Wall thickness of the pipes shall be as under.
614mm dia. Pipe; 7mm Thk.
714mm dia. Pipe; 7mm Thk.
813mm dia. Pipe; 7mm Thk.
914mm dia. Pipe; 8mm Thk.
1016mm dia. Pipe; 10mm Thk.
1219mm dia. Pipe; 10mm Thk.
1524mm dia. Pipe; 12mm Thk.
Tolerance in wall thickness shall be within + 5.0 % limit.(Higher side only)
- 3.6** Finished pipes shall not deviate from straightness by more than 0.1% of the total length. Straightness shall be checked out by using a taut string or wire from end to end, along the side of the pipe to measure, the greatest deviation.
- 4.0 Hydraulic Pressure Test:-**
- 4.1** Testing shall be carried out as specified in IS: 3589:2001./Relevant I.S.
- 5.0 Mechanical Test:-**
- 5.1 Tensile Test:-**
- 5.1.1** Tensile test shall be carried out as mentioned in IS:1894:1972 or its latest version as well as IS:3589:2001.The tensile strength & percentage elongation of the pipes shall strictly conform to the provision of IS:3589: 2001. The Manufacturers shall submit the required test certificates at free of cost, both for the pipes as well as steel strips also.

5.1.2 Guided Bend Test:-

5.1.3 Guided Bend test shall be carried out as per the provisions of IS:3589:2001 and necessary test certificate shall be submitted by the Manufacturers at free of cost.

6.0 Chemical Composition :-

6.1 As mentioned earlier in 2.2, the steel used for manufacturing shall strictly conform to IS:2062:1992 having grade designation Fe 410W B. Chemical composition should be conforming to IS:2062: 1992. Laddle analysis shall be carried out as mentioned in IS:2062:1992 and various constituents viz. Carbon, Manganese, Sulphur, Phosphours, Silicon, copper etc. shall be within prescribed permissible limits. The Manufacturers shall submit the required test certificates at free of cost, both for the pipes as well as steel strips/H.R.Coils also.

7.0 Pipe Ends :-

7.1 All the pipes shall have one end swaged and other end plain/ suitable for field welding. The edge of each pipe must be truly vertical. The swelled/swaged end shall be formed, strictly as per the dimensions and process mentioned in IS:3589:2001. Normally the dimension of the swelled/swaged end shall be such that the plain end can be inserted easily at the time of laying on site.

8.0 Workmanship:-

8.1 All the pipes shall be clearly finished and when visually inspected, shall be free from defects such as cracks, surface flaws, laminations etc. The ends of the pipes shall be cleanly cut as mentioned in 7.0 and truly vertical with the axis of the pipe.

9.0 The copy of the ISI License for manufacture of pipes for the particular unit from where the pipes will be manufactured shall also be submitted.

10.0 Marking :-

Each pipe shall be legibly marked at free of cost with the following details.

(a) Manufacturers's name or trade-mark.

(b) Outside diameter in mm.

(c) Wall thickness in mm.

(d) ISI mark.

(e) Pruchaser's Name - SMC.

(f) Last two digits of the year of Manufacture.

(g) Weight of pipe in KG upto two digits (i.e.0.00)

(h) Heat number of the H.R. Coil used for manufacturing the particular pipe

INSIDE AND OUTSIDE SOLVENT FREE FOOD GRADE EPOXY PAINTING

Specification for Solvent free food grade liquid epoxy inlining Providing & applying internal coating to MS pipe with solvent free food grade epoxy having dry film thickness of 406 microns including scrapping the surface of the pipe.

General

Buried steel pipelines shall be coated internally, with a single coat two parts solvent free high build liquid epoxy lining as per AWWA C210-07 suitable for potable water application and shall be approved by NSF International Standard NSF/ANSI-61:2004 or by water regulations advisory scheme (WRAS), UK or Central food research Institute, Mysore as per standards BS6920 UK. The Contractor shall perform all work in accordance with these specifications and the latest pipeline coating practices, and shall complete the work in all respects to the full satisfaction of the Owner/Owner's Representative. The entire coating operation starting from cleaning and surface preparation till coatings shall be performed under the supervision of skilled personnel who are well conversant with the work. Pipes which have been cleaned and primed, or cleaned, primed and coated, without having been inspected and approved shall be rejected.

This specification is not intended to be all inclusive and the use of guidelines set forth here does not relieve the Contractor of his responsibility for the quality and performance of the applied coatings system, and to supply coating material capable of performing its intended service.

All steel special sections, connections fittings and field joints to be used for underground steel pipelines shall be internally coated with same liquid epoxy.

Reference Standards

The following standards (latest revision) referenced below are a part of this specification. In case of conflict between this specification and the referenced standards, this specification shall apply

- i. ANSI/AWWA C210- Standard for Liquid Epoxy Coating Systems for the Interior & Exterior of Steel Water Pipelines.
- ii. NSF/ANSI 61- Standard for Drinking Water System Components- Health Effects.
- iii. ANSI/ASTM D149- Standard Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies.
- iv. ANSI/ASTM D3359- Standard Test Method for Measuring Adhesion by Tape Test.
- v. ANSI/ASTM D3363- Standard Test Method for Film Hardness by Pencil Test.
- vi. ANSI/ASTM D4417 - Standard Test Method for Field Measurement of Surface Profile of Blast Cleaned Steel.
- vii. ANSI/ASTM D4541 - Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.
- viii. ANSI/ASTM D2240 - Standard Test Method for Rubber Property- Durometer Hardness
- ix. ANSI/ASTM D5000- Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser
- x. SSPC-PA 2- Measurement of Dry Paint Thickness with Magnetic Gauges

- xi. SSPC-SP 1 -SolventCleaning
- xii. SSPC-SP 6/NACE No.3- Commercial BlastCleaning

General

Protective linings shall consist of a coating system consisting of 100% solid epoxy comprising of resin & hardener mixed in a proportion as recommended by the manufacturer.

The mixed epoxy shall be applied to an abrasive blasted steel surface in the coating plant using a plural airless spray machine with an extended boom to apply the lining to a smooth finish without any drip or sag. The epoxy shall also be capable of application by spray/brush at field joint locations and repair of damages to the spray/brush applied epoxy.

Internal Lining System

The internal epoxy lining shall consist of chemically cured resin (epoxy) & hardener (curing agent), mixed in the ratio as recommended by the manufacturer and applied to a dry film thickness (DFT) of minimum 406 μ . Physical properties of the internal lining shall be as follows.

Table: Physical Property of Internal Lining

Property	Requirement	Test Method/ Reference
Long term contact with potable water	No effects for human consumption as certified by NSF International	NSF / ANSI -61
Thickness (applied min)	406 μ	SSPC-PA 2
Thickness deviation (min)	-0/ + 200 μ	SSPC-PA 2
Dielectric strength (min)	450V/mil (15V/ μ m)	ASTM D149
Hardness Shore D	85 (min)	ASTM D2240
Adhesion to Steel (min)	800 psi	ASTM D4541
Tabor Abrasion	1560 cycles/ mil	ASTM D4060
Compressive strength	70 MPa	ASTM C109

Coating Application

General

All internal epoxy lining work for main pipelines shall be done in a coating plant using two component airless plural spray machine. For internal soft bends, short section of pipes, tees, fittings etc., internal epoxy will be manually spray applied either in the coating plant or in the field using suitable two component airless plural spray machine.

Internal field joint coatings shall be spray/brush applied. The internal epoxy lining shall be applied only on blasted steel surface.

Pipe preparation

Metals surface condition

Internal surface of the pipe shall be free from mud, mill scale, mill lacquer, wax, oil, grease, or any other foreign material. Before blast cleaning, surface shall be inspected and pre-cleaned according to SSPC-SP1 to remove oil, grease, and loosely adhering deposits. Visible oil and grease spots shall be removed using a solvent. Only solvents that do not leave residues shall be used. Preheating to remove oil, grease, and mill scale may be used provided that all pipe is preheated in a uniform manner to avoid distortion.

After drying and removing all loosely adhering foreign materials, the pipe surfaces shall be cleaned by blasting with grit or steel shot to achieve a surface preparation at least equal to SA 2.5 that is specified in BS 7079/ISO 8501-1:2007. The blast anchor pattern or profile depth shall be 2 mils to 3 mils (50 μ m to 75 μ m) measured in accordance with ASTM D-4417 and/or ISO 8503-4.

For consistent surface finish, a stabilized working mix shall be maintained in an abrasive recycling blasting machine by frequent small additions of new grit, shot in frequent large additions shall be avoided. The abrasive working mix, abrasive recycling blasting machine shall be maintained clean of contaminants by continuous effective operation of blasting machine scaling and air-wash separators.

The cleaned interior pipe surfaces shall be inspected for adequate surface preparation. Surface imperfections, such as slivers, scabs, burrs, weld spatter, and gouges, shall be removed by hand filing or grinding if necessary to prevent holidays.

Blast-cleaned pipe surfaces shall be protected from conditions of high humidity, rainfall, or surface moisture. No pipe shall be allowed to flash rust before coating. To ensure a dry pipe surface at the time of liquid epoxy application, the minimum steel substrate temperature shall be 10°C and at least 3°C above the dew point.

Coating Application

- **Main Pipe Line–**

- a. Application temperature**

The temperature of the mixed coating material and of the pipe at the time of application shall be not lower than 10°C. Preheating of the coating material by using in line heaters to heat the coating material may be used to facilitate the application. Heating shall conform to the recommendations of the epoxy coating manufacturer.

b. Application of epoxy

The epoxy shall be applied directly to the abrasive roughened steel surface pipe using a hot plural component airless spray equipment, with all necessary ancillary equipment like spraying boom etc, in accordance with the epoxy coating manufacturer's recommendations. Pipe will be rotated at a suitable speed and the boom of the spray machine carrying the spray gun will travel inside the pipe at a pre-determined speed to ensure that the thickness of minimum 406 microns is achieved in one single spray application. Alternatively, fixed boom & spray machine with moving pipe with pre-determined speed to achieve minimum thickness of 406 micron in a single spray is also accepted.

c. Curing

After application of epoxy, curing of the epoxy shall be natural air convection. Typical dry time of the epoxy at ambient temperature of 25-40°C shall be between one hour to three hours. Shore D hardness of the epoxy after 10 hours shall be >65.

d. Internal coating cutback

Internal coating cutback on either side of the pipe shall be 75 mm +/- 25 mm.

Internal Coating of Field Joints

After the main pipes have been welded in the trench, internal epoxy coatings shall be applied on the inside of the pipeline at the girth welds using brush/spray application. Internal epoxy for field joint coatings shall be supplied by the same manufacturer and shall be NSF approved. The epoxy shall be supplied in small cans of appropriate size required per joint with applicator pad.

The internal surface of the field joint shall be inspected and weld spatter or slag shall be removed by grinding.

The internal surface shall then be manually blasted to remove rust /contamination etc. The resin & hardener will be mixed and the coating applied to a minimum thickness of 406µ. The internal field joint coating shall overlap the factory applied main line internal coating by 50mm on either side.

Material acceptance, inspection and testing

Material acceptance

Proposed internal epoxy lining material shall be approved by the Owner/Owner's representative. Test certificate from independent third party test laboratory shall be submitted conforming compliance to the physical properties as listed in Table 3.1 (Clause no 3.8.4). No deviation to the physical properties shall be acceptable.

When the material is supplied, acceptance of the material shall be based on submission of certificate of conformance of the internal epoxy to this specification along with manufacturing acceptance

test certificates for various lots as per manufacturer's quality assurance and quality control requirements.

Coating application inspection

The entire internal lining operation by the Contractor will be supervised by qualified experts from the manufacturer. The credentials of the manufacturer's expert shall be approved by the Owner/Owner's representative. All coating work will be done in the presence of the Owner/Owner's representative.

Thickness

Thickness of the coating system shall be checked in accordance with SSPC-PA2. Thickness shall be in accordance with the values given in the Table. Out of 25 Nos. of pipes, one pipe shall be tested for the thickness at two selected places.

Holiday testing:

The completed pipe shall be subjected to holiday detection tests which shall be carried out to the satisfaction of the Engineer In-charge. The applied voltage shall be those appropriate to the coating under test as recommended by the coating material manufacturer.

Pull Off Adhesion

The pull off adhesion of the internal epoxy lining to steel shall be checked in accordance with ASTM D-4541. The average value below the limits stated in the Table shall constitute a failure of the system to meet the adhesion requirement. Out of 25 Nos. of pipes, one pipe shall be tested for the pull off adhesion test at two selected places.

Field procedures

At all times during construction of the pipeline, the Contractor shall use caution to prevent damage to the internal lining on the inside of the pipe. No metal tools or heavy objects shall be permitted to unnecessarily contact the finished coating. Workmen shall not be permitted to walk on the internal coating except when necessary. In these cases, they shall wear shoes with rubber or composition soles and heels or other suitable footwear that will not damage the coating. Any damage to the pipe or the protective coating from any cause during the installation of the pipeline shall be repaired.

Coating repair in field

All holidays visually or electrically discovered either at the coating plant or in the field shall be repaired by applying the same liquid epoxy coating using brush. The minimum overlap at the damaged area shall be 100 mm all around. The repaired area shall be tested with a holiday detector as per specifications after the repair is completed. The thickness of the coating at the repair area shall be minimum 406 μ .

Epoxy Coating for Internal Surface of Pipes and Specials

The epoxy coatings shall be solvent-less, liquid epoxy coating of at least 406 microns thickness, for the interior surface of steel pipelines & conforming to IS-3589 and/or IS-5504. Epoxy paint to be used for this work shall be suitable to local environmental conditions/ ambient conditions.

General

All steel pipes and fittings outside the pumping stations shall be internally lined with a spray applied solvent free epoxy approved for contact with potable water under the United Kingdom Water Regulations Advisory Scheme authorized for use under Regulation 31(4)(a) of the water supply (Water Quality) Regulations 2000 for contact with potable water. The applicable specifications for the coatings system shall be suitable to potable water at elevated ambient/air temperature tested as per BS-6920. AWWA C210 is referred standard for coating application as per Sec. 4.4. Surface preparation application condition, post treatment of coated surface to be as per manufacturer's specifications.

Paint- NSF standard 61- NACERP-01-75. paint should be suitable for long time storing or potable water in the pipeline.

Materials & Workmanship

The coatings system shall be factory lined and the linings shall be suitable for application in an environment with black bulb temperature up to 85°C.

All steel pipes shall be lined at the factory. Pipes welded on site shall be lined on site to the same standards as for pipes.

Pipe ends- coatings shall be held back in from the ends of pipe section to be jointed by field welding.

Detailed proposals of the lining method, materials and apparatus to be used for both factory and site applications shall be submitted to and approved by the Engineer In-charge before work starts. Storage and applications shall be in accordance with recommendations of the coating manufacturer, but as a minimum:

- a. A visual examination of the surface to be coated shall be carried out and any slivers or similar deposits removed.
- b. Prior to blasting all oil and greases shall be removed from the surface to be coated.

- c. Preparation of steel surfaces for both factory and site application shall be to a minimum of SA 2.5 in accordance with BS 7079/ISO 8501-1:2007 specifications or as per client specifications and roughness should be 50-75 micron.
- d. The surface to be coated shall be dry, clean and free from foreign material and coatings shall take place before any surface rusting and at least within 4 hours of blasting.
- e. Surface preparation and coating shall not be carried out when the relative humidity exceeds 85% or when the surface to be coated is less than 3 deg C above the dew point.
- f. The coatings shall have a minimum mean dry film thickness of 406 microns.
- g. Coatings shall be used within the pot life specified by the manufacturer.
- h. The materials to be used for the work of each batch, test certificate shall be reviewed.
- i. Paint shall be applied by brush/ air-less or conventional spray method.

Pipe linings shall be inspected on site and damaged, defective or otherwise unsatisfactory linings may be condemned. All defective areas shall be made good to the satisfaction of the Engineer In-charge.

Inspection and Testing:

It will be detailed in the contractor's Quality Plan and will be undertaken as a minimum to the following:

- a. Visual inspection of blasted profile on every pipe to be coated.
- b. Visual inspection of finished coating on every pipe.
- c. Measurement of coating thickness at four points on each pipe.
- d. The completed pipes shall be subjected to holiday detection tests which shall be carried out to the satisfaction of the Engineer In-charge. The applied voltages shall be those appropriate to the coating under test as recommended by the coating material manufacturer.
- e. The adhesion test as per clause no. 5.1.6 of AWWA-C-210.07 shall be carried out on one pipe per lot of every 10 pipes. Two parallel knife cuts about 100 mm long and 20 mm apart shall be made through the coating. If necessary, the test knife may be heated to make the cut. The painted surface between two cuts shall be lifted off the pipe with a stiff blade. If the paint film does not pill-off, more than the width of the cut, the bond shall be deemed to be satisfactory. If the width of the peel exceeds the width of the cut, two additional tests shall be made on the same pipe at two different locations. The painted surface shall be accepted if both the tests are satisfactory. If the results of either of the tests are unsatisfactory, the painting work of pipelines shall be rejected. Adhesion tests shall be performed on 1 pipe out of 10 pipes. If the adhesion test fails for one pipe, then this test shall be performed on all the remaining 9 pipes of that particular lot.
- f.

Prior to acceptance and application of the material, the Epoxy coating material shall be submitted by the contractor & shall be tested in an independent third party/vendor's test laboratory designated by the purchaser, in presence of client / consultant and the results shall be in accordance with the specified standards. The

frequency of the test shall be minimum 1 sample in every 10000 litres or per batch of the coating material. Tests like: Specific Gravity, Hardness (shore-D), Adhesion to steel, Tabor abrasion, pull-off adhesion tests, will be carried out. Rejection: If the sample of coating material does not comply with the standard, the coating material represented by such a sample shall be rejected.

- g. The pull-off adhesion of the internal epoxy lining to steel shall be checked in accordance with the ASTM D – 4541.
- h. All holidays visually or electrically discovered either at the coating plant or in the field shall be repaired by applying the same liquid epoxy coating using the brush. The minimum over-lap at the damaged area shall be 100 mm all around. The repaired area shall be tested with a holiday detector as per specification after the repair is completed. The thickness of the coating at the repair area shall be minimum 406 micron.

Preservation, Marking and Shipping

Preservation

The bare ends of each pipe shall be painted outside with a removable varnish as temporary corrosion protection during transportation.

Contractor to ensure proper protection at bevel ends of each pipe.

Marking

In addition to the marking required by API 5L, the specification MOI “Steel Pipes for Mainlines and other applicable projects specifications”, the Pipe Coating Contractor’s unique coating numbers shall be marked to the internal surface or the pipe with synthetic resin paint.

Further marking details like colour coding etc. shall be agreed upon with the Engineer In-charge. The markings shall have at least a distance of 150 mm to the pipe end.

Shipping

Shipping and Loading preparations shall be in accordance with API Specification 5L or otherwise stated in the contract documents.

Documentation

Pre-Production Documentation

The Contractor shall submit the following documents to the Engineer In-charge for approval prior to commencing pipe coating work. Work shall not commence until these procedures have been reviewed and approved by the Engineer In-charge.

- a. The manufacturer’s trade name and data sheets for all proposed coating materials. This includes cleaning and abrasive blasting consumables.
- b. Procedure for identifying or maintaining the identification of each coated item.
- c. Handling procedure.
- d. Stacking procedure.
- e. Materials control and traceability procedure for the batches of coating materials.

- f. Materials control and traceability procedure (pipe and coating materials).
- g. Procedure for steel surface preparation including materials, cleaning, inspection, verification of cleanliness and surface profile.
- h. Coating application procedures.
- i. The results of the batch tests for batches to be used for pre-qualification tests.
- j. Details of testing methods including instrument types and copies or current calibration certificates.
- k. Details of inspection methods for bare and coated pipe.
- l. Full test results from the Coating Procedure Qualification Test (PQT).
- m. Repair procedure and results or tests on demonstration of repairs.
- n. Project specific Quality Plan.

Production Records

A daily log containing the following data shall be maintained and be available for inspection by the Engineer In-charge during and/or after production. Data shall be recorded against the pipe's unique identification number.

- a. Bare pipe inspection data
- b. Ambient temperature (every 4 hours)
- c. Humidity (every 4 hours)
- d. Coating progress (no. of items coated. Including item serial numbers)
- e. Blast pipe surface amplitude
- f. Tests for cleanliness of blast surface
- g. Test for cleanliness or blast medium
- h. Film thickness measurements
- i. Average, maximum and minimum coating thickness during each shift
- j. Details of any coating repairs
- k. The unique identification number of all items that are stripped for recoating – 'RP'
- l. Pipe coating test results

This log shall be available to the Engineer In-charge throughout all coating operations

Release Documentation

The Contractor shall submit to the Engineer In-charge the following documentation in hard copy and soft copy (format to be agreed upon with the Engineer In-charge) with each batch of pipes released:

- a. Mill certificates for line pipe
- b. Unique pipe identification numbers
- c. Unique coating identification number (if different)
- d. Pipe length
- e. Length of the coated portion of each pipe and total coated lengths of all pipes.
- f. Reductions in length due to use in tests, damage or repairs, recorded against pipe unique identification number
- g. Date of coating

- h. Batch numbers of coating materials used

This shall be followed within two weeks by the following:

- a. Manufacturer's certificates for each batch of coating materials
- b. Certification/ calibration certificates for all testing and coating equipment
- c. Inspection and test records, results, and other documentation of all materials and coating tests

All reports shall be signed by the Pipe Coating Contractor to signify compliance with the requirements of this specification.

LOWERING, LAYING AND JOINTING OF MS PIPELINE

Pipe shall be lowered, laid and jointed by welding including preparation of ends wherever required, grinding as per relevant IS code of welding, testing etc. complete with hydraulic testing complete as per IS: 5822-1994.

SPECIFICATIONS FOR WELDING

These specifications cover shop welding as well as site welding for requirement of M.S. pipe in particular length and M.S. specials. Following types of joints are considered for connecting the pipes or pipe and specials.

- i) Fillet weld with swaging of one end of pipe

OR

- ii) Butt weld without swaging of one end of pipe.

a) WELDING UNDER RAIN AND STRONG WIND:

If welding is to be done during rain or strong wind, suitable protection shall be provided for the parts to be welded and the welder. Pre-heating of electrodes shall be done so as to remove any moisture. Where this is not practicable, no welding shall be done on piping under such conditions.

All types of bends, scour tees, air valves, tail pieces of valves and water meters etc. shall be fabricated as per standard practice from M.S. pipe to be supplied by Contractor. Fillet or butt weld as may be required for joints. Holes of appropriate diameters shall be drilled in flanges of specials at appropriate spacing to facilitate jointing of sluice valves, water meter, air valves and other types of valves.

The following are applicable for welding:

IS:814	Code for covered electrode for metal Arc welding for mild steel.
IS:815	Classification and coding of covered electrodes for metal arc welding of mild steel and low alloy high tensile steel.
IS:1663	Part-1/part-II regarding method of tensile testing of steel sheets and stripes.
IS:3600	Codes of procedure for testing of fusion welding joints and weld metal in steel.

b) ELECTRODES:

The contractor shall use preferably Advani Orelikon over cord S.S. Greecon (Blue) or other electrodes as approved by Engineer-in-Charge depending upon the thickness of the plate and type of joint. They shall use standard current and Arc Voltage required for the machine in use as per manufacturer's directions. Welding electrode shall conform to test procedure of IS:814 and IS:815. The contractor shall submit manufacturer's test certificate for each batch of electrode used by him. Electrodes shall be stored unopened in original containers. Electrodes when used shall be free of rust, oil, grease and all other matter which could be harmful for the good quality of welding.

c) QUALIFICATION OF WELDERS:

Only such welders who are experienced and whose workmanship is satisfactory shall be employed for the work. Welders will be individually tested for the welding skill before they are allowed to work.

WELDING PROCESS:

All welds shall be made down-hand by manual or automatic shielded arc welding process. Welding shall be done so that there shall be thorough fusion and complete penetration. Sealing runs in the inside shall be done manually. The joints for seams and circular weldings shall be square but as per standard practice as per IS:816 shall be accepted.

END PREPARATION:

Ends to be welded will be preferably made by machining. However preparation of ends may be made by flame cutting, provided all grooves and irregularities are ground off and all the oxidation is removed.

CLEANING:

The ends to be welded shall be properly cleaned. All paint, oil, grease, rust and oxide as well as earth, sand or any other material sticking which could be harmful to the welding should be removed. Ends shall be totally dry while welding. No dirt or debris will be permitted in the pipeline. Prior to alignment the inside of each joint shall be adequately scrapped by approved means to the satisfaction of the Engineer-in-charge.

ALIGNMENT AND SPACING:

Pipe to be welded shall be aligned and fitted with external line up clamp and spaced in a suitable manner, so as to hold ends during welding at a distance to ensure full penetration. Root openings shall not be more than as specified. Internal offset shall not exceed 1.5mm. The pipe piece to be butt welded shall be coupled by means of pipe couplers or by yokes or bridge "c" clamps. Owner's inspector may check and approve the joint fit-up and alignment prior to the commencement of welding.

WELDING TECHNIQUE:

As required in the welding work following points shall be observed. The contractor shall use the standard electrode depending on the thickness of the plate and type of joints. They shall also use standard current and arc voltage required for the machine in use as per the direction of the Engineer-in-Charge. Welding electrodes shall conform to IS 814 of Indian or equivalent foreign make of required quality approved by Engineer-in-Charge shall be used wherever.

WELDING EQUIPMENT, TOOLS AND SUPPLIES:

All welding machine, line up clamps, beveling machines, cutting torches and other equipment, tools and supplies used in connection with the welding work shall be kept in good working condition so as to produce sound welds. The welding machine shall have adequate controls for obtaining current adjustment for all pipe line welding requirements. Ground clamp shall be of such design as to be dependable and should not deflect the pipe and with as large a contact area as is practicable.

PREPARATION OF PIPE FACE FOR WELDING:

Before aligning, assembling and welding pipe faces shall be cleaned by scrapping by wire brushes or by any other method approved by Engineer-in-Charge. The correctness of shape and bevel edge will be checked with templates and required corrections carried out before welding.

GAS CUTTING:

Gas cutting if required for preparing in-situ distance pieces, strap set etc. and cutting out holes in the pipelines shall have to be carried out by the contractor at his own cost. After cutting the edge shall be made smooth and even by using electrical or pneumatic grinders so as to remove all inequalities. Care shall be taken to see that the shape of the material cut does not defect in any way at the time of cutting.

ROOTPASS:

a) FOR BUTTJOINTS:

The maximum electrode size shall be 3.15 mm (10 SWG) and the electrode holder shall be connected, having due regard for the polarity requirement of the electrode approved for the use for pipe in horizontal position. Upward technique shall be used with the recommended values of current.

The root pass for butt joints, regardless of the technique used, shall be such as to achieve full penetration. However, projection of weld metal in top pipe bore shall not exceed more than 5 mm. Root grooves and defective restart of the weldings shall be carefully avoided. For pipes having diameter greater than 500 mm all circumferential joints shall be welded on both sides i.e. outside and inside.

At each interruption of welding and on completion of each run, craters, weld irregularities and slag shall be removed by grinding or chiseling. After the welding is started and until the joint has been completed, displacements, shocks, vibration or stresses shall be avoided in order to prevent cracks or breaks in the weld.

b) FOR FILLET WELDS:

The maximum electrode size shall be 4 mm (8 SWG). On completion of the root pass, any visual defect or irregularity shall be ground off to avoid defects or irregularities in the next pass.

JOINT COMPLETION:

Electrode size of more than 8 SWG (4 mm) shall not be allowed for filling of the weld upward

Technique shall generally be used for pipe in horizontal and vertical position welding. At each interruption of welding and after each run of welding is completed, chipping and slag removal shall be done. When the welding is completed, butt joints shall have a cover pass. It shall be slightly convex and fuse into the surface of the base metal in such a manner as to have a gradual notch free finish and good fusion at the joint edges. Welds shall have a regular appearance and shall be free from defects. Weld numbers shall be stamped along side each weld whenever required by the Engineer-in-Charge/ consulting engineer.

BLANK FLANGES:

Blank flanges shall be provided at all ends left unattached for temporary closure of work and also for commissioning a section of pipeline for testing the line laid. For temporary closure, non-pressure blank flanges consisting of M.S. plate tack welded at the pipe ends may be used. The blank flanges or domes designed as per requirements shall be provided. Separate payment will not be made for the flanges or domes.

STRAPS:

Whenever pipeline is to be done from two faces and /or required to be done in broken stretches due to any difficulty met at site the final connection has to be done by introducing stripe to cover the gap up to 30 cm length. Such strap shall be fabricated in field by cutting pipes splitting them longitudinally and tapping them over the ends connected in the form of collar. The collar shall be in two halves and shall have the inside diameter equal to the outside diameter of pipe to be connected. A minimum lap of 8 cm on either end of the pipes shall be kept and fillet weld shall be run for circumferential joint. The longitudinal joint of the collar shall be butt welded. The material for straps and labor for doing above work is included in the rate, and nothing extra shall be paid for material as well as labor. The joint shall be provided with Reinforced cement mortar coating outside and cement mortar lining inside.

LOWERING:

- 1) After the application and inspection of coating, the entire welded pipe shall be normally lowered into the finished trench next day after completion of the coating where ever required.
- 2) The trench shall be of sufficient width, to enable lowering of pipe without difficulty. The trench bottom shall not be uneven.
- 3) Water present in the trench at the time of lowering shall be bailed out by the contractor without any extra cost.
- 4) The pipe shall be brushed before lowering and laying or remove any soil or dirt etc. that may have accumulated".

CONTRACTOR'S SCOPE:

Cutting of pipes required for fabricated specials or for completing the gaps should be cut in such a way that the wastage shall be minimum.

THE SCOPE FOR THE ITEM COVERS:

- a) Cost of additional excavation required for jointing, clearing the site of all scrubs, bushes and trees and dewatering whenever necessary.
- b) Cost of all materials like steel, cement, aggregate, bolts, nuts, washers, white lead, grease, rubber packing etc. necessary for pipe lowering, laying and jointing.
- c) Labor for laying pipes in trench to correct alignment at required depth with tools including cutting of pipes and specials if required for laying the pipes, including connecting pipes, including connecting pipes to specials and appurtenances.
- d) Cost of scaffolding, tools and plants, ropes etc.
- e) Protection of existing works from damage and cost of repairs to the damages carried out

to the existing structures, poles, sewer, pipe line, telephone/electricity cables, and electric lines, Gas pipe line, etc.

- f) Labor for making joints including welding with all materials for joints, tools as well as test for welds including testing of welded joints as per IS 5822 : 1994 para 6.2 etc.
- g) Testing of pipes for leakage under water pressure, and flushing the pipes after testing. Water required for this hydraulic testing and construction work shall have to be arranged by the contractor at his own cost.
- h) Re welding defective joints:
- i) Providing temporary arrangements to keep the pipe clean and in position.
- j) Labor for cutting pipes by gas cutting or any other method and laying and fixing the same. Labor for fabricating necessary specialss such as bends, tees, reducers, enlarges, branch, flange etc. Using M.S. Plates including drilling holes in flanges as may be required.
- k) Carting surplus pipes, pieces, scrap etc. to stores at plant site, head work or sub head work sites.
- l) Supply of any other material or labor not mentioned above but required to complete the work.

FIELD TESTING

a) HYDRAULIC TEST:

The final high pressure test on the completed section over ground or in the trench shall be performed before backfilling. The testing shall be carried out in strict compliance with the testing procedure that shall be specified by the Engineer-in-Charge/consultant. The final hydro-static pressure test on the pipe line shall be performed with water. All arrangement required for testing shall be made by the contractor and after testing they shall be removed to the entire satisfaction of the contractor and after testing they shall be removed to the entire satisfaction of the Engineer-in-Charge. Water to be used for testing should be clean, arranged and supplied by the contractor. While the line is full, hydro-static pressure shall be applied at 1.5 times the internal design pressure and maintained on the line without significant loss. Failure of the line disclosed by loss of pressure shall be located and reported by the contractor. Cost of required repair shall be borne by the contractor. Before taking delivery and commencement the should inspect the pipes and if any defect is noticed at the time of taking over he should bring it to the Engineer-in-Charge.

b) RADIOGRAPHY

Radiography test shall be conducted in pipelines. The extent of Radiography

shall be 10% of the pipe length. Location for Radiography shall be as directed by EIC.

CLEANING DISINFECTIONING AND COMMISSIONING OF THE PIPELINE

Upon completion of a newly laid main, the main shall be disinfected as directed by the Engineer.

The main shall be flushed prior to disinfection except when the tablet method is used. After initial flushing, the hypochlorite solution shall be applied to the water main with mechanically or electrically powered chemical feed pump designed for feeding chlorine solutions. For small applications, the solution may be fed with a hand pump.

In the case of main of large diameter, water from the existing distribution system or other approved source of supply shall be made to flow at a constant measured rate into the newly laid pipeline. The water shall receive a dose of chlorine also fed at a constant measured rate. The two rates shall be proportioned so that the concentration in the water entering the pipeline is maintained at no less than 300 mg/l. The chlorine shall be applied continuously and for a sufficient period to develop a solid column of 'Slug' chlorinated water that will as it passes along the line expose all interior surfaces to a concentration of at least 300 mg/l. for at least 3 hours. As the chlorinated water flows past tees and crosses related valves and hydrants shall be operated so as to disinfect the appurtenances.

In the case of newly laid mains in which scrupulous cleanliness has been exercised the tablet method can be adopted and in this method, the initial flushing is dispensed with. The calcium hypochlorite tablets are placed in each section of pipe and also in hydrants, hydrant branches and other appurtenances. The tablets shall be attached by an adhesive and must be at the top of the main. The main shall then be filled with water and the water shall remain in the pipe for at least 24 hours.

After the applicable retention period, the heavily chlorinated water shall be flushed from the main until the chlorine concentration in the water leaving the mains is not higher than that generally prevailing in the system or less than 1 mg/l.

After final flushing and before the water main is placed in service, a sample or samples of water shall be collected from the end of the line and tested for bacteriological quality and shall show the absence of coliform organisms. If the initial disinfection fails to produce satisfactory samples, disinfection shall be repeated until satisfactory, samples are obtained before the main is placed in service.

The Contractor is expected to carry out the disinfection work as a part of laying the pipes and his rates for laying the pipes should include the disinfection and other connected works till the main is placed in service, unless otherwise specified in the schedule.

Distance indicators and markings

The contractors shall supply and fix indicators at all points of change of direction, at all valves and at every one kilometer intervals along the buried pipes line. Indicators shall consist of 10 cm x 10 cm precast concrete posts 1.25 metre long, set 0.75 metre into the ground and painted white above ground level. The description shall be written in blue at one face of the precast post.

Method of Measurement and Payment

The measurement shall be made on Running Meter basis.

DTS No. 20

Providing, supplying M.S. specials with inside and outside solvent free epoxy painting such as bend, bell mouth etc. is to be made to SMC store or site of works anywhere in Surat including all taxes, loading, unloading, carting, stacking, insurance, inspection charges, octroi etc. complete.

The detailed specification is as per the **DTS No. 19** above.

Method of Measurement and Payment

The measurement shall be made on Kg. basis.

DTS No. 21

Providing and fixing in position, Ultra Sonic Level Transmitter level indicator of 9 m range for measuring OHT level as per design & specification etc. complete, as directed.

DATA SHEET FOR ULTRASONIC LEVEL TRANSMITTER (SINGLE / DUAL CHANNEL)

SR.NO.	PARAMETER	REQUIREMENT
	CONTROLLER	
1	Accuracy	+/-0.25 %
2	Resolution	2 mm or 0.1 % of empty distance whichever is greater
3	Power supply	110/230 V ac \pm 15%, 50/60 Hz OR 24 V DC
4	Output	Analog (4-20mA)
5	Communication	RS232/RS485
6	Programmable relay	As per mfg std.
7	Temperature	0 ⁰ to 50 ⁰ C
8	In built Temperature Compensation	Required
9	Degree of Protection	min IP 65
10	Indication	Min 4 digit, LCD backlight
11	Blanking distance	Programmable min 0.3 m

SR.NO.	PARAMETER	REQUIREMENT
	TRANSDUCER	
12	Process medium	Chlorinated water
13	Range	Up to 12 mtr
14	Type	Non-contact ultrasonic level measuring
15	Accuracy	+/-0.5% of measured range
16	Resolution	2 mm or 0.1 % empty distances whichever is greater.
17	In built Temp Compensation	Required
18	Body material	Suitable to resist effects of chlorine
19	Face material	Suitable to resist effects of chlorine
20	Degree of Protection	IP 67/68
21	Beam angle	10 or 12 degree at -3 db
22	Temperature	0 ⁰ to 50 ⁰ C
24	Process connection	Screwed/flanged
	SITE CONDITION	
25	Ambient Conditions	40 deg cent, RH up to 90%.
26	Tank shapes	Invert conical or similar shape variant (Over Head Tank) or cubical (Underground Tank). To visit site and decide accordingly.
27	Installation	Mostly closed vessel
28	Approved Vendors	Siemens, VEGA, E+H, forbesmarshall ABB
29	Test Certificates, O & M manual	Required with each unit.

Work included with providing & installation of all necessary material i.e. 230 supply cable, sintex box

Mode of Measurement and Payment

The rate shall be including the cost of all materials, labour, scaffolding, tools and plant etc. required for complete item.

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

DTS No. 22

Painting letters with enamelled paint for capacity of reservoir with size of letters 45 cm. height and 75 mm width etc. On top of ESR, in front of ESR and also painting letter on incoming and outgoing pipeline as indicated and as directed in the drawing attached.

The enameled paint shall be got approved from the Engineer-in-charge. The size of letters shall be 45 cm high and 75 mm wide and shall be approved by the Engineer-in-charge. The rate includes necessary materials and labours etc. complete

Payment shall be made as Ls for complete item as specified.

DTS No. 23

Providing, supplying DIDF Resilient Seated Glandless Sluice / Scour valves conforming to IS-14846-2000 with Gear box of following class and diameter including all taxes, insurance, transportation, freight charges, octroi, inspection charges, loading, unloading, conveyance to departmental stores, stacking etc. complete.

500 mm dia for inlet and outlet pipe (short body, PN-1 with hand wheel operation with Gear Box)

300 mm dia for washout pipe (short body, PN-1 with hand wheel operation)

300 mm dia for scour valve (short body, PN-1 with hand wheel operation)

DETAILED SPECIFICATIONS FOR 500 MM DIA SLUICE VALVE, AND 300 MM DIA. SCOUR VALVE,

DI RESILIENT (SOFT) SEATED GLANDLESS SLUICE VALVES

SPECIFICATION:-

- (1) All Ductile Iron resilient seated sluice valves shall be manufactured strictly in accordance with and conforming to Indian Standard specification IS:14846-2000/ BS:5163/ EN:1074-1&2 Or its latest amendments and detailed specification of S.M.C.
- (2) The valves intended to be used in water supply systems up to 70°C in vertical/ horizontal position. All the sluice valves shall be Double flanged of non-rising spindle type and shall be of PN1.0 type.
- (3) The Material of Construction for different components, parts of sluice valves shall conform to requirements given in table below:

Sr.	Components	Material	Ref. to IS No.	Grade or Designation
1	Body and Bonnet	Ductile iron/ SG Iron	GGG-50/40 or 1865	500/7 or 400/15
2	Stem	Stainless steel	AISI 420	
3	Stem sealing	NBR wiper ring		NBR O-rings
4	Wedge	Ductile iron/ SG Iron	GGG-50/40 or 1865	500/7 or 400/15, core fully encapsulated with EPDM rubber with integral wedge nut
5	Bonnet bolts	Stainless steel	AISI 420	Sealed with hot melt
6	Bonnet gasket	EPDM rubber	WRAS or DVGW approved	EUW-70
7	Wedge Nut	Aluminum Bronze		
8	Coating	Electro statically applied epoxy powder coating	DIN 30677-2 or GSK guide lines	Internally and externally RAL Blue colour

Manufacturing:-

- a) Dimensions of each part of the valve shall conform to IS:14846-2000/ BS:5163/ EN:1074-1&2 or Manufacturer's standard.
- b) The valve shall be glandless and pocket less for smooth flow of water.
- c) The valve shall be easy in operation having negligible head loss and it shall be maintenance free.
- d) Resilient wedge with double sealing points provides absolute water tightness.
- e) Ductile Iron wedge core is fully vulcanized with EPDM rubber on all sides.
- f) The valve shall be open anticlockwise.
- g) The flange of the valve shall conform to IS:1538-1993/ BS EN:1092-2 table-9 or its latest amendments.
- h) Hand wheel:-All valve shall be provided with hand wheels as per required size. The direction of closing shall be indicated on the top of the hand wheel.
- i) The supplier shall submit a detailed G.A. drawing which is to be approved by the S.M.C. after awarding the work. The valves shall be manufactured and supplied according to this approved drawing.

Testing:-

The DI Sluice Valve shall be tested according to IS:14846-2000/ as per approved drawings in presence of representatives of SMC or / and S.M.C. appointed TPI consultant. Representative of SMC or / and S.M.C. appointed Third Party Inspection Consultant [TPI] may visit/inspect the worksite at any stage of manufacturing for inspection/testing and may reject any material which does not conform to the specified requirement. The supplier shall give at least 15 days notice period for the inspection/testing of the material. All the charges towards testing/ inspection including traveling charges of S.M.C. representatives shall be borne by the manufacturer. T.P.I. Charges shall be borne by S.M.C.

- (7) All valves shall be provided with enclosed greased packed spur gear box (for 400 mm dia. and above size). The valves shall be vertically operated by removable key from top accordingly the design of the shaft and Gear box shall be done. The gear box essentially be of worm and worm wheel design, self locking type with or without additional Spur gear arrangement to ensure that the effort on hand wheel is limited to 180 N pull and Push. The gear box shall be invariably of Master gear/Auma/Limitorque/ Ameya/ Transpower/BEL-Bombay Engg. Ltd./Safex/New-Tech/Perfect Engg. only with operating torque as per AWWAC-504rating.

MARKING:-

The following information shall be cast/punched/painted on each valve body in raised letters.

- (a) The manufacturer's name or trade mark.
- (b) ISI mark if any.
- (c) The nominal pressure of valve.
- (d) The size and serial number of valve.
- (e) Year of manufacturing.
- (f) Heat number of cast.
- (h) S.M.C./ or any other mark.

Packing:

All valves shall be supplied with the wedge closed. Valve of small diameter may be packed in wooden case parts liable to injury in transit shall be wrapped with wood-wool or similar material as a protection.

The valve shall be of the following make only.

- (1) Fouress Engg. (Ind.) Ltd., Bangalore "FOURESS"
- (2) Indian Valve International, Kolkata - "IVI"
- (3) Kirloskar Bros. Ltd., Mumbai - "KIRLOSKAR"
- (4) Indian Valve Pvt. Ltd., Nasik - "IVC"

Mode of Measurement and payment:

The rate shall be paid in Nos. basis.

DTS No. 24

Fixing, ISI mark DI D/F, Sluice/ Scour valves of following class and diameter including jointing material, nut, bolts and giving satisfactory hydraulic testing etc. complete.

500 mm dia for inlet and outlet pipe (short body, PN-1 with hand wheel operation)

300 mm dia for washout pipe (short body, PN-1 with hand wheel operation)

300 mm dia for scour valve (short body, PN-1 with hand wheel operation)

Fixing of Valve

Valve shall be lowered and fixed in proper position and right to the plump and flange joints with the sets of tail pieces shall be carried out perfectly water tight. Nut bolts, rubber insertion etc. required shall be got approved by the Hydraulic Engineer or his authorized assistant.

Mode of Measurement and payment:

The rate shall be paid in Nos. basis.

DTS No. 25

Supply, fabrication, delivery at site, transport, loading, unloading etc. and erection of structural steel work. The rate should also include one shop coat of red oxide after fabrication and three coats of enamel paint etc. complete.

For ESR

MATERIALS

The structural steel shall conform to M-18

WORKMANSHIP

M.S. Plate/Angles etc for insert plate and other necessary structural steel work required shall be as directed by Engineer in charge. The rate includes welding and labours required for executing the item. The clamps required for clamping the inlet, outlet and overflow pipe shall include all required nuts, bolts, and labour. All items include one coat of red oxide and two coats of oil paint.

MODE OF MEASUREMENT AND PAYMENT

The rate shall be paid on unit of one kg.

DTS No. 26A

Providing and fixing SS-316 mesh of 10 gauge (3.10 mm th.) and having opening of 25 mm X 25 mm each crimped mesh with a frame of angle section of 50X50X6 including one coat of primer and two coats of approved oil paint to the side of skylight and ventilators as per instructions of the Engineer-in-charge.

MATERIAL:

The crimped mesh should be of stainless steel (S.S.), of 3.10 mm thick (10 gauge) having an opening of 25mm X 25 mm. The crimp mesh shall be welded on M.S. angle frame. The M.S. angle frame shall be painted by one coat of primer and two coat of approved oil paint.

WORKMANSHIP:

The crimped mesh shall be fixed to the sides of skylight at the top of container and at ventilators in the shaft as directed by the Engineer-in-charge.

MODE OF MEASUREMENT & PAYMENT:

The item includes for all materials, labours required to carry out the work as described above.

The measurement shall be on square metre basis at any level with all lead and lift.

DTS No. 26B

Providing and fixing with wooden battens Netlon-type P.V.C. net to the sides of skylight and ventilators including Indian Teak wood frame of 75 mm x 35 mm having three equal sections using wooden battens of required size including one coat of primer and two coats of approved oil paint as directed by the Engineer-in-charge.

The P.V.C. net shall be of approved quality (Netlon type). It shall be fixed on wooden frame by using Teak wood scantling and / or battens of required sizes as directed by the engineer in charge.

The item includes for all materials, labours required to carry out the work as described above including P.V.C. net, scantlings, battens, making holes in R.C.C. or masonry as required the same etc. complete as directed.

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

DTS No. 26C

Providing and fixing sky light arrangement in top dome of ESR, as directed.

Sky light shall be fixed in the top dome as shown in drawing and as directed by Engineer-in-charge.

The payment shall be made on number basis.

DTS No. 27 & 27A

Providing and fixing 40 / 25 mm dia. GI -B class pipes railing with three horizontal rows of pipes and posts of angle iron of size 65 mm x 65 mm x 8 mm RCC 150 mm and 1.15 m. height and placed at 1.85 m C/C including two coats of oil paint and anchorage in C.C. etc. complete.

G.I. pipe shall be of "B" class and of required diameter. The railing shall be fabricated as per design. The vertical post members shall be welded to the insert plates grouted in the R.C.C. floor. The railing shall be fixed in true plumb and line. After fixing welding joints shall be ground and made smooth.

After cleaning the surface and removing all dirt and welding drops, primer coat and two coats of paint as suggested by Executive Engineer of approved quality and brand shall be applied.

The rate shall be as per running meter length of the completed item of railing provided to the satisfaction of the Executive Engineer.

The rate includes the cost of structural steel as well as GI pipe of approved quality.

DTS No. 28

Providing Aluminum pole ladder made from channel size 44 mm x 25 mm x 3 mm (1.314 x 1 x 1/8") and step made from non sleep corrugated aluminum pipe 25 mm dia. complete with rubber shoes at top and bottom available in aluminum for any height.

The material shall be of approved make and of good workmanship.

The payment shall be made on running meter basis.

DTS No. 29

Conveying, carting and removing of the surplus excavated stuff from site to lead stated below as directed by the Engineer-in-charge including loading, unloading, carting, dumping or spreading etc. complete.

Up to 2.0 km

From 2.0 km to 5.0 km

Carting excess quantity of surplus earth from the site to within city limits of Surat Corporation including all leads, lifts, loading and unloading at the site unloading as directed by the Engineer etc. complete. All material will be property of the S.M.C.

The contractor has to convey the surplus excavated earth or material not useful in any way from the site to the place as directed by the Engineer in charge within the city limit of Surat Municipal Corporation. It should be dumped and / or spread in such a way as not to obstruct the path of vehicles but it should also make approach to lay the earth beyond that dumps neither any excuse for difficulties for passing the vehicles over the dumped earth shall be allowed nor any extra charge will be paid to the contractor for the same.

The conveying of earth shall be done in such matter that it should not cause to any delay in the progress of work.

During the conveying of the earth due care should be taken that the earth should not be misused or wasted. The contractor shall have arranged to collect the mis-spread earth with his own cost.

The earth should be loaded, unloaded and spreader or dumped in the presence of engineer in charge or his representative.

All carted material shall be property of Surat Municipal Corporation.

Mode of Measurement and Payment

The conveyed / carted earth shall be measured by the measurement of the conveying vehicles. The measurement shall be recorded by Engineer in charge or his representative and shall be counter signed by the Contractor or his representative in token of his acceptance.

The rate shall be for unit of a cubic meter.

DTS No. 30

Providing & constructing brick work using common burnt clay Fly ash building bricks confirming to I.S. 13757, I.S.5454, I.S.3495 having crushing strength not less than 35kg/cm square in foundation & plinth in C.M. 1:6 (1 Cement:6 fine sand) etc. comp. up to G.L./P.L.

MATERIALS

Water shall conform to M-1, Cement shall conform to M-3, Sand shall conform to M-5, Bricks shall conform to M-12, Cement mortar shall conform to M-8.

WORKMANSHIP

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

Wetting of Flyash building bricks : The Flyash building bricks required for masonry work shall be thoroughly wetted with clean water for about two hours before use or as directed. The cessation of bubbles, when the Flyash building bricks are wetted with water is an indication of thorough wetting of Flyash building bricks.

Laying : Flyash building bricks shall be laid in English bond unless directed otherwise. Half or cut Flyash building bricks shall not be used except when necessary to complete the bond. Closures in such case shall be cut to required size and used near the ends of the walls.

A layer of mortar shall be spread on full width for suitable length of the lower course. Each Flyash building bricks shall first be properly bedded and set home by gently tapping with handle of trowel or wooden mallet. Its inside face shall be flushed with mortar before the

next against it. On completion of course, the vertical joints shall be fully filled from the top with mortar.

The walls shall be taken up truly in plumb. All courses shall be 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 Flyash building bricks course shall kept in uniform.

The Flyash building bricks shall be laid with frogs up wards. A set of tools comprising of wooden straight edges, manson's spirit level, square half metre rub, and pins, string and plumb shall be kept on the site of work for frequent checking during the progress of work.

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

All fixtures, pipes, outlet, hold fasts of doors and windows etc. which are required to be built in wall shall be embedded in cement mortar.

Joint : Flyash building 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 ranking tool daily during the progress of work, when the mortar is still green so as to provide key for plaster or pointing to done.

face of Flyash building bricks shall be cleaned the very day on which the BurntClayFlyashBuilding brick work is laid and all mortar dropping removed.

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

Preparation of Foundation Bed : If the foundation is to be laid, directly on the excavated bed, the bed shall be levelled, cleared of all loose materials, cleaned and wetted before starting masonry.

If masonry is to be laid on concrete footing, the top of concrete shall be cleaned and moistened. The Contractor shall obtain the Engineer's approval for the foundation bed, before foundation masonry is started. When pucca flooring is to be provided flush with the top to plinth, the inside plinth offset shall be kept lower than the outside plinth top by the thickness of the flooring.

Fixtures – The frames of doors, windows, cup-boards etc. shall be housed into the Burnt Clay Flyash building bricks work at the correct location and level as directed. The heavy steel doors and windows required opening for frames hold-fasts etc. shall be left in the wall and frames embedded later on in order to avoid damage to the frames.

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

Packing out of joints – For the face of Flyash building bricks work, where plastering is to be done, joints shall be raked out to a depth not less than thickness of joints. The false of Flyash building bricks work shall be cleaned and mortar dropping removed on very same day that Flyash building bricks work is laid.

MODE OF MEASUREMENTS & PAYMENT:

The measurements of this item shall be taken for the Flyash building bricks masonry fully completed for or as directed shall be final.

No deductions shall be made from quantity of Flyash building bricks work. No extra payment will be made for embedding in masonry holes in respect of the following items –

Ends of joints, beams, posts, girders, rafters, purlins, trusses, corbel, steps etc. Sectional area does not exceed 500 Sq. cm.

Opening not exceeding 1000 Sq.cm.

Wall plate, sand bed plates, bearing of slab, chajjas and like whose thickness does not exceed 10 cms. and the bearing does not extend the full thickness of wall.

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

Iron fixtures : Pipes up to 300 mm. dia. hold fasts of doors and windows built into masonry and pipes etc. for concealed wiring.

Forming charges of section not exceeding 350 Sq.cm. in masonry.

Apertures for fire places, shall not be deducted nor shall extra labour required to make splaying of jumps, throating and making arches over the aperture be paid for separately.

The rate shall be for a unit of one cubic metre at any level with all lead and lift.

DTS No. 31

Providing 10 mm thick cement plaster in 1:3 C.M. (1 cement : 3 fine sand) in single coat for B.B. masonry and R.C.C. surface for plastering level and finished even and smooth with a floating coat of neat cement slurry as directed by Engineer-in-charge.

MATERIALS

Water shall conform to M-1. The cement mortar of proportion 1:3 shall conform to M-8.

WORKMANSHIP

Scaffolding – Wooden ballies, 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.

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

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

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

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

APPLICATION OF PLASTER

The plaster about 15 x 15 cms. shall be first applied horizontally and vertically at not more than 2 metres intervals over the entire surface to serve as gauge. The surface gauges shall be truly in place 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 of wooden flat according as a smooth or a sandy granular texture is required. Excessive trowelling or overworking the float shall be avoided. All corners, rises, angles and junctions shall be truly vertical or horizontal as the case may be and shall be carefully finished. Rounding or chamfering corners, junctions etc., shall be carried out with proper templates to the size required.

Cement plaster shall be used within half an hour after addition of water. Any mortar or plaster which is partially set shall be rejected and removed forthwith from the site. 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 scrapped 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 cms. to any corners or arises. It shall not be closed on the body of features such as plaster bands and cornices nor at the corners or rises. Horizontal joints in plaster work shall not also occur on parapet tops and copings as those invariably lead to leakage. No portion of the surface shall be left out initially to be packed up later on.

Each coat shall be kept damp continuously till the next coat is applied for a minimum period of 7 days. Moistening shall commence as soon as plaster is hardened sufficiently. Soaking or 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 to dry weather shall be prevented by hanging mattings or gunny bags on the outside of the plaster and keeping them wet.

MODE OF MEASUREMENTS & PAYMENT

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

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

Thickness of the plaster shall be exclusive of the thickness of the key i.e. grooves or open joints in brick work, stone work etc. or space between laths. Thickness of plaster shall be average thickness.

This item includes plastering at any level.

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

Soffits of stairs shall be measured as plastering on ceiling. Blowing soffits shall be measured separately.

For jambs, soffits, sills etc. for openings not exceeding 0.5 Sq. Mts. each in area for ends of joints, beams, posts, girders, step etc. not exceeding 0.5 Sq. Mts. each in area for and for openings exceeding 0.5 Sq. Mts. and not exceeding 3 Sq. Mts. in each area deductions and additions shall be made in the following manner –

No deductions shall be made for ends of joints, beams, posts etc. and openings not exceeding 0.5 Sq.Mts. each and no addition shall be made for reveals, jambs soffits, sills etc. of these openings for finish to plaster around ends of joints, beams, posts etc.

Deduction for openings exceeding 0.5 Sq.Mts. but not exceeding 3 Sq.Mts. each shall be made as follows and no additions shall be made for reveals, jambs, soffits sills etc. of these openings -

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

When two faces of wall are plastered with different types of plaster 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 doors, windows etc. on which width of reveals is less than that on the other side but no deduction shall be made on the other side. Where width of reveals on both faces of all are equal, deductions of 50% of area of opening on each face shall be made from areas of plaster and / or pointing as the case may be.

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

In case of opening of area above 3 Sq.Mts. each deductions shall be made for opening but jambs, soffits and sills shall be measured.

The rate shall be for a unit of one Sq. Mt.

DTS No. 31A

Providing 15 mm thick cement plaster in CM 1:3 in single coat on brick / concrete wall for inside and outside plastering as directed by Engineer-in-charge.

The relevant specifications of **DTS No. 31** shall be followed.

DTS No. 32

Providing & fixing M.S. manhole frame and cover of 0.60 m x 0.45 m size and approx. 50 kg weight with prime coat of red oxide and two coats of oil paint having plate thickness of 12 mm etc. complete as directed by Engineer in charge. (For Valve Chamber)

MATERIAL:

M.S. manhole frame and cover of required size shall be manufactured from the 12 mm thick M.S. plate as per instruction of Engineer-in-charge.

WORKMANSHIP:

The M.S. manhole cover shall be fixed as and where directed. The frame of manhole cover shall be embedded firmly in RCC slab while casting the R.C.C. slab. After completion of work, manhole covers shall be sealed by means of thick grease.

MODE OF MEASUREMENT AND PAYMENT:

The rate includes cost of all labour and materials required for satisfactory completion of this item.

The rate shall be for the unit of one kg.

DTS No. 33

Providing & fixing C.I.Steps of Size 500 mm x150 mm x22.5 mm. painted with a coat of primer and two coats of oil paint etc. complete or P.V.C. steps as directed by Engineer in charge. (For Valve Chamber)

MATERIAL:

C.I. Steps of 300 mm x 150 mm x 22.5 mm size shall be of best quality. Anti-corrosive paint shall be of best quality.

WORKMANSHIP:

The C.I. / Fiber Steps shall be fixed as and where directed. The Steps shall be embedded firmly in masonry wall and fixing in horizontal position that easy moving is possible. Vertical space between two steps will be as directed by the Engineer-in-charge for C.I. Steps, approved by Engineer-in-charge shall be necessary.

MODE OF MEASUREMENT AND PAYMENT:

The rate includes cost of all labour and materials required for satisfactory completion of this item.

The rate shall be for a unit of one number.

DTS No. 34

Providing and installing copper lighting conductor system with necessary fixtures, material etc. complete as required and as directed. Lightning Arrestor (Job including with providing & installation Copper Strip(20 mm x 3 mm), 20 mm Dia Copper Air Terminal, 600 x 600 x 6mm copper plate type earthing, earthing chamber fill with Charcoal and salt)

Entire work shall be done as directed by the engineer – in – charge.

MODE OF MEASUREMENT AND PAYMENT:

The rate includes cost of all labour and materials required for satisfactory completion of Job as specification with final testing.

LIGHTNING PROTECTION SYSTEM BRIEF SPECIFICATION:

The Water Tank shall be provide with a Lightning Protection system in accordance with the requirement of IS: 2309 and BS: CP- 326.

Water Tank shall be provides with Pointed Air terminal rod, installed at the top of the tank. Air terminal shall be Copper rod, not less then 20-mm diameter and 1000 mm long, securely anchored and braced.

Air terminal shall be connected to a continuous circumferential horizontal conductor of Copper Strip, of 20 x 3-mm thk. mounted approximately 4.0 Mt. Below the top of the tank with suitable anchored fasteners in the out side face of the concrete shell. Down conductor should be distributed round the out sidewalls of the structure, it shall preferably be run along the corner and other projection.

Contractor shall provide one Down Conductor each of 20 x 3-mm thk. Copper Strip. Down conductor shall be connected to the Circumferential Conductor Strip at the top. Each Down Conductor shall be connected to the Grounding System (Earthing Electrode). The Down Conductor shall follow the most direct path between the Air termination and the Earth Termination avoiding any sharp turns.

All joints shall be clamped or bolted by high-pressure contact to form an electrically and mechanically effective joint. The lightning protection system shall have minimum joints, if joints are necessary they shall be mechanically and electrically effective, The joints may be clamped, screwed, bolted, crimped, riveted, or welded and have minimum 20 / 25 mm overlapping. If joint to be provide for strip then it shall be welded or braced and double riveted. Clamped or bolted joint shall be used at the test link. Down conductor below ground, there shall be no joints.

Supply installation, testing and commissioning of plate type earthing station with 600x600x6mm copper plate as specified & shown on the drawings and in IS : 3043 complete with Following:

Excavation in hard murram .

Copper plate electrode.

Watering pipe .

Brick masonry with C.I. frame and hinged covers.

Charcoal and salt fill .

The entire Lightning Protective system should be mechanically strong to withstand to mechanical force produce in case of the lightning.

The Earth Electrode shall be constructed and installed in accordance with IS 3043. The earth electrode shall be out side the circumference of the structure base, minimum 7.5 Mt away.

The each Earth Termination should have a resistance in ohms, which should be kept as low as possible to the effective functioning of the Lightning Protection system.

Testing and Inspection:

On completion of the installation the resistance of the each earth termination shall be tested and testing result shall be submitted to the engineer – in – charge at site.

DTS No. 35

Providing and fixing on masonry or concrete block 1.00 m x 0.90 m size & 25 mm thick Granite stone for foundation stone & inauguration including engraving the approved material on the stone as directed by Engineer in charge etc. complete.

SELF EXPLANATORY AND AS DIRECTED BY ENGINEER IN CHARGE

The rate shall be paid per a unit of no.

DTS No. 36

Providing and fixing iron doors including using the frames of channels, angles, flats and MS sheets as per drawing including revating or welding and fixing in concrete block including iron fixtures and fastenings with one coat of primer and 3 coats of enamel paint etc. complete.

MATERIALS

The structural steel shall conform to M-18

WORKMANSHIP

M.S. Plate/Angles etc for insert plate and other necessary structural steel work required shall be as directed by Engineer in charge. The rate includes welding and labours required for executing the item. The clamps required for clamping the inlet, outlet and overflow pipe shall include all required nuts, bolts, and labour. All items include one coat of red oxide and three coats of oil paint.

MODE OF MEASUREMENT AND PAYMENT

The rate shall be paid on unit of one kg.

DTS No. 37

Providing and fixing in position collapsible steel shutters with vertical channels 20 mm x 10 mm x 2 mm braced with vertical channels 20 mm x 5 mm size with top and bottom rails of T-iron 40 mm x 40 mm x 6 mm with 38 mm dia. steel pulleys complete with bolt, nuts, locking arrangement, stoppers handles including applying a priming coat of red lead paint.

MATERIALS:

The collapsible gate shall confirm to M-24.

WORKMANSHIP:

“T” Rails shall be fixed to the floor and to the lintel at top by means of anchor bolts, embedded in cement concrete of floor and lintels. The anchor bolts shall be placed approximately at 45 mm centers alternatively in the two flanges of the “T” iron. Iron bottom runner (T-Iron) shall be embedded in the floor and proper above shall be formed along the runner for the purpose. The collapsible gate shall be fixed at the sites by fixing the end double channels in the T-Iron rail and also by hold fasts bolted to the end double channel and fixed in the masonry at the side walls or the otherwise.

In case where the collapsible gate is not required at the lintel, beams a slope above T-Iron suitably designed may be fixed at the top embedded in masonry and provided masonry with necessary clamps and roller arrangement at the top.

All the adjoining work damaged while fixing at gate shall be made good to match the existing work without any extra payment.

All members of the collapsible gate including “T” – iron shall be thoroughly cleaned to rust, scales, dust etc. and given a primary coat of red lead, before fixing them in position, and after fixing two coats of approved quality oil paint shall be applied.

MODE OF MEASUREMENT AND PAYMENT:

The collapsible gate shall be measured in Sq. metre. The height of the gate shall measured as the length of double channels and breadth from outside to outside of the end fixed double channels in the open position of the gate. The rate includes providing handles, locking arrangements, stoppers etc. The rate also includes two coats of approved quality oil paint.

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

DTS No. 38

Supply & Fixing best quality EZ-7 steel frame windows and ventilators with 6 mm thick wired glass / aluminium with safety bars etc. complete with one coat of red oxide as primer and two coats of enamel paint of approved quality etc. complete.

MATERIALS

The material shall conform to M-18

WORKMANSHIP

M.S. Plate/Angles etc for insert plate and other necessary structural steel work required shall be as directed by Engineer in charge. The rate includes welding and labours required for executing the item. The clamps required for clamping the inlet, outlet and overflow pipe shall include all required nuts, bolts, and labour. All items include one coat of red oxide and two coats of oil paint.

MODE OF MEASUREMENT AND PAYMENT

The rate shall be paid on unit of one kg.

DTS No. 39

Providing and supplying safety hanging net of appropriate capacity / dia of rope and of suitable nylon quality which can withstand any impact of human being etc from the top of the tank at Internal and external periphery of ESR with necessary sufficient supporting arrangement for. In short the arrangement should be such a way, that the safety purpose shall be ensured with all respect. during construction period and the same can be taken back by contractor after completion of the work duly concerned by Engineer-in-charge.

The work shall be carried out as per the Safety Norms and as per the site conditions.
The payment shall be made on LS basis

DTS No. 40

Taking photograph of work in progress and submit with each R.A.Bill. Photograph shall cover detail of location of the activity of work in progress. The contractor shall submit photograph with album in a set comprising 2 (two) copies (size of photo 4" x 6" with matt finish) and a soft copy of same. Work shall be carried out as per the instruction of Engg.-in-charge.

The work shall be carried out by as directed by the Engineer-in-charge.

The payment shall be made on set basis.

ELECTRIFICATION WORK**DTS No. 41**

Point wiring for Light / Fan/ Bell/ Primary Point with 2-1.5 sq. mm & earthwire of 1.5 sq. mm (green) both are of ISI marked 1.1 kv grade FRLS PVC insulated multistrand copper wires, in following type of pipe to be erected concealed in /flushed on wall/ceiling , complete with 6A Tissino Type ISI marked flush type switch / bell push and accessories erected on Metal / PVC Box covered with 3 mm thick PC(Polycarbonet) /Acrylic sheet. with necessary Lamp holder/ceiling rose / H.D.Connector as directed. (Incl. mains, holders etc.)

(a) with medium class Rigid PVC pipe and accessories

DTS No. 42

Point wiring for independent PLUG with following size mainsearhwire of 1.5 sq.mm (green) both are of ISI marked 1.1 KVgrade FRLS PVC insulated multistrand copper wires, infollowing type of pipe to be erected concealed in /flushed onwall/ceiling , complete with ISI marked 3 / 5 Pin socket andtissino type switch erected with earth continuity connectionerected on Metal / PVC box covered with 3 mm thickPC(Polycarbonet) / Acrylic sheet. (Incl. mains, holders etc.)[B] 6/16A Plug with 2-2.5 sq. mm Cu. Mains

(a) with medium class Rigid PVC pipe and accessories

DTS No. 43

Providing and erecting XLPE(IS:7098)(I)-88 ISI armoured cablemultistrand Copper conductor for 1.1 KV. to be laid on wallwith necessary clamps or in existing trench / pipe at roadcrossing or floor of following size of cable.

(a) 3 core 2.5Sq. mm

DTS No. 44

Providing and erecting XLPE(IS:7098)(I)-88 ISI armoured cablemultistrand Copper conductor for 1.1 KV. to be laid on wallwith necessary clamps or in existing trench / pipe at roadcrossing or floor of following size of cables.

(A-1) 4 core 4 Sq. mm

DTS No. 45

Providing and erecting XLPE(IS:7098)(I)-88 ISI armoured cablemultistrand Copper conductor for 1.1 KV. to be laid on wallwith necessary clamps or in existing trench / pipe of followingsize of cables

(a) 2 core 2.5 Sq. mm

DTS No. 46

Providing and, fixing heavy duty flange type brass cable glandwith rubber ring for PVC insulated armoured cable completewith out going tails, insulating tape etc for following size ofcables.

(a) 2 to 4 core 2.5 Sq. mm

(b) 2 to 4 core 4 Sq. mm

DTS No. 47

Solderless crimping type Copper lugs conforming to IS suitablefor cable of following size evenly crimped with high pressure tool & connected to switchgear terminals with brass/cadmiumplated nut bolts in an approved manner.

(A) 1.5/2.5 to 6 Sq.mm

DTS No. 48

Providing and erecting, heavy duty flood light integralluminaire comprises die cast aluminium body with heatresistant toughened front glass, silicon rubbergasket,anodised reflector hot deep powder coated cradleclamp with suitable size of necessary built in control gearcomplete with lamp. With necessary brackets/clamps/hardwares and wires (Item also includes Liasoning Chargeswith

preparing required attested documents & drawing for obtaining timely Power from Competent supply authority on behalf of client (Applicable Fees / deposits shall be paid by Client).

(B) With one no. 150 watt HPSV / Metal halide lamp

Cat.III

DTS No. 49

Supply, Erection, Testing and connecting PVC/ XLPE insulated unarmoured copper conductor cable 1.1 KV grade of following size

(b) 2 core 2.5 Sq. mm (For Fittings)

DTS No. 50

S.E.T.C. of Sintex or approved make SMC press moulded composite FRP (plastic) loop-in, loop-out approx. 2mm thick box complete with bakelite connector strip 4way & hinged doors having locking arrangements with mounting clamp with nuts, bolts & washers suitable for erection on wall, Beam, Column with suitable MCB, cable clamps & earth bolt of following size of box.

(c) 280mm X 170 mm X 100mm

DTS No. 51

Supplying and erecting nuwood 12mm thick on existing angle iron frame or wooden patti

DTS No. 52

Providing & erecting white stove enamelled Box type fluorescent fitting complete with Electronic Ballast assembly, tube, holders erected with lead wires & connection with one

tube 36/40 watt. 120 cms and adapter if required.

Cat III

DTS No. 53

Providing and erecting white stove enamelled channel type /Industrial type fluorescent fitting with open ended through reflector complete with Electronic Ballast complete with holder erected with lead wire and connections with one tube 40 watt. 120 cms. and adapter if required.

Cat III

DTS No. 54

Providing & erecting Approved make Power Saving 50 Watt Ceiling Fan with double ball bearing ISI mark with Condenser 230 volt A.C. 50 Hz 1200 mm sweep complete having 3 blades with aluminium blades with , canopy & 30 cms. down rod erected with 24/ 0.2, 3 core flexible wire with earthing. (Make shall be approved by Engineer in charge)

DTS No. 55

Providing and erecting Annealed bare Copper wire 8 to 16SWG.

DTS No. 56

Providing and erecting HOT deep Galvanised iron strip wire 8to 16 SWG.

DTS No. 57

Supplying & erecting funnel type earthing having earth plate of following size buried in specifically prepared earth pit 3mtr. below ground with 40 kg. charcoal and salt with alternate layers of charcoal & salt, 20mm.dia. G.I. pipe with Funnel with a wire mesh for watering & bricks masonry block, C.I. Cover complete as per para 7.3 of IS 3043 with necessary length of double Galvanised Iron / copper earth wire No 6 SWG bolted with lug to the plate and covered in 12 mm dia. G.I. pipe 2.5 mtr long complete connected to the nearest switch gear with end socket as per direction & duly tested by earth tester confirming to IS (As per drawing) with following specification (C) with 60 x 60 x 0.315 cms. Copper earth Plate

DTS No. 58

Supplying KITKAT pattern porcelain cut-out with base of following current capacity erected on existing block board.

(iv) 63 A 500 V

(v) 100 A. 500 V.

DTS No. 59

Miniature circuit breaker single pole 6A to 32A suitable to operate on 240 V A.C. system and having breaking capacity 10KA to be erected in existing box. confirming to IS 8828/1996 with ISI Mark

Cat.III

DTS No. 60

Providing & erecting 240 V MCB double pole switch for lighting Load (B Curve) having 10 KA breaking capacity & confirms to IS : 8828 in existing box having following capacity

(A) 6 to 32 Amp.

Cat.III

DTS No. 61

Providing & erecting 415V MCB Four Pole Switch for Lighting Load (B curve) having 10KA breaking capacity & confirms to IS : 8828 in existing box having following capacity

(a) 6 to 32 Amp.

Cat.III

DTS No. 62

Providing & erecting 415 V MCB Four Pole for Motor & Inductive Load (C Curve) having 10KA breaking capacity & confirms to IS : 8828 in existing box having following capacity

(c) 63 Amp.

Cat.III

DTS No. 63

Providing & erecting approved make thermo plastic MCB/ELCB distribution board having modular Double door with DIN rails, epoxy powder coated finish metal frame

& door assembly with Acrylic/ Plastic door, spring & hinged pins complete with required PVC sleeved 32 / 63A copper Bus strips without MCB / ELCBs

- (a) One Row 8 Mod**
- (b) One Row 10 Mod**
- (c) One Row 14 Mod**
- (d) Two Row 20 Mod**
- (e) Two Row 28 Mod**
- (f) Two Row 36 Mod**

DTS No. 64

Approved make ELCBs / RCCBs conforming to IS: 12640 and having sensitivity of 30 mA and Short Circuit withstand capacity of 6 KA and suitable for operation on single phase 240 V. having characteristic of quick action & tripping with all advance feature & do not incorporate any electronic component. for following Max. rating erected as directed

- (iii) 63 Amps. DP**
- Cat. III**

DTS No. 65

Approved make ELCBs / RCCBs conforming to IS: 12640 and having sensitivity of 30 mA and Short Circuit withstand capacity of 6 KA and suitable for operation on 3 phase and neutral 415V. having characteristic of quick action & tripping with all advance feature & do not incorporate any electronic component for following Max. rating erected as directed.

- (iii) 63 Amps. FP**
- Cat. III**

DTS No. 66

Supplying & fixing box for housing ELCB / ELCB + MCB combination made of 18 SWG sheet steel duly powder coated with gasket, dust & vermin proof bakelite shield two earthing terminals for following type of RCCB, ELCB, ELCB + MCB[a] For 2 pole

- [a] For 2 Pole**
- [b] For 4 Pole**

DTS No. 67

Supply, Installation, testing, fixing and commissioning of stationary type twin aviation warning light fitting suitable for 100 watt GLS lamp of reputed make having weather proof enclosure. The power to the fitting to be provide through 3c x 2.5 mm² cu cable (at top of tank)

DTS No. 68

Laying of cable with excavation of trench having depth of 90cm. & refilling with clay and covering with 50 mm dia. (O.D.) DWC (Double corrugated pipe) & back filling the same to make ground as per original.

- (i) Soft soil / Kachcha Road**
 - (ii) Hard Murrum / Asphalt Road**
- Making 6" to 8" deep zari & refilling by similar material**

MODE OF MEASUREMENT AND PAYMENT:

The rate includes cost of all labour and materials required for satisfactory completion of work with final testing.

The rate shall be done as per no of each Item/ mtr / kg / Sq.mtr / point

LIGHTNING SYSTEM AND AVIATION WARNING LIGHTING BRIEF SPECIFICATION:

Entire work shall be done as directed by the engineer – in – charge.

Material shall be as per the specification and from the vender list provided below

Cable: -

Unistar, CCI, Incab, Gloster, Torrent, Finolex, Bharat Cab, Havells , Avocab.

Fitting: -

For HPSV Lamp :- Philips, Crompton, Bajaj, GE, Keselec, Schereder, Surya.

For Tube Light :- Philips, Crompton, Bajaj, GE, Keselec, Schereder, Wipro, Surya, Shakti, Havell's, prestolite, Shah Inava,

High Lumen Tube:

Osram, Philips, GE (General Electric, USA), Crompton, Bajaj, Surya.

Electronic Ballast for FL fittings:

Philips, Crompton, Opal, Asian, Bajaj, Inova, Surya.

MCB/Distribution Board:

Standard, Indo Kopp, MDS, Havells, Hager, Schneider-CG, Merlin Gerin

Switch fuse unit:

L & T, Siemens, E.E., CG- Schneider, Havells

ELCB/RCCB:

L & T, Siemens, Schneider, Havells, Hager, Merlin Gerin, BCH, Jyoti.

Contractor shall supply, installed a stationary type twin aviation warning light fitting suitable for 100 watt GLS lamp of reputed make having weather proof enclosure.

Contractor shall provide Two Heavy guage ISI PVC Conduit Riser of 25 mm dia, cleated on the outer surface of the central column. One conduit riser will carry the cable to the aviation warning light provide at the top the Water tank. Second conduit riser will carry the electric cable for illumination lights to be provided on the mid platforms and at last platform level at 39.0 mt.

M.S. junction box to be provide at every 7.5 mt.Interval vertically on column. The lowest junction box shall be located 450 mm above finished floor level . Each conduit riser shall run from the lowest junction box to highest junction box. The conduit riser shall be run adjacent to the stair case such that junction box are easily accessible.

The Earth Electrode shall be constructed and installed in accordance with IS 3043. The earth electrode shall be out side the circumference of the structure base, minimum 5.0 Mt away for **the earthing system of aviation warning lighting and lighting system.**

Wiring for both the system shall be carried out using 1100 volt grade, copper conductor PVC insulated and over all PVC sheathed cables.

Each junction box to be provide with 3 way 20 amp connector strip for lighting system only. For aviation lighting direct cable to be provide from the distribution board , which shall be located at water tank base near door.

Contractor shall provide MCB distribution board , fabricated from 18 guage M.S. sheet steel having weather proof enclosure. The DB shall be installed at 1200 mm level. Both aviation warning light and light fittings directly controlled from the MCB Distribution board. Incoming power to the DB shall be provide by the client.

Safety rules & regulations and instruction from SMC shall be followed during carry out maintenance work.

At water tank base near MCB DB shall be provided with single phase 240 volt, 16 amp industrial power plug to be provided in weather proof 16 guage M.S. sheet steel enclosure with plug top and 16 amp SP MCB.

DTS No. 69

Boring holes 4.5 mt. deep in ordinary soil (for cast in situ piles) and getting out the soil and disposal of the surplus excavated soil as directed within a lead of 50 metre following diameter of piles.

300 mm / 450 mm

Bore holes may be made by selecting suitable techniques at a given site depending on sub soil strata condition and type of pile.

If bore holes made by EARTH AUGERS, In case of manual boring, an auger boring guide shall Be used to keep the bores vertical or to the desired inclination and in position.

The payment shall be made on No. basis.

DTS No. 70

SITC of 6 KW Lighting Fedderpillar for automatically ON/OFFof Street Light

Note : Item also includes Liasoning Charges with preparingrequired attasted documents & drawing for obtaining timely Power from Competent supply authority on behalf of client for that only Applicable Fees / deposits shall be paid by SMC (Client)

DTS No. 71

The Manufacturing, supply and delivery of Electronically -controlled Flow Control Valve with variation of flow rate as perdemand given in detailed specification. The Flow Control Valveshall be electronically operated, direct diaphragm sealing, single chamber weir pattern valve. A diaphragm and a spring are the theonly moving parts, and the diaphragm itself is the component thatcloses or opens to regulate the water flow. The SCADA operatedelectronic controller will activate the main control valve by two2/2 Solenoid valves. One solenoid closes, the other opens thevalve as per design data. The controller should activate thesolenoids by electric pulses, when a controlled parameterdeviates from its programmed value. The flow set-value may be modified automatically on time basis, or by a pre-defined relationto pressure or another measured parameter.

Losses in flow control valve shall not be more than 0.2 kg/ cm2for present as well as ultimate demand

Specifications of Diaphragm Valve

Electronically-controlled Flow control valve with variations of flow rate as per demand Technical Description

Main valve

The control valve has a weir pattern, consists of a main valve and a pilot control system. The main valve is hydraulically operated, Direct- Sealing Diaphragm valve. A diaphragm and a spring Are the the only moving parts, and the diaphragm itself is the component that closes or opens the liquid flow.

The standard basic valve has the capability to regulating at near zero flow, no low- flow devices such as a V-port or bypass valve are allowed.

The standard valve model **fits all control operations**, using different pilot control systems. Valves at sizes 20mm to 250mm have a single control chamber and diaphragm, sizes 300mm and 400mm are assemblies of 2 control chambers and diaphragms, sizes 500 and 600mm are assemblies of 4 chambers and diaphragms, all actuated simultaneously by a common control circuit- which may vary according to the required control function.

The standard valve body is made of ductile iron, withstanding both high hydraulic and mechanical stresses.

While the valve closes, the closure pace slows down, reducing the risk of water hammer.

Material of Construction:

Body	Ductile iron to ASTM A536
Internal trim- metals	Spring- SST302
Internal trim- Non-metalic parts	Diaphragm- NR, Spring disc- GRP
Pilot	Body Brass EN12164, Elastomers NBR, Sleeve POM
Circuit fittings	Brass EN12164
Control tubes	Nylon
Surface Protection	Epoxy coating min. 150 microns, color RAL 5005 Blue Polyester coating min.100microns, color RAL 5005 Blue
Operation	Automatic, manual override enabled

Please note: "Further Optimization in Sizing of Valves shall be acceptable for maximum Pressure Drop of 0.2 Bar in Flow control valve for present as well as ultimate Flow rate."

Electronic controller of hydraulic control valves Technical Description

The valve will be controlled by an Electronic controller, which enables control of Inlet pressure, Outlet pressure, water flow which is measured by an analog sensor. The controller should enable control up to 4 different parameters, or 2 parameters plus their remote control, simultaneously.

The start / stop operation of the controller can be made manually or by external dry- contact (digital) signals. The controlled parameter can be modified automatically on time basis, or by a pre-defined relation to measured parameter.

(Optional): The controlled parameter can be modified by a 4-20mA signal, provided to the controller by a remote terminal unit (RTU) of the SCADA. When the remote- control signal is activated, the programmed parameter will be overridden, and its value determined by the remote-control signal.

The controller will activate the main control valve by two 2/2 Solenoid valves. One solenoid closes, the other opens the valve. The controller should activate the solenoids by electric pulses, when a controlled parameter deviates from its programmed value.

The pulses length will automatically extended, as the deviation of network value from the programmed value increases- so the response of the valve accelerates.

And vice-versa: when the network value becomes nearer to the required set-point (+/- preset tolerance), the activation pulses will be shorter and less frequent, to eliminate over-reaction and unstable regulation.

The programming of the controller should be made in plain English, no special programming skill will be required.

The programming will be protected from un-authorized change, by entry codes.

The controller requires continuing supply of energy to activate the solenoids. It can be provided by a local 220 or 110VAC grid, by water-driven turbine or by asolar panel. All supply sources will charge a rechargeable battery, which enables sufficient energy to run the valve and sensors for [approximately] one day, in case of failure of the power source.

The initial programming of the controller will not be lost, even in the case it is not supplied by any power source, including the battery.

The controller will be insulated against direct water spraying and medium mechanical impact, but should not be installed in a potentially-flooded site.

In the case it must be installed near to a strong source of electromagnetic emission such as pump contactor, the controller should be installed inside an earth-connected metal box.

DATA FOR FLOW CONTROL VALVE

Sr. No.	ESR Location	Diameter of pipe in mm	Maximum Flow in LPS	Minimum Flow in LPS	Remarks
1	ESR-SE11				Existing ESR of Part-1
2	ESR-E9A				
3	ESR-E10				
4	ESR-1				Proposed ESR of Part-2
5	ESR-2				
6	ESR-3				
7	ESR-4				
8	ESR-5				
9	ESR-6				
10	ESR-7				

Note :- Staging height of ESR is 24 mt. i.e.U/S pressure(minimum) to be consider 2.4 kg/sqcm

Payment shall be made on number basis.

6.20.6 ITEMWISE DETAILED TECHNICAL SPECIFICATIONS (IDTS) FOR RISING MAIN AND DISTRIBUTION NETWORK

DTS No. 1

Providing and supplying DI K-9 pipes with EPDM Rubber Gasket for nominal bore diameter with internal cement mortar lining including all taxes, insurance, transportation, freight charges, octroi, inspection charges, loading, unloading, conveyance to departmental stores, stacking etc. complete. (IS 8329-2000)

- (i) 100 mm dia.**
- (ii) 150 mm dia.**
- (iii) 200 mm dia.**
- (iv) 250 mm dia.**
- (v) 300 mm dia.**
- (vi) 350 mm dia.**
- (vii) 400 mm dia.**
- (viii) 450 mm dia.**
- (ix) 500 mm dia.**
- (x) 600 mm dia.**
- (xi) 700 mm dia.**

General :-The specification pertains to ductile iron spigot and socket spun pipes (suitable for jointing with rubber gaskets) with ISI make and in standard length and of classes mentioned in the bill of quantities confirming to IS -8329/ISO 2531 with all upto date amendments and revision inclusive of all taxes, transportation loading, unloading from the railway wagons, carting to site of work, stacking at site of work (F.O.R.) site of work including all the taxes and duties. Ductile Iron pipe manufacturer must have ISI licence for the entire range of DI pipes required for this tender as on date of submission of tender.

Material :-The material shall confirm IS 1387 of 1993 (second revision) for General requirements for supply of metallurgical materials.

Manufacture :-The Ductile iron pipes shall be manufactured disconfirming the procedure laid down in clause 7 of IS 8329-2000.

Mechanical test :-Shall confirm clause 10 J IS: 8329-2000

Hydraulic test :-Shall confirm clause 10 J IS: 8329-2000

Cement motor lining :-Shall confirm Annex B of IS: 8329-2000

Rubber gasket :-Rubber gasket used for jointing shall be of EPDM Rubber gasket and physical properties of gasket material shall confirmed to IS: 5382-1985.

Test Reports :-The contractor shall have to produce the original copy of manufacturer's test certificate & third party inspection certificate from organisation agency authorized by SMC for quality and strength of D.I pipes.

Stacking Pipes :- All pipes shall be stacked as per manufacturer's recommendations unless otherwise directed by the Engineer.

Transportation of Pipes at Site:-After pipes, fittings and valves will be delivered to and off-loaded at temporary stores/ go-down, the Contractor shall make all arrangements for subsequent transport and handling on or about the site to the point of installation, including where necessary any movement into and out of temporary storage.

The Contractor has to transport the pipes and other materials from manufacturers to the site of lying as indicated by the Engineer. Pipes should be handled with care to avoid damage to the surface and the socket and spigot ends, deformation or bending. Pipes shall not be dragged along the ground or the loading bed of a vehicle. Pipes shall be transported on flat bed vehicles/trailers. The bed shall be smooth and free from any sharp objects.

The transportation and handling of pipes shall be made as per IS: 12288. Handling instructions of the manufacturers of the pipes shall be followed. All precautions set out shall be taken to prevent damage to the protective coating, damage of the jointing surfaces or the ends of the pipes.

Loading & Unloading: -Pipes shall be loaded and un-loaded manually or by suitable mechanical means without causing any damage to the stacked pipes.

Cranes or chain pulley block or other suitable handling and lifting equipment shall be used for loading and un-loading of heavy pipes. Where using crane hooks at sockets and spigot ends hooks shall be broad and protected by rubber or similar material, in order to avoid damage to pipe ends and lining. Damage to lining must be repaired before pipe laying according to the instructions of the pipe manufacturer. Pipes shall not be thrown directly on the ground or inside the trench.

When using mechanical handling equipment, it is necessary to employ sufficient personnel to carry out the operation efficiently ensuring safety. The pipes should be lifted smoothly without any jerking motion and pipe movement should be controlled by the use of guide ropes in order to prevent damage caused by pipes bumping together or against surrounding objects. Rolling or dragging pipes along the ground or over other pipes already stacked shall be avoided.

Support of Pipe on Transit & Storage: - The pipe should be given adequate support at all times. The pipes shall rest uniformly on the vehicle bed in their entire length during transportation. Whatever method and means of transportation is used, it is essential that the pipes are carefully placed and firmly secured against uncontrolled movement during transportation to the satisfaction of Engineer.

Stocking of Materials: -The Contractor shall remain responsible for the safe custody of all kinds of materials received by him till consumption of the same in the works. The materials must be stored in a protected temporary store near the site of work and shall not be removed without specific permission of the Engineer. Temporary stores shall be built by the Contractor at location as directed by the Engineer at the Contractor's cost.

A stock register shall be maintained by the Contractor and the day to day receipt, consumed and balance of such materials shall be recorded therein. This register shall be produced by the Contractor to the Engineer or his representative whenever required for verification of stock. The Engineer shall have free access to the temporary stores/go-down of the Contractor at any time and without any prior intimation.

Materials supplied for a particular work or part thereof shall not be used elsewhere without permission from the Engineer.

Temporary Storage: -The Contractor shall take into temporary protective storage all pipes and valves not required for immediate installation in the works. The Contractor shall provide proper and adequate storage facilities to protect all the materials and equipments against damage from any cause whatsoever and in case of any such damage/theft, the Contractor shall be held responsible. Pipe should be stored on a reasonably flat surface free from stones and sharp projections so that the pipe is supported throughout its length. In storage, pipe racks should provide continuous support and sharp corners of metal racks should be avoided. Pipes should not be stacked in large piles. Socket and Spigot pipes should be stacked in layer with sockets placed in alternate ends of the stack to avoid lop sided stacks. Pipes should not be stored inside another pipe. On no account the pipes should be stored in stressed or bent condition or near the sources of heat. Pipes should not be stacked more than 2 m high and pipes of different sizes and classes should be stacked separately. The ends of the pipes should be protected from abrasion. The pipes should be protected from excessive heat at all times. Their storage facility should be well ventilated. Valves shall be stored under cover until they are required for installation and particular care shall be taken for the protection of any associated mechanical equipment.

The period between taking delivery of pipe and the completion of its installation shall be kept to a minimum and generally, the pipes shall be laid within four weeks from the date of their dispatch from the manufacturer / store.

Any period during which the pipes are strung out along the pipeline or placed alongside the works awaiting installation shall also be kept to a minimum and if this period exceeds one month pipes shall be raised at least 75 mm from the ground on timber bearers. Jointing parts and materials shall in any case be stored under cover as for valves.

The contractor shall supply the required dia. of pipe at his cost. **The pipes shall be accepted after the third party inspection by agency authorized by SMC**, the charges for the same shall be **borne** by the contractor

DTS No. 2

Manufacture, Supply & Delivery of Ductile Iron Flange socket spigot bends, tees, reducers etc.

Specifications:-

The DI specials shall be manufactured and tested in accordance with IS 9523 or BS 4772. The mechanical test and hydrostatic test shall confirm to clause 9 and clause 10 respectively of IS 9523. The tolerances on dimensions shall be as per IS 9523.

The manufacturer of the pipes shall supply the fittings. D.I. Specials shall confirm to relevant IS codes of latest edition. Material should be procured from approved manufacturer with manufacturers test certificate. At least 50% of the D.I. specials should be inspected by agency approved by the SMC. Inspection charges shall be borne by the contractor.

All the DI fittings shall be supplied with rubber rings for each socket. The rubber ring shall conform to IS 12820 and IS 5382. Flanged fittings shall be supplied with one rubber gasket per flange and the required number of nuts and bolts. Rubber Gaskets shall be as per IS specifications mentioned in the schedule.

Synthetic rubber ring dimension should be as per IS 12820 / 89 and quality should be as per I.S. 5382/1985 and suitable for jointing of D.I. pipes as per I.S. 8329-2000 or C.I. pipes as per I.S. 1536-2001. Mechanical joint Bends, Tees, Reducer, Adopter etc. shall be of exact size, dia degree and as per standard specifications.

The special shall be coated or protected from rusting and shall be suitable for D.I. pipes (as per IS 8329/2000)

Mechanical compression sealing flanged socket tail piece (Jiffy flange adopter) shall be of exact size and dia. to match D.I. pipes (IS 8329-2000). Mechanical Joint double socket reducer shall be as per IS 13382-1992 and suitable to D.I. pipes (IS 8329-2000) sealing gaskets of S.B.R. shall be as per IS 12820-1989.

This item includes providing of special, transporting the special to site and testing. It also includes cost of entire jointing material, cost of specials, and nut-bolts etc.

The contractor shall supply the required dia of special at his cost. **The Special shall be accepted after the third party inspection by agency authorized by SMC**, the charges for the same shall be **borne** by the contractor.

DTS No. 3

Providing, supplying DI DF Resilient seated glandless Sluice / Scour valves conforming to IS 14846-2000 with Gear Box of following class and diameter including all taxes, insurance, transportation, freight charges, octroi, inspection charges, loading, unloading, conveyance to departmental stores, stacking etc. complete.

100 mm dia Sluice Valve PN-1.0

150 mm dia Sluice Valve PN-1.0

200 mm dia Sluice Valve PN-1.0

250 mm dia Sluice Valve PN-1.0

300 mm dia Sluice Valve PN-1.0

350 mm dia Sluice Valve PN-1.0

400 mm dia Sluice Valve PN-1.0

450 mm dia Sluice Valve PN-1.0

500 mm dia Sluice Valve PN-1.0

DI RESILIENT (SOFT) SEATED GLANDLESS SLUICE VALVES

SPECIFICATION:-

- (1) All Ductile Iron resilient seated sluice valves shall be manufactured strictly in accordance with and conforming to Indian Standard specification IS:14846-2000/ BS:5163/ EN:1074-1&2 Or its latest amendments and detailed specification of S.M.C.

- (2) The valves intended to be used in water supply systems up to 70°C in vertical/horizontal position. All the sluice valves shall be Double flanged of non-rising spindle type and shall be of PN1.0 type.
- (3) The Material of Construction for different components, parts of sluice valves shall conform to requirements given in table below:

Sr.	Components	Material	Ref. to IS No.	Grade or Designation
1	Body and Bonnet	Ductile iron/ SG Iron	GGG-50/40 or 1865	500/7 or 400/15
2	Stem	Stainless steel	AISI 420	
3	Stem sealing	NBR wiper ring		NBR O-rings
4	Wedge	Ductile iron/ SG Iron	GGG-50/40 or 1865	500/7 or 400/15, core fully encapsulated with EPDM rubber with integral wedge nut
5	Bonnet bolts	Stainless steel	AISI 420	Sealed with hot melt
6	Bonnet gasket	EPDM rubber	WRAS or DVGW approved	EUW-70
7	Wedge Nut	Aluminum Bronze		
8	Coating	Electro statically applied epoxy powder coating	DIN 30677-2 or GSK guide lines	Internally and externally RAL Blue colour

Manufacturing:-

- Dimensions of each part of the valve shall conform to IS:14846-2000/ BS:5163 / EN:1074-1&2 or Manufacturer's standard.
- The valve shall be glandless and pocket less for smooth flow of water.
- The valve shall be easy in operation having negligible head loss and it shall be maintenance free.
- Resilient wedge with double sealing points provides absolute water tightness.
- Ductile Iron wedge core is fully vulcanized with EPDM rubber on all sides.
- The valve shall be open anticlockwise.
- The flange of the valve shall conform to IS:1538-1993/ BS EN:1092-2 table-9 or its latest amendments.
- Hand wheel:-All valve shall be provided with hand wheels as per required size. The direction of closing shall be indicated on the top of the hand wheel.
- The supplier shall submit a detailed G.A. drawing which is to be approved by the S.M.C. after awarding the work. The valves shall be manufactured and supplied according to this approved drawing.

Testing:-

The DI Sluice Valve shall be tested according to IS:14846-2000/ as per approved drawings in presence of representatives of SMC or / and S.M.C. appointed TPI

consultant. Representative of SMC or / and S.M.C. appointed Third Party Inspection Consultant [TPI] may visit/inspect the worksite at any stage of manufacturing for inspection/testing and may reject any material which does not conform to the specified requirement. The supplier shall give at least 15 days notice period for the inspection/testing of the material. All the charges towards testing/ inspection including traveling charges of S.M.C. representatives shall be borne by the manufacturer. T.P.I. Charges shall be borne by S.M.C.

- (7) All valves shall be provided with enclosed greased packed spur gear box (for 400 mm dia. and above size). The valves shall be vertically operated by removable key from top accordingly the design of the shaft and Gear box shall be done. The gear box essentially be of worm and worm wheel design, self locking type with or without additional Spur gear arrangement to ensure that the effort on hand wheel is limited to 180 N pull and Push. The gear box shall be invariably of Master gear/Auma/Limitorque/ Ameya/ Transpower/BEL-Bombay Engg. Ltd./Safex/New-Tech/Perfect Engg. only with operating torque as per AWWAC-504rating.

MARKING:-

The following information shall be cast/punched/painted on each valve body in raised letters.

- (a) The manufacturer's name or trade mark.
- (b) ISI mark if any.
- (c) The nominal pressure of valve.
- (d) The size and serial number of valve.
- (e) Year of manufacturing.
- (f) Heat number of cast.
- (h) S.M.C./ or any other mark.

Packing:

All valves shall be supplied with the wedge closed. Valve of small diameter may be packed in wooden case parts liable to injury in transit shall be wrapped with wood-wool or similar material as a protection.

The valve shall be of the following make only.

- (1) Fouress Engg. (Ind.) Ltd., Bangalore "FOURESS"
- (2) Indian Valve International, Kolkata - "IVI"
- (3) Kirloskar Bros. Ltd., Mumbai - "KIRLOSKAR"
- (4) Indian Valve Pvt. Ltd., Nasik - "IVC"

Mode of Measurement and payment:

The rate shall be paid in Nos. basis.

DTS No. 3A

Providing and supplying ISI mark CI BF of the following class and diameter including all taxes, insurance, transportation, freight charges, inspection charges, loading, unloading, conveyance to departmental stores, stacking etc. comp. D/F BF valves, of following class and diameters

- (a) 600 mm dia B/F Valve PN-1.0**
- (b) 700 mm dia B/F Valve PN-1.0**

1.0 Butterfly Valves as per IS 13095 with PN 1.0 - Gear operated

SCOPE – Fabricated valve will not be considered.

This standard cover double flanged and wafer type of metal seated, resilient seated cast iron, ductile iron, and carbon steel and lined butterfly valves for general purpose. Valves covered under this standard are manually, pneumatically, hydraulically or electrically operated.

It covers valves of nominal pressure designations up to and including 4 Mpa. and class 300 with ends flanged in accordance with appropriate table of I.S 6418 : 1971 ‘Cast iron and malleable cast iron flanges for general engineering purpose’ or wafer type valves with bodies designed to be accommodate between pipe work flanges in accordance with appropriate table of IS 6418 : 1971 or IS 6392 : 1971 ‘steel pipe flanges’ in nominal size DN 40 to DN 2000. It also covers valves up to class 300 and flanges as per the pressure/temperature ratings given in IS 13159 (Part 1) : 1991 ‘steel pipe flanges and flanged fittings : part I dimensions’ and IS 6418 : 1971 ‘cast iron and malleable cast iron flanges for general engineering purposes’.

2.0 REFERENCE

The Indian standards are necessary adjuncts to this standard.

3.0 TERMINOLOGY AND DEFINITIONS

Terminology and definition covered in IS 4854 (Part3) : 1974 are generally applicable.

4.0 VALVE END CONNECTIONS

Double flanged valves

A valve having flanged ends for connection to pipe flanges by individual bolting.

5.0 SERVICE APPLICATIONS

Valves shall be suitable for one or more of the following applications.

- (a) Tight shut off** - A valve having no visible leakage on the disc in closed position under test conditions.

- (b) Regulating - A valve intended for regulating purpose and which may have a clearance between the disc and the body in close position.
- (c) Low leakage - A valve which has specified maximum leakage rate on the disc in the closed position.

Vacuum Condition

Where valve are to be used under vacuum conditions, purchaser shall mention specifically and the detailed design provision shall be mutually agreed between the purchaser and the manufacturer.

6.0 NOMINAL SIZES

The range of nominal valve size (DN) in mm shall be as follows:

40, 50, 65, 80, 100, 150, 200, 250, 300, 350, 400, 450, 500, 600, 700, 750, 800, 900, 1000, 1200, 1400, 1600, 1800 and 2000

7.0 NOMINAL PRESSURES

Valve shall be designated by nominal pressure (PN) defined as the maximum permissible working pressure (Mpa) at 20⁰ C temperature as follows:
PN 0.25, PN0.6, PN1.0, PN 1.6, PN 1.25 and PN4.0

The class designation for valves specified by nominal pipe size shall be class 125, class 150 and class 300.

8.0 PRESSURE / TEMPERATURE RATINGS

Maximum permissible gauge working pressure and operating temperatures shall be in accordance with IS 6418 : 1971 and IS 13159 (Part I) : 1991 except that restriction on temperature may be placed by the manufacturer on valves in accordance with this standard by reason of valve type, trim materials or other factors. However, all valves shall be suitable for continuous use at their PN designation within the temperature range of -10⁰ c to 65⁰ c.

9.0 BODY ENDS

Double Flanged Body Ends

The dimensions of flanged body ends and drillings shall be in accordance with the requirement given in Annex B. Flanges as per any other specific requirements of the purchaser may also be given as agreed to between the manufacturer and the purchaser or as per I.S. 13159 (part I) : 1991.

Flanges shall be at right angles to the axis of the bore and concentric with the bore. Flanges shall be drilled unless otherwise specified and bolt holes shall be off centers. Tapped by the design of the valve

Wafer Body Ends

Body ends shall be capable of being fitted between the pipe flanges complying with the requirements of annex B flange drilling.

The joint faces shall be at right angles to the axis of the bore and concentric with the bore.

Holes may be provided, where required by the design, for the passage of the bolts securing the flanges and the valve. Where through bolting is not practicable due to the presence of valve shaft, bearing housing, tapped holes may be provided for individual bolting of each flange.

10.0 FACE TO FACE DIMENSIONS

Face to face dimensions of double flanged and wafer types of valve shall be as per Table 1.

Face to face dimensions given in Table 1 are exclusive of the sealing gaskets at both ends.

The manufacturer shall ensure that adequate space will be available between valve flanges for bolting when flanged valve with short body face to face to face or wafer long face to face are manufactured.

Tolerance on face to face dimension in Table 1 shall be as follow

Face to face dimension of Unlined valve		Tolerance
MM		MM
Over	Up to and Including	
0	250	± 2
250	500	± 3
500	800	± 4
800	100	± 5
1000	2400	± 6

11.0 BODIES

Bodies end ports shall be circular and the numerical values of the diameter shall be as close as possible to the valve of DN.

12.0 DISC AND SHAFT

The disc and shaft shall be designed to withstand the maximum pressure differential across the valve in either direction of flow. The shaft may be of one piece design or in two pieces separately attached to the disc. Any means of attachment between the shaft and the disc shall be such as to preclude components becoming loose in service.

13.0 SEATING AND LININGS

Non-integral seating, and lining where used, and their means of attachment shall be such as to preclude their becoming loose in service.

14.0 BEARINGS

- 14.1 The bearings shall be suitable for the maximum loads imposed by the shaft during testing and in service.
- 14.2 For valves DN 350 and above, a bearing shall be provided to take the axial thrust, spring retaining clips (circlips) shall not be used as thrust bearing.
- 14.3 Suitable sealing shall be provided for the shaft where it passes outside the pressure containing enclosure.

15.0 MATERIAL OF CONSTRUCTION

This standard is based on materials specified in I.S.S. Unless otherwise agreed, the materials shall be of a grade equivalent to those given in I.S.S. or superior. Other material may be used as per agreement between the manufacturer and the purchaser. The material of construction shall be as per table given below

Sr. No.	Part Component	Pressure Rating (1 Bar + 1 atmosphere)
1.	Body	D.I. / S.G.IRON IS 1865 GR 500/7
2.	Disc	D.I. / S.G IRON IS 1865 GR 500/7
3.	Shaft (DE/NDE)	SS AISI 410
4.	Seal	EPDM Rubber having Properties equal or superior to the following. 1) Tensile strength Min. 130 Kg/cm ² 2) Elongation at break: Min 375% 3) Tear resistance : Min.35 Kg/cm ² Compression set at 100°C for 72 hours: Max. 20%.
5.	Seat ring / Retaining Ring	SS AISI 316
6.	Bearing	Steel backed PTFE
7.	Internal Hardware	SS AISI 316
8.	External Hardware	C S to IS 1367
9.	Hand wheel	M.S. round, Chrome Plated
10.	Cast Steel parts to be protected with coating suitable for tropics.	Clause 16 of B.S. 1218
11.	Drilling of valves flange	Drilling of the flange shall be as per Table of BS 4504 / IS 1538 and thickness of the flange as per the pressure rating of the valves.

The material of construction of Gear Box for valves shall be as per table given below

Sr. No.	Description	Materials
1.	Gear Case & Cover	Cast Steel ASTM A 216 Gr. WCB or S.G Iron to IS 1865 Gr. 400/15
2.	Sector Gear	D.I. / S.G.I. IS 1865 Gr. 600/3
3.	Worm / Shaft, spur Gear /pinion /shaft	BS 970 EN 19 / EN 24
4.	Fastners / Dowels	SS 316 / SS 304
5.	O – Rings	Nitrile Rubber with Shore hardness of 65 \pm 5
6.	Bearing for shaft	Ball / Roller bearing.

16.0 OPERATION

16.1 Manual Operation

All valves shall be capable of operated at a differential pressure across the disc as marked on the valve. Lever, worms gear / travelling nut type or any other suitable type of operator can be used.

16.1.1 Direction

Unless otherwise, specified manually operated valves shall be closed by turning hand wheel or lever in a clockwise direction when facing the hand wheel or lever. The design of lever when fitted shall be such that the lever may only be assembled to the valve so that it is parallel to the direction of flow when the valve is open.

16.1.2 All gear travelling nut operators shall be provided with suitable stops to prevent movement of the shaft beyond the limit corresponding to the fully closed position of the disc.

16.1.3 All gear travelling nut operators shall be packed with grease for life time operation. Gear / travelling nut operators shall be totally enclosed and weather proof for general application. For special applications such as marine, submerged service etc. the purchaser may specify special en-closer.

16.1.4 All gear / travelling nut operators shall be self locking type. All leaver operated valve shall be capable of being locked at least three intermediate position.

16.2 The operating hand-wheels shall be marked 'CLOSE' or 'SHUT' to indicate the direction of closer.

16.3 The operator shall be provided with arrangement to indicate the disc position.

17.0 TESTING

All valves shall hydrostatically tested by the manufacturer before dispatch. The pressure shall be obtained without any significant hydraulic shock. Testing shall be carried on before application of paint or other similar treatment unless otherwise agreed between the purchaser and the manufacturer. There shall be no air entrapped within the part of the valves subjected to test pressure.

17.1 Performance Testing

Each valve shall be shop operated from fully closed to fully open position and reverse, under no pressure and no flow condition to demonstrate that the complete assembly is workable.

17.2 Body Test

Completely assembled valve shall be tested as follows:

‘The body ends shall be blanked so that the valve is subjected to the full pressure in all directions include by the test pressure wafer valves may be tested in any suitable manner agreed between the purchaser and the manufacturer. The valve disc shall be in slightly open position and pressure equivalent to 1.5 times the maximum permissible working pressure shall be applied with water. The duration of this test shall be as in Table 3 below in Para 17.3.

17.3 Seat Test

The seating surface of the valve shall be cleaned unless a surface treatment forms an integral part of the design or the use of a temporary surface treatment has been agreed between the manufacturer and the purchaser to avoid the possibility of damage under the condition of the test.

NOMINAL DIA MM	MINIMUM TEST DURATION IN MINUTES	
	BODY TEST	SEAT TEST WHEN APPLICABLE
Up to and including 50	0.25	0.25
65 to 150	1.00	1.00
200 to 300	2.00	2.00
350 to 1000	5.00	2.00
1200 to 2000	5.00	3.00

17.3.1 Each valve shall be shop tested for leaks in close position. The test shall be conducted with the body flanges in a horizontal position. Pressure shall be applied to the upstream end of the valve, the downstream being open to atmosphere. The duration of test shall be as per Table above. There shall be no indication of leakage past the valve disc during test and valves shall be drop tight. Seat test shall be carried out in both the direction of valve if agreed between the manufacturer and the purchaser. The seat pressure applied on upstream side shall be equivalent to 1.1 times the maximum permissible working pressure at 20 °C and shall be applied with water.

17.3.2 For regulating type valves seat test shall not be applicable.

17.4 Disc Strength Test

The test shall be conducted with the body flanges in horizontal position. The test pressure shall be 1.5 times the maximum permissible pressure at 20 °C. With disc in closed position, hydro test pressure shall be applied to the lower face of the disc for duration as per table-3. There shall be no damage to the valve disc nor shall any part of valve or disc be permanently deformed by the test. The purpose of this test is to provide evidence of the adequacy and structural integrity of disc and body. Any leakage past the seat shall not be the criteria for rejection of the valve (Sampling test sample as per IS 2500). For regulating type valves, disc strength shall not be applicable.

17.5 Maximum permissible leakage shall be as given in Table in para 18.0.

18.0 TEST CERTIFICATES

When specified by the purchaser, the manufacturer shall issue a test certificate confirming that the valves have been tested in accordance with this standard and stating the actual pressures and medium used in the test.

VALVE TYPE	LEAKAGE RATE
Tight shut-off	No visible leakage for duration of test
Low leakage	0.1 mm ² /s X DN (sec 5)
Regulating	Not specified. Outside the scope of this standard.

19.0 INSPECTION

The purchaser or his authorized representative shall have access to the manufacturer's works at all reasonable times to inspect assembled valve at factory. The bidder has to make necessary arrangements for testing facilities of the valves as per the relevant IS at factory.

20.0 WITNESSING OF TESTS

When the purchaser desires to witness the tests, this shall be specifically agreed in advance.

21.0 MARKING

Marking shall be cast integral on the body or on a plate securely attached to the body. The markings shall be in accordance with I.S. 9866: 1981.

22.0 PREPARATION FOR DISPATCH

- (a) Valve shall be complete in all respect when dispatched. Each valve shall be drained, cleaned, prepared and suitably protected with 2 coats of red oxide on unmachined surfaces and rust preventive coats on machined and flanged surfaces for dispatch in such a way as to minimize the possibility of damage and

deterioration during transit and storage. Painting other than specified on the finished valve shall be as per the agreement between the manufacturer and the purchaser.

- (b) Disc shall be unseated when dispatched, but care shall be taken to ensure that there is no risk of damage to the disc.
- (c) When specified, the body ends shall be suitably sealed to exclude foreign matter during transit and storage.
- (d) Components shipped unattached shall be adequately protected and identified to permit correct field assembly.

23.0 APPROVED MAKE FOR BUTTERFLY VALVES

- 1. Kirloskar Brothers Limited
- 2. Fouress Engineering Limited
- 3. R & D Multiples
- 4. Indian Valve Company

24.0 MODE OF PAYMENT

The payment will be made on No. basis.

DTS No. 4

Providing and supplying CI temper proof Air valves conforming to IS 14845 with SS 304 float gun metal nozzle of approved make and quality of following class and diameter including all taxes, insurance, transportation, freight charges, octroi, inspection charges, loading, unloading, conveyance to departmental stores, stacking etc. comp.

Temper proof air valve with isolation sluice valve PN 1.0

- (a) **150 mm dia**
- (b) **100 mm dia**
- (c) **80 mm dia**

Tamper proof double acting Kinetic Air Valves

Tamper proof double acting Kinetic Air Valves are to be supplied which shall be designed as per AWWA C512-92 standards.

1.0 GENERAL

The double air valves shall have two ball chambers, having one outlet of large capacity for admission and release of bulk volume of air during emptying and filling of the main and another having small outlet for escape of smaller quantities of entrapped air. This type of air valves shall be of flanged type with full conformation with IS:1538.

The ball sealed orifice always remains open while air is exhausting and is immediately closed when water rises in the chamber, lift the ball and seals the orifice. It shall also ensure that there are no recesses or pockets, sheltering, escaping air for the large orifice (low pressure) valve to drop into when the valve is open. Turbulent air at the time of

filling of pipe shall not circulate in such cavities and cause the ball to blown into when the valve is open. Turbulent air at the time of filling of pipe shall not circulate in such cavities and cause the ball blown into the discharging air streams, blowing the valve shut prematurely.

The cone angle of the lower pressure chamber shall be such that even at the critical velocity of air escape at 300 m/sec. The total impact force on the ebonite covered ball is less than the suction force on the angular area between the ball and the cone. The design of the valve should be such as to allow maximum free air discharge at various pressure differentials. The tenderer shall submit with the tender full set of curves showing discharge of free set of curves showing discharge of free air valves pressure differential for all sizes of valves offered by him.

Under no circumstances shall be large orifice ball blow shut prematurely.

The low pressure cover shall be massive and designed to withstand full operating thrust in working conditions.

Air valve shall be design to prevent premature closure prior to all air having been discharge from the line. The orifice shall be positively sealed in the close position but float (Ball) shall only be raised by the liquid and not by mixer of air and liquid. The sealing shall be design to prevent the floats sticking after long period in the close position.

All branched outlets including outlets for Air valves will be with compensation pads (Dia of Main / For branch Dia ratio greater than 3). Diameter of compensation pad will not be less than 1.75 times the O.D. of the branched outlet. Plate thickness for pads will be same that of the main.

For outlets with above ratio less than three, then the joints will be of plate reinforcement type.

All branched outlets including air valve tee's will be provided with one ½" BSP coupling duly plugged for measurement of pressure in due course. The closing plug will be in Stainless Steel (AISI 304 or equivalent) with Hex. Head and will be provided with copper washer for sealing.

The neoprene seat ring shall be held securely in place under the low pressure cover by a joint support ring to prevent it from sagging when the ball is not sealing the orifice.

The valve body, the orifice cover, cowl of the air valves shall be made of cast iron of grade 2 of IS:210.

Where tenderer considers necessary a suitable drain plug shall be provided.

2.0 HIGH PRESSURE ORIFICE

The high pressure orifice and the high pressure chamber shall be so designed that the orifice is effectively sealed in working conditions by "EPDM" coated float.

The material of the orifice shall be gunmetal. The orifice shall be of size not less than 3 mm and tapering to 100 mm suitable to release accumulated air within the pipe. The profile of the orifice shall be carefully chosen to avoid damage to the float surface. The orifice shall be protected by a suitable plug of stainless steel.

3.0 VALVE FLANGES

All valves flanges shall be designed to withstand the stresses to which they would be subjected under hydraulic tests. Flanges shall be machined flat. The flanges shall be drilled in accordance with IS:1538 (part – I to XXII) – 1976 (specifications for C. I. Fittings for pressure pipes for water etc.)

4.0 COATING

The casting shall be such that it shall not impart any taste or smell to water. The coating shall be smooth, glossy and tenacious, sufficiently hard so as not to flow when posed to a temperature of 770 C and not so brittle at a temperature of 150 C as to chip off when scratched lightly with the point of penknife.

Alternatively, two coats of black Japan conforming to type 8 of IS 341-1971 (Or latest edition) or paint conforming to type – 2 of IS 158-1969 (OR latest edition) shall be applied.

5.0 TAMPER PROOF AIR RELEASE VALVES

The bidder has to supply tamper proof Air Release Valves.
The valves shall be

- (i) 100% tamper proof
- (ii) Zero water leakage
- (iii) Unaffected by strong air flow
- (iv) Maintenance free

The tamper proof air release valve shall have following:

- (i) Double orifice & double float.
- (ii) Stainless steel large & small float.
- (iii) Stainless steel guiding stem for large float shall give 100% perfect closing.
- (iv) Aerodynamic bucket design for maximum airflow & which should restrict entry of foreign material.
- (v) Integral vent welded to inverted cap made of MS should restrict tampering of Air Release Valve large orifice.
- (vi) Small orifice automatic valve vertically assembled should discharge small quantity of dissolved air / air pockets automatically.
- (vii) Design shall be as per AWWA C512-92 standards.
- (viii) Air Release Tamper Proof Valves shall be tested as per IS 14845 – 2000.

6.0 MATERIAL OF CONSTRUCTION OF KINETIC AIR VALVES

Sr. No.	Kinetic Air Valves	Material Description PN 10, PN 16 / PN 25
1	Body	Ductile Iron DIN 1693-GG40/ Spheroidal Graphite Iron IS 1865 Gr 400/15
2	Float (Large)	Stainless Steel : ISI – 304 / 316 / 316L
3	Nozzle	Gun Metal : IS 318 LB2 / GM + Neoprene Rubber
4	Gasket	Rubber : Neoprene
5	Cover	Carbon Steel : Plate
6	Fasteners	Carbon Steel : IS 1363

7.0 TESTING

The air valves shall be tested as per IS 14845 – 2000. The air valves shall withstand 1.5 times the working pressure. The joints and air valve shall be water tight. During test if the joints of air valve are found leaking or the air valve is found not functioning properly then the same shall be got rectified or replaced by the contractor to the satisfaction of Engineer-in-charge.

8.0 APPROVED MAKE FOR KINETIC AIR VALVE – TAMPER PROOF

1. Indian Valve Company
2. Kirloskar Brothers Limited
3. Fouress Engineering Limited
4. R & D Multiples

9.0 MODE OF PAYMENT

The payment will be made on No. basis.

DTS No. 5

Excavation for pipeline trenches including all safety provision (barricadding, fencing etc.) using site rails with shoring, strutting and stacking the excavated stuff upto 90.00 mt. Cleaning the site etc. complete for lift and strata s specified. The excavation shall be carried out in stable slope for which no extra payment will be made. Rate is inclusive of backfilling the trenches with available excavated earth (excluding rock) in layer including ramming, watering, consolidation desposal surplus stuff as directed within a radius of 3 km.

- (a) **In all sorts of soil, soft murrum, hard murrum, soft rock, etc.**
- 0 to 1.5 mt. Depth
 - 1.5 mt. to 3.0 mt. Depth

The trench for laying the pipes shall be excavated true to lines, levels and grades as shown on the drawings or directed by the Engineer with the help of boning rods.

The depth shall be such that the pipe shall have a clear cover of at least 1.2 m. The trench shall be excavated through all strata met with. When it is necessary and ordered by the Engineer in writing, the sides shall be shored or sloped, otherwise they shall be as vertical as possible. The rates shall include shoring and provision of slopes.

Various materials excavated shall be separated and stacked beyond one meter or more from the edge as may be necessary in the opinion of the Engineer to avoid provision of slopes.

The bed shall be even and to the correct grade and line in all cases.

The trench shall be barricaded and warning board fixed, Red lights shall be hung at night time at sufficiently close intervals to indicate the danger and a chowkidar employed to see that the lights are properly burning. The contractor shall be solely responsible for any accidents, due to any default in barricading, sign posting or red lights and shall bear the consequences.

At all road crossing, the trench shall be excavated only for half the width of the road and pipe laid. The other half shall be excavated only after backfilling over the laid pipe and making it suitable for the traffic. At all road crossings, the pipes shall be sufficiently laid below the crust of the road.

All pipes, gas gline, cables service lines etc. met with during the excavation shall be carefully protected and supported. Any damage done shall be made good by the contractor at his own cost. For making end connection or branch connection it shall be the responsibility of the contractor to excavate the trench in such manner so as to enable the fitter to make the connections conveniently. At crossing of cross drains, sewer mains, old water main, drain connection, electric cable etc. it shall be to such a depth as to enable the fitter to take the pipe from, below above or through the cross drain or the cable etc as the case may be and as directed by the Hydraulic Engineer. No extra payment shall be made in above cases of excavation. In case contractor has laid the pipeline in the trench excavated less than above specified depth, contractor may be asked to lay the line after making proper depth as directed by the Hydraulic Engineer or his Authorised representative on site. The extra labour involved in such cases will have to borne by the contractor. If contractor, fails to carry out such direction, Hydraulic Engineer may give the reduced rates for portion of pipe line laid in the trench as he thinks fit or relay the line at the risk and cost of contractor as deemed fit, no measurement will be taken for joints pits as the same included in the item of lead jointing.

The contractor shall have to keep chowkidar and red lights (of a proper size) during night on open trenches during the progress of the work and until the trench or pit is completely refilled. Red flags road closing board etc. and such other precautionary measures shall have to taken by the contractor. If the contractor fails carry out the above precautionary measures, Hydraulic Engineer shall engage, even without giving a notice to the contractor wherever the situation demands quick action for the chowkidar, places, necessary red lights and manage to guard the trenches all the expenditures so incurred shall be recovered from the contractor from his bill or deposit. The contractor will have no right to dispute the action taken by the Hydraulic Engineer.

Excavated earth shall be used for refilling of trenches however, surplus excavated stuff will be the property of Contractor and Contractor may disposed off or stock the same at their own risk and cost. **NO PAYMENT FOR THE CARTING OF SURPLUS EXCAVATED STUFF WILL BE MADE.**

The earth to be used for filling shall be free from salts, organic or other foreign matter. All clods of earth shall be broken. 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 and filled with earth in layers not exceeding 20 cms. Layers 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 butt ends of crowbars where rammer cannot be used.

After compaction and consolidation, If any short fall of excavated stuff is found, than Contractor has to bring the soil of the required quantity in order to meet short fall at his own cost. Moreover, if any settlement of road after reinstatement or after first monsoon or during watering, contractor shall be fully responsible for the settlement of trenches. Patches / depression / settlement shall be repaired with chhara or soil at his own cost. Surplus excavated stuff shall be disposed off in such a way that it does not create any nuisance to the public or SMC's road surface.

Mode of measurement and payment:-

The depth of excavation shall be counted from the bottom of the base course of metal or asphalt road surface.

Payment shall be made on cubic meter basis.

DTS No. 6

Excavation of asphalt pavement of any thickness etc. complete with tacking the material as directed by the Engineer-in-charge (only carpet thickness shall be considered for calculation of quantity)

Item includes breaking and removing of the road surface upto the bottom of asphalt surface item also include stacking of useful material upto lead of 90 meters.

Mode of measurement and payment:-

Payment shall be made on cubic meter basis.

DTS No. 7

Reinstatement of asphalt road / pavement using same material for soling and providing new soling and new metalling, grouting with tack coat etc. complete, as directed.

This work shall consist of necessary excavation prepared base, spreading metal using excavated useful material, new metal for second layer and grouting it with tack coat.

Necessary specifications of MoRTH & ULB are applied for specific layer.

The item should be measure in Square meter.

The unit rate shall include all the activities to complete above job including all materials, labours, machineries as directed by engineer in charge.

DTS No. 8

Providing sand bedding of average 15 CM thickness including ramming, watering, consolidating etc. complete.

Providing sand bedding under pipe of average 15 CM thickness including watering raming consolidating and dressing etc. complete as and where instructed by Engineer-in-charge

1. The sand to be use for filling shall be free from salts, organic or other foreign matter. All clods of sand shall be broken.
2. As the excavation of trench is done up to required depth and of required width, The sand is filled in trench with average thickness of 15 CM (compacted) in full width of trench before laying pipe. It is watered and rammed to required level so that the average thickness of sand bedding is 15 CM.
3. **Mode of measurement and payment:-**

The payment shall be made for filling sand as per drawings. No deduction shall be made for shrinkage or voids, if consolidated as instructed above.

The rate shall be for a unit of one cubic meter

DTS No. 9

Lowering, laying and jointing DI Pipes of various classes with specials of following diameters in proper position grade and alignment as directed by Engineer in charge.

- (i) 100 mm dia.
- (ii) 150 mm dia.
- (iii) 200 mm dia.
- (iv) 250 mm dia.
- (v) 300 mm dia.
- (vi) 350 mm dia.
- (vii) 400 mm dia.
- (viii) 450 mm dia.
- (ix) 500 mm dia.
- (x) 600 mm dia.
- (xi) 700 mm dia.

The DI pipes will be transported to the site of work where actually they are to be laid and jointed. All necessary steps shall be taken to prevent damage to pipes during transport, loading, unloading, operations etc. Only approved method for conveyance loading and unloading, stacking operations etc. Only approved method for conveyance loading unloading, stacking operations such as winch and chain pulley block tripod, etc. may be adopted. The DI / C.I. pipe should be laid as per IS 12288 and as given below.

Laying of Pipes Under Ground :-

The pipes should be lowered into the trench with tackle suitable for weight of pipe. Either a well designed set of shear legs or mobile crane shall be used for lowering of pipe into the trench. When lifting gear is used the positioning of the sling to ensure proper balance should be checked when the pipe is just clear of the ground. The pipe should be clearly cleaned of any debris inside the pipe either before or just after joint is made. When the laying is not in progress the temporary end closure should be securely fitted to the open end of pipe line.

On gradient of 1:15 or steeper, precautions should be taken to ensure that the spigot of the pipe being laid does not move into or out of socket of the laid pipe during jointing operation. As soon as the joint assembly is completed. The pipe should be held in position while the trench is back filled over the barrel of pipe.

The designed anchorage shall be provided to resist the thrust developed by internal pressure at bends, tees and other specials etc. The cement concrete block should be casted in situ to resist the thrust designed taking into account the maximum pressure the main is to carry in service or on test and the safe bearing pressure of the surrounding soil.

Cutting and Chamfering to D.I. Pipes :-

This item shall be executed for use of cut pipes in required length only when directed by Engineer in charge and after obtaining the permission from him. The burn left after cutting should be trimmed off by light grinding or by filing method. The chamfering of pipes shall conform to IS 12288 — 1987.

The chamfering shall be suitable for push on joints / mechanical joint without damaging the rubber gasket. The pipe after chamfering should be so smooth that enables to push in gasket for push on jointing. This item includes cost of all labour and tools required for executing the complete item.

Jointing of Pipes :-

The DI pipes should be jointed either with flexible joints / SBR rubber gasket joints or by rigid flanged joints. The pipes shall be joined by the rubber gaskets (SBR) except where there are specials / valves to be jointed to the pipeline. The SBR rubber gasket of suitable size required for laying of CI pipes shall have to be procured by the contractor at his own cost. The SBR ring should confirm to IS 12820/1989.

Before assembling the joint the spigot of one pipe and the interior of the socket of the adjacent pipe should be thoroughly cleaned. The insertion of the gasket can be facilitated by the prior application of a thin film of lubricant to the bulb seating the inside the socket.

The rubber gasket should be wiped clean, flexed and then placed in the socket with the bulb towards the back of the socket. The groove in the gasket must be located in the retaining heel in the socket and the retaining heel of the gasket firmly embedded in its seating:

It is necessary to ensure that the SBR gasket fits evenly around the whole circumferences removing any bulges which prevent the proper entry of the spigot end. In the larger diameter this operation may be assisted by forming a second loop in the gasket opposite the first then pressing the loop flat one after the other.

A thin film of lubricant should be applied to the inside surface of the gasket which will be in contact with the entering spigot. In addition a thin film of lubricant may be applied to the outside surface of the entering spigot for a distance of 25 cms from the spigot end.

The pipe to be jointed should be supported centrally by the tackle used for laying and balance just clear of the trench bottom. The spigot of the pipe must be aligned and entered carefully into the adjacent socket until it makes contact with the gasket. Finally assembly of the joint is completed from this position.

Joint assembly is completed by forcing the spigot end of the entering pipe through the gasket, which is thus compressed until the spigot end reached the total depth of the socket, if the assembly is not completed with the application of reasonable force, the spigot should be removed and the position of the gasket examined.

For joints 200 mm and above rack and level tackle may be used for completing assembly wherever found necessary at the cost of contractor.

The rack is placed on the socket with the hooked end of the rack extending over the spigot of the entering pipe. The tumble on the end of the 3.2 meters long socket rope is placed over the hook bolt on the rack, which should be in its lowest position, with nut of the top of the thread. The plain end of the rope is passed round the body of the pipe looped through the rope adjuster on the side of the rack housing, wedge inserted and the rope draw tight, this pulls the wedge home thus securing the rope. The tackle is then tamped firmly to the pipe by tightening the nut on the work bolt once the length of the rope is correctly set, it is not necessary to loosen the wedge adjuster for subsequent joints unless the diameter of pipes being jointed in change. The thimble secured to one end of 6.1 m. wire rope is not loosed over the hook at the end of rack and the free end carried to the socket end of the pipe to be jointed.

A special hook and rope adjuster is then fitted on to this rope and securely located in convenient position by means of the wedge. Once the position of the hook and rope adjuster has been thus set subsequent assembly of pipe of similar length should be subsequently jointed.

Backfilling

Pipe trenches shall be backfilled after completion and acceptance of field hydraulic tests and repair of coating as required and/or as directed. The work shall be done in accordance with IS: 12288.

Backfilling of trenches shall be done as specified below with watering and compacting in layers under "Optimum Moisture Content" conditions to achieve required density of refilling and strength after compaction. For the purpose of backfilling, the depth of the trench shall be considered as divided into the following three zones from the bottom of the trench to its top:

Zone A: From the bottom of the trench to the level of the centre line of the pipe	Backfilling by hand with sand, fine gravel or other approved material placed in layers of 150 mm and compacted by tamping. The back-filling material shall be deposited in the trench for its full width of each side of the pipe, specials and appurtenances simultaneously. Special care shall be taken to avoid damage of the pipe and the coating or movement of the pipe.
Zone B: From the level of the centre line of the pipe to a level 300 mm above the top of the pipe	Backfilling and compaction shall be done by hand or approved mechanical methods in layers of 150 mm, special coating or moving or moving of the pipe.
Zone C: From a level 300 mm above the pipe to the top of the trench.	Back-filling shall be done by hand or approved mechanical methods in 150 mm layers after compacting and carried to the level necessary to allow for the temporary restoration of road and path surfaces, and also for hard core (if and where ordered) on roads or to such level as will leave the requisite space for the top soil, road surface etc. to be reinstated as directed by the Engineer.

Where the excavation is made through permanent pavements, curbs, paved footpaths, or where such structures are undercut by the excavation, the entire back-fill to the sub-grade of the structures shall be made with sand in accordance with IS:12288.

The excavated material may be used for back-fill in the following cases, provided it complies with IS: 12288 Clause 4.11.1:

- a) In Zone C: In cases where settlement is unimportant the back-fill shall be neatly rounded over the trench to a sufficient height to allow for settlement to the required level.
- b) In any zone, when the type of back-fill material is not indicated or specified. Provided that such material consists of loam, clay, sand, fine gravel or other materials which are suitable for back-filling in the opinion of the Engineer.

All excavations shall be backfilled to the level of the original ground surfaces unless otherwise shown on the drawings or ordered by the Engineer, and in accordance with the requirements of the specification. The material used for backfill, the amount thereof and the manner of depositing and compacting shall be subject to the approval of the Engineer, but the Contractor will be held responsible for any displacement of pipe or other structures, any damage to their surfaces, or any instability of pipes and structures caused by improper depositing of backfill materials.

Trenches shall be backfilled with selected material placed in layers not exceeding 150 mm in thickness after compacting, wetted and compacted to a density of not less than 90 percent of the maximum dry density at optimum moisture content for zones A, B and C of the surrounding material. Any deficiency in the quantity of material for backfilling the trenches shall be supplied by the contractor at his expense. Water for compaction shall be arranged by the contractor at his cost.

The contractor shall at his expense make good any settlement of the trench backfill occurring after backfilling and until the expiry of the defects liability period.

On completion of pressure and leakage tests exposed joints shall be covered with approved selected backfill placed above the top of the pipe and joints in accordance with the requirements of the above specifications. The contractor shall not use backfilling for disposal of refuse or unsuitable soil.

Laying to Curves

Where flexible jointed pipes are to be laid to curves, the deflection at each joint shall not exceed 75% of the maximum allowable values as per the recommendations of the pipe manufacturer. For sharper curves made bevel pipes, bevel adapters and standard bends shall be provided.

Anchor/Thrust Blocks

The contractor shall provide anchor/thrust blocks at all bends, at dead ends and at all other places both below and above ground as directed by the Engineer. Anchor blocks shall be in cement concrete

as per dimensions given in the approved drawings. The grade of concrete as specified in the relevant sections of the specification shall be strictly followed. Shuttering shall be as required and to the satisfaction of the Engineer.

The thrust faces of all blocks shall be placed directly against the undisturbed faces of excavations and the shape and size of the blocks shall be as shown on the drawings or as otherwise determined by the Engineer having regard to the nature of the ground and the load or thrust to be encountered. The concrete shall be placed around the fitting in such a way that the coupling are not covered or fixed by it to allow for flexibility and to provide access to the collars for replacing when necessary.

Before casting concrete, bituminous felt shall be wrapped around the fitting at the interface between concrete and fitting. Where required, anchor clamps shall be cast into the anchor blocks. **Hydraulic testing**

1. DI pipes and Fittings:
2. All the Pipes, specials and fitting of DI shall be supplied and tested as per relevant IS codes and specifications. The Following code shall be used for
 - a. Factory Test Pressure: as per IS 8329
 - b. Site Test Pressure: as per IS 8329

Suitable section as directed by the Engineer in charge shall be taken for such testing from time to time during progress of the work and satisfactory test given for that section. All testing apparatus, gauges, connections, etc. and water required for testing shall be arranged by the contractor at his cost. The TMC does not undertake any responsibility to supply water for testing which the contractor has to arrange by paying the required charges directly. The TMC shall have the right to recover such charges from his bills if complaints are received that contractor has not paid the charges thereof. If there is delay in testing, the contractor shall

refill the trenches for the time being and reopen them at time of testing at his own cost failure of which shall entitle the TMC to do the refilling and reopening of trenches at the risk and cost to the contractor. If the trenches are filled due to any reason whatsoever before testing, the contractor shall have to open them for testing at no extra cost.

1.0] Satisfactory hydraulic test shall be recorded when the section under test shall withstand the pressure as specified by the Engineer in charge for about 15 minutes without operating the test pump. The test pressure being maintained at the specified figures during that 15 minutes interval.

1.2] The field test pressure to be imposed should be not less than the maximum of following.

- a) 1.5 times the maximum sustained operating pressure (with minimum design pressure as 6.0 kg/sqcm) in the pipeline.
- b) 1.5 times the maximum static pressure (with minimum design pressure as 6.0 kg/sqcm) in the pipeline in the pipe line
- c) Sum of maximum sustained operating pressure and maximum surge pressure.
- d) Sum of maximum pipe line static pressure and maximum surge pressure,

The testing conditions for the pipelines are summarized as follows:

- Pre test and saturation period with addition of make-up water
Pressure : Test pressure
Duration : 24 hrs for DI pipes with cement mortar lining
- Pressure test with addition of make-up water
Pressure : Test pressure
Duration : 3 hrs

The pipeline shall be filled slowly from the lowest point in such a manner as to allow expulsion of air through air release valves at highest points. The following filling rates are recommended:

Size (mm)	100	150	200	250	300	400	500	600
Filling rate (l/sec)	0.3	0.7	1.5	2.0	3.0	6.0	9.0	14.0

After filling, the pipeline shall be pressurised to the specified operating pressure and left for a period of time to achieve stable conditions. The pipeline shall then be pressurized upto the full test pressure and the section under test completely closed off. Care shall be taken to ensure that the pipeline is free of air. For this if required or if asked by the Engineer, water release test shall be carried out. The hydraulic test shall be maintained for a period of not less than 10 minutes to reveal any defect in the pipes, joints and anchorages.

If the test is not satisfactory, the fault shall be found and rectified. In case fault cannot be identified easily, the section under test shall be sub-divided and each part tested separately.

If it is required to test a section of a pipe line with a free end, it is necessary to provide temporary support against the considerable end thrust development by the application of the test pressure. The end support can be provided by inserting a wooden beam or similar strong material in a short trench excavated at right angle to the main trench and inserting suitable packing between the support and pipe end.

Leakage Test for DI/MS Pipeline

Test criteria for permissible losses in DI pipes shall be as under

$Q = 1$ litre per km per length per 10mm diameter of pipe per 30mtr test pressure per 24 hrs. All pressure testing at site should be carried out hydrostatically. The pipes shall be accepted to have passed the pressure test satisfactorily, if the quantity of water required to restore the test pressure does not exceed the amount 'Q', calculated by the above formula.

If it is required to test a section of a pipeline with a free end, it is necessary to provide temporary support against the considerable end thrust developed by the application of the test pressure. The end support can be provided by inserting a wooden beam or similar strong material in a short trench excavated at right angle to the main trench and inserting suitable packing between the support and the pipe end.

No section of the pipe work shall be accepted by the Engineer until all requirements of the test have been obtained.

On completion of a satisfactory test any temporary anchor blocks shall be broken out and stop ends removed. Backfilling of the pipeline shall be completed.

During testing if any joints are found leaking they shall be repaired and / or redone by the contractor at his cost till the test is found satisfactory. Similarly, any pipes collars, specials, show hair cracks, leaks etc. during testing the contractor shall replace them with sound pipes and specials etc. free of cost. The hydraulic test shall be given in presence of the Engineer in Charge.

Cleaning Out after Testing

On completion of a satisfactory test any temporary anchor blocks shall be broken out and stop ends removed. Backfilling of the pipeline shall be completed.

All pipes or joints which are proved to be in any way defective shall be replaced or remade and re-tested as often as may be necessary until a satisfactory test shall have been obtained. Any work which fails or is proved by test to be unsatisfactory in any way shall be redone by the contractor.

After the completed pipeline is tested, approved, backfilled and the Contractor has removed all temporary works and has reconnected any parts temporarily removed from the pipeline, the Contractor shall finally clean out the whole pipeline and flush it through with water.

Disinfection

After cleaning out, disinfection shall be performed in the following manner: after flushing the pipes the system shall be drained completely, all valves shall be closed carefully and the

system filled with a strong chlorine solution of about 50 ppm free chlorine. This solution shall remain in the system for a period as directed but not exceeding 24 hours uninterruptedly. Chlorine residual tests shall be done at various points by an orthotolidine reagent with a colour scale. The disinfection process shall be repeated until the chlorine residual is not less than 10 ppm at all sampling points. After disinfection the entire pipeline shall be rinsed with potable water till the chlorine residual is less than 4 ppm at various points of testing. Contractor will not paid separately for this activity.

After completion of disinfection and rinsing the results shall be reported by the Contractor in writing and signed by the Contractor and the Engineer.

The Contractor shall provide at his own expense such sampling points as the Engineer may direct if permanent points are not available or suitably located.

Water for Testing and Cleaning

The Contractor shall provide all water required for testing, cleaning and disinfection of the pipeline at his own cost and shall use only potable water. Contractor shall also bear the cost of chemical required for disinfection.

Disposal of water after testing, disinfection and cleaning shall be arranged by the Contractor with prior approval from the Engineer. The disposal shall be done in such a manner as will not cause any harm to any standing crop, cultivated land, damage to roads or structures, cause submergence and/or nuisance to any public or vehicular traffic.

DTS No. 10

Lowering, laying and jointing in position following BF valve, Sluice valves, Resilience seated SV including of all labour, jointing material, including nut bolts and giving satisfactory hydraulic testing etc. complete.

- (a) 100 mm dia Sluice Valve PN-1.0
- (b) 150 mm dia Sluice Valve PN-1.0
- (c) 200 mm dia Sluice Valve PN-1.0
- (d) 250 mm dia Sluice Valve PN-1.0
- (e) 300 mm dia Sluice Valve PN-1.0
- (f) 350 mm dia Sluice Valve PN-1.0
- (g) 400 mm dia Sluice Valve PN-1.0
- (h) 450 mm dia Sluice Valve PN-1.0
- (i) 500 mm dia Sluice Valve PN-1.0
- (j) 600 mm dia. - B/F Valve PN 1.0 class
- (k) 700 mm dia. - B/F Valve PN 1.0 class

Valves shall be lowered and fixed in proper position and right to the plump and flange joints with the sets of tail pieces shall be carried out perfectly water tight. Nut bolts, rubber inseration etc.required for jointing shall be provided by the Contractor.

Mode of the measurement and payment:-

The rate shall be for unit of one number.

DTS No. 10A

Lowering, laying and jointing in position following Air valves including of all labour, jointing material, including nut bolts and giving satisfactory hydraulic testing etc. complete.

- (a) 150 mm dia
- (b) 100 mm dia
- (c) 80 mm dia

Valves shall be lowered and fixed in proper position and right to the plump and flange joints with the sets of tail pieces shall be carried out perfectly water tight. Nut bolts, rubber insolation etc. required for jointing shall be provided by the Contractor.

Mode of the measurement and payment:-

The rate shall be for unit of one number.

DTS No. 11

Providing & laying Cement Concrete 1:3:6 (1 Cement, 3 Course sand, 6 graded stone aggregate 40 mm. Nominal size) with ramming, curing etc. complete including cost of form work

- (a) For Pipe Encasing
- (b) For foundation and plinth.
- (c) For Thrust Block

1. Item shall be carried out in general and shall be as per IS 456:1984 or revised from time to time shall be followed.

1.1 The materials like cement, sand, coarse aggregates shall be as per the general specification of the materials and as per relevant IS.

2. Concrete Mix :

In ordinary concrete, the proportion of cement to fine aggregate to coarse aggregates shall be 1:3:6 i.e. one part of cement and three parts of sand and six parts of coarse aggregates. The volume of cement is considered to be 1.20 cft.

The crushing strength of 6 "square cube shall be as per Table No.1, I.S.456 i.e. for 7 days 105.5 Kg/cm² (1500 lb/Sq.in) and for 28 days 158.2 Kg/Cm² (2250 lbs/Sq.in).

3. Water Contents :

The water contents for an ordinary concrete mix should generally be equal to 27 to 35 litres per bag. Allowance for surface water present in aggregates shall be made when computing the water content.

Form work :

4. General :

The form work shall conform to shape, lines and dimensions as shown on plan and be so constructed as to remain sufficiently rigid during the placing and compacting of concrete and shall be sufficiently tight to prevent loss of liquid from the concrete.

For form work constructions of plywood or steel plates will be used except for small junction and crossing.

Clearing of forms :

All rubbish, chipping shaving and saw dust shall be removed from the interior of forms before the concrete is placed and form work in context with concrete shall be cleaned thoroughly wetted or treated with the approved composition.

Stripping time :

The frame shall be structured after expiry of following period.

- (a) Vertical sides of beams and columns, columns footing -48 Hours
- (b) Bottom of slabs upto 4.6 M.Span. - 7 Days
- (c) Bottom of slabs above 4.6 M.to 6.0 M.Span. -14 Days
- (d) Removal of props under beam upto 6 M. Span. -14 Days
- (e) Removal of props under beam above 6 M.Span. -21 Days

Procedure when removing the form work :

All form work shall be removed without such sock on vibration as would damage the reinforced concrete. The concrete should be sufficiently hardened before the so fits and props are removed proper precautions shall be taken in cold whether.

5. Centering :

The centering to be provided shall got approved from the Engineer-in-charge. It shall be sufficiently strong to ensure safety of the form work and concrete work before, during and after pouring concrete, watch shall be kept to see the behaviour of centring and form work satisfactory during the concreting. Erection shall also be such that it would allow the removal of forms in proper without damaging either concrete for forms to be removed.

The props of centering should be provided in on firm foundations or base of sufficient strength to carry the load without settlement. The props shall be strong durable and not less than 3" dia. If wooden pulling are used. In case of centering of slabs, the props shall be of 3" dia c/c for beams and shall be placed not more than 2 to 2'-3" c/c.

The cross horizontal struts shall be provided at every 8" to 10" height of props. The centering and form work will be inspected and approved by the Engineer- in-charge before concreting. But this will not relieve the contractor or responsibility for strength and safety of the form works and centering. If there is failure of form work or centering, contractor shall be responsible for any damage to work, or injury to life and property.

6. Scaffolding :

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

7. **Workmanship :**
The quantity of cement shall be assumed to be per bag having volume 1.2 cft. The quantity of fine and coarse aggregates shall be measured in volumetric basis i.e. steel phromes of 0.30 x 0.30 x 0.38 high.
8. **Mixing :**
Concrete shall be mixed in a mechanical mixer. Mixing shall be continued until there is a uniform distribution of the materials and mass is uniform in colour and consistency.

The case of failure of the mechnary, hand mixing shall be permitted but in such cases, 10% extra cement shall have to be used without any extra cost to the Corporation.
9. **Transporting :**
Concrete shall be handled from the place of mixing to the place of final deposit at regidle, as practicable by methods which will present the segregation or base any in gradients. During not or cold weather, concrete shall be transported in deep containers.
10. **Placing and compacting :**
Concrete shall be carried out continuously upto construction joints, the position and arrangements shall be determined by the department. When the work has to be resumed on the surface which are hardened such surface shall be roughned on before the new concrete is laid.
11. **Compacting :**
Concrete shall be thoroughly compacted during the operation of placing and thoroughly worked around the reinforcement and into corner of form work by means of mechanical vibrator and wooden screeds, so that whole mass becomes compact and homogenous and there is no air bubble or honey combing. At the time of concreting, proper care shall be taken, so that honey combing formation is minimum.

After the form work is removed, if any such honey combing etc. work is found, it shall be immediately finished with the cement mortar 1:1, so that the crevices are properly filled and no reinforcement is exposed. If however, the honey combing is found of any severe nature and is found through out the surface of concreting, exposing the reinforcement. The concrete work shall be rejected and redone without any extra cost.
12. The concrete shall be covered with a layer of stacking canvas hession or similar absorent materials and kept constant wet for 20 days from the date of placing of concrete for R.C.C. slab cement or lime mortar cykes 7 c.m. to 10 c.m.height shall be filled with water. If proper curing arrangement is not done by contractor the same shall be done by department at risk and cost of the contractor and the contractor shall be fully responsibility for the same.
13. **Testing :**
The work test concrete shall be carried out as per Appendix 'E' of I.S.456. The size of cubes shall be 15 cm x 15 cm x 15 cm. The mould for test specimen shall be made of steel plated. They shall not vary from the std. dimension by more than one percent.

The moulds shall be so constructed that there will not be leakage of water from the test specimen during moulding.

More samples of concrete consisting six cubes sizes 150 mm x 150 mm x 150 mm shall be taken for every 45 cms. or part there of concrete work. The contractor may taken his own arrangement for taking samples and testing of the samples in Government laboratories at his own cost. A register shall be maintained at site of the work.

Results of the test shall be as per requirements as per I.S. If the results are found slightly below the prescribed limit and within permissible range. The work shall be accepted by the Engineer-in-charge as a special case if deemed proper otherwise the work shall be rejected.

14. **Finishing :**

After removing the centering all exposed R.C.C.members shall be tightly chiselled to have proper key with mortar plastering work and shall be finished with cm 1:3 cement plastered of required thickness of 1/2" to bring the work in line and level including cement finishing etc.

Item includes all materials, labours, tools plants and machinery required for the satisfactory completion of item in cluding forms, centering, scaffolding and carrying out necessary test as per I.S.516:1959 including finishing etc. complete.

Rates :

The item shall be measured and paid on cubic meter basis.

DTS No. 12

Providing & laying ordinary cement concrete in C.C.1:1.5:3 (1 Cement,1.5Coarse sand & 3 coarse agreegate 20 mm Nominal Size)

- (a) For RCC Slab in C.C.1:1.5:3 for valve chamber**
- (b) For RCC Encasing**
- (c) For Thrust Block**

1. **Materials :-**

Water shall conform to M-1, Cement shall conform to M-3. Sand shall conform to M-5. Grit shall conform to M-6. Graded stone aggregate 20 mm nominal size shall conform to M-9.

2. **General :-**

- 2.1 The concrete mix is not required to designed by preliminary tests. The proportion of the concrete mix shall be 1:1 1/2:3

[1 cement:1 1/2 coarse sand:3 graded stone aggregate 20 mm nominal size] by volume
Concrete work shall have exposed concrete surface or as specified the item.

- 2.2 The designation ordinary M-100, M-150, M-200, M-250 specified as per I.S. corresponding approximately to 1:3:6 1:2:4, 1:1:1, 1:1 1/2: 3 and 1:1:2 nominal mix of ordinary concrete by volume respectively with conforming to IS:456.

- 2.3 The ingredients required for ordinary work, containing one bag of cement of 50 kg. by weight [0.0342 cu.m.] for different proportion of mix shall be as under.

Grade of concrete	Total quantity of dry aggregate by volume per 50 kg. of cement to be taken as the sum of individual volume of fine and coarse aggregate maximum	Proportion of line aggregate to coarse aggregate	Quantity of water per 50 kg. of cement maximum
M-100 [1:3:6]	300 Litres	Generally 1:2 for fine aggregate to	34 litres
M-150 [1:2:4]	220 "	Coarse aggregate by volume but subject	32 "
M-200 [1:1.5:3]	160 "	to and upper limit of 1:1 1/2 & lower	30 "
M-250 [1:1:2]	100 "	limit 1:3	27 "

- 2.4 The water cement ratios shall not be more than those specified in the table. The cement content of the mix specified in the table shall be increased if the quantity of water in a mix has to be increased to overcome the difficulties of placement and compaction so that the water cement ratio specified in the table is not exceeded.
- 2.5 Workability of the concrete shall be controlled by maintaining a water cement ratio that is found to give a concrete mix which is just sufficiently wet to be placed and compacted without difficulty with the means available.
- 2.6 The maximum size of coarse aggregate shall be as large as possible within the limits specified but in no case greater than one fourth of the minimum thickness of the member, provided that the concrete can be placed without difficulty so as to surround all reinforcement thoroughly and to fill the corners of the form.
- 2.7 For reinforced concrete work, coarse aggregates having a nominal size of 20 mm are generally considered satisfactory.
- 2.8 For heavily reinforced concrete members as in the case of the ribs of main beams the nominal maximum size of coarse aggregate should usually be restricted to 5 mm, less than the minimum clear distance between the main bars, or 5 mm, less than the minimum cover to the reinforcement whichever is smaller.
- 2.9 Where the reinforcement is widely spaced as in solid slabs, limitations of size of the aggregate may not be so important and the nominal maximum size may sometimes be as great as or greater than the minimum cover.
- 2.10 Admixture may be used in concrete only with approval of Engineer-in-charge based upon the evidence that with the passage of time; neither the compressive strength of concrete is reduced nor are other requisite qualities of concrete and steel impaired by the use of such admixtures.

3. WORKMANSHIP :

3.1 General :- The bars shall be kept in position by the following method:

In case of beam and slab construction, sufficient number of precast cover blocks in cement mortar 1:2 [1 cement 2 coarse sand] about 4 x 4 cms. section of thickness equal to the specified cover shall be placed between the bars and shuttering as to secure and maintain the requisite cover of concrete over the reinforcement.

In case of cantilevered or doubly reinforced beams or slabs, the main reinforcing bars shall be held in position by introducing chair spacers or supports bars at 1.0 to 1.2 metres centres.

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

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

3.2 Proportioning :-

Proportioning shall be done by volume, except cement which shall be measured in terms of bags of 50 kg. weight. The volume of one such bag being taken as 0.0342 cu. metre. Boxes of suitable sizes shall be used for measuring sand and aggregate. The size of the boxes [internal] shall be 35x25 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 sand, allowances for bulking shall be made.

3.3 Mixing :-

3.3.1 For all work, concrete shall be mixed in a mechanical mixer which along with other accessories shall be kept in first class working condition and so maintained throughout the construction. Measured quantity of aggregate, sand and cement required for each batch shall be poured into the drum of the mechanical mixer while it is continuously running. After about half a minute of dry mixing measured quantity of water required for each batch of concrete mix shall be added gradually and mixing continued for another one and 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 shown complete coating of mortar containing its proportionate amount of cement. In no case shall the mixing be done for less than two minutes after all ingredients have been put into the mixer.

- 3.3.2 When hand mixing is permitted by the Engineer-in-charge for small jobs or for certain other reasons, it shall be done on the smooth watertight platform large enough to allow efficient turning over the ingredients of concrete before and after adding water. Mixing platform shall be so arranged that no foreign material gets mixed with concrete nor the mixing water flow out. Cement in required number of bags shall be placed in a uniform layer on top of the measured quantity of fine and coarse aggregate, which shall also be spread in a layer of uniform thickness on the mixing platform. Dry coarse and fine aggregate and cement shall then be mixed thoroughly by turning over to get a mixture of uniform colour. Specified quantity of water shall then be added gradually through a rose can and the mass turned over till a mix of required consistency is obtained. In hand mixing, quantity of cement shall be increased by 10 percent above that specified.
- 3.3.3 Mixer which have been out of use for more than 30 minutes shall be thoroughly cleaned before putting in a new batch, unless otherwise agreed to by the Engineer-in-charge. The first batch of concrete from the mixture shall contain only two thirds of normal quantity of coarse aggregate. Mixing plant shall be thoroughly cleaned before changing from one type of cement concrete to another.
- 3.4 Consistency :
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 test in accordance with I.S. 1199 : 1959. The slump of 10 mm to 25 mm shall be adopted when vibrators are used and 80 mm when vibrators are not used.
- 3.5 Inspection :
- 3.5.1 Contractor shall give the Engineer-in-charge due notice before placing any concrete in the forms to permit to inspect and accept the false work and forms as to their strength, alignment and general fitness but such inspection shall not relieve the contractor of his responsibility for the safety of men, machinery, materials and for results obtained. Immediately before concreting, all forms shall be thoroughly cleaned.
- 3.5.2 Centring design and its erection shall be got approved from the Engineer-in-charge. One carpenter with helper shall invariably 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 platform 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.
- 3.6 Transporting and laying :-
- 3.6.1 The method of transporting and placing concrete shall as approved. Concrete shall be so transported and placed that no contamination segregation or loss of its constituent material takes place.
- 3.6.2 All form work shall be cleaned and made free from standing water dust snow or ice immediately before placing of concrete. No concrete shall be placed in any part of structure until the approval of Engineer-in-charge.

- 3.6.3 Concreting shall proceed continuously over the area between construction joints. Fresh concrete shall not be placed against concrete which has been in position for more than 30 minutes unless a proper construction joint is formed. Concrete shall be compacted in its final position within 30 minutes of its discharge from the mixer. Except where otherwise agreed to by the Engineer-in-charge concrete shall be deposited in horizontal layers to a compacted depth of not more than 0.45 metre when internal vibrators are used and not exceeding 0.30 metre in all other cases.
- 3.6.4 Unless otherwise agreed to by the Engineer-in-charge, concrete shall not be dropped into place from a height exceeding 2 meters.
- 3.6.5 When trunking or chutes are used they shall be kept close and used in such a way as to avoid segregation. When concreting has to be resumed on a surface which has hardened, it shall be roughened, swept clean, thoroughly wetted, and covered with a 13 mm thick layer of mortar composed of cement and sand in the same ratio as in the concrete mix itself, this 13 mm layers of mortar shall be freshly mixed and placed immediately before placing of new concrete. Where concrete has not fully hardened, all laitance shall be removed by scrubbing the wet surface with wire or bristle brushes, care being taken to avoid dislodgement of any particles, of coarse aggregate. The surface shall then be thoroughly wetted, all free water removed, and then coated with neat cement grout. The first layers of concrete to be placed on this surface shall not exceed 150 mm in thickness and shall be well rammed against old work, particular attention being given to corners and close spot.
- 3.6.6 All concrete shall be compacted to produce a dense homogeneous mass with the assistance of vibrators, unless otherwise permitted by the Engineer - in - charge for exceptional cases such as concreting under water where vibrators cannot be used. Sufficient vibrators in serviceable condition shall be kept at site so that spare equipment is always available in the event of breakdowns.
- 3.6.7 Concrete shall be judged to be compacted when the mortar fills the spaces between the coarse aggregate and begins to cream upto form an even surface. Compaction shall be completed before the initial setting starts i.e. within 30minutes 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.
- 3.7 Curing :-
Immediately after compaction, concrete, weather including rain, running water, shocks, vibration, traffic, rapid temperature changes frost and drying out process it shall be covered with wet sacking, hessian or other similar absorbant 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. Masonary work over foundation concrete may be started after 48 hours of its laying but curing of concrete shall be continued for a minimum period of 14 days.
- 3.8 Sampling and Testing of concrete :-
- 3.8.1 Samples from fresh concrete shall be taken as per IS 1199:1959 and cubes shall be made, cured and tested at 7 days and 28 days as per requirements in accordance with IS 516:1959. A random sampling procedure shall be adopted to ensure that

each concrete batch shall have a reasonable chance of being tested i.e. the sampling should be spread over the entire period of concreting and cover all mixing units. The minimum frequency of sampling of concrete of each grade shall be in accordance with following.

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

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

3.8.3 The average strength of the group of cubes cast for each day shall not be less than the specified cube strength of 150 kg/cm² at 28 days. 20% of the cubes cast for each day may have value less than the specified strength provided the lowest value is not less than 85% of the specified strength. If the concrete made in accordance with the proportion given for a particular grade does not yield the specified strength such concrete shall be classified as belonging to the appropriate lower grade. Concrete made in accordance with the proportions given for a particular grade shall not, however, be placed in a higher grade on the ground that the test strength are higher than the minimum specified.

3.9 Stripping :

3.9.1 The Engineer- in- charge shall be informed in advance by the contractor of his intention to struck the form work. While fixing the time for removal of form work, due consideration shall be given to local conditions, character of the structure, the weather & 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 expiry of period specified in the Item No.4 for respective item of form work.

3.9.2 All form work shall be removed without causing any shock or vibration as would damage the concrete. Before the soffit are removed, the concrete surface shall be exposed, where necessary in order to ascertain that the concrete has sufficiently hardened. Centring shall be gradually and uniformly lowered in such a manner as to permit the concrete to take stresses due to its own weight uniformly and gradually. Where internal metal ties are permitted they or their removeable 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 shuttering, the Executive Engineer shall inspect the work and satisfy by random checks that concrete produced is of good quality.

3.9.3 Immediately after the removal of forms all exposed bolts etc. Passing through the cement member and used for shuttering or any other purpose shall be cut inside the cement concrete member to a depth of at least 25 mm. below the surface of the concrete and, the resulting holder be filled by cement mortar. All fins caused by from joints, all cavities produced by the removal of form ties and all other holes and depression, honeycomb spots, broken edges or corners and other defects, shall be thoroughly cleaned, saturated with water and carefully pointed and rendered true with mortar of cement and fine aggregate mixed in the proportions used in the grade of concrete that is being finished and so as dry consistency as is possible to use. Considerable pressure shall be applied in filling and pointing to ensure thorough filling in all avoids. Surfaces which are pointed shall be kept moist for a period of 24 hours.

3.9.4 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 portions of the structure affected.

4.0 Mode of measurement and payment :

4.1 The consolidated cubical contents of concrete work as specified in item shall be measured. The concrete laid in excess of section shown on drawings or as directed shall not be measured. No deductions shall be made for.

[a] Ends of dissimilar materials such as joints, beams, posts, girders, rafters, purline, trusses, corbels and steps etc. upto 500 sq.cm. in section.

[b] Opening upto 0.1 sq.m.

[c] The volume occupied by reinforcement shall not be deducted from R.C.C. work.

4.2 The rate includes cost of all materials labour, tools and plant required for mixing, placing in position vibrating and compacting, finishing as directed, curing and all other incidental expenses for producing concrete of specified strength. The rate excludes the cost of form work.

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

DTS No. 13

Providing & fixing T.M.T Fe-500 Bar reinforcement for RCC work including, bending, binding and placing in position etc. complete.

(a) **For Valve Chamber**

(b) **For RCC Encasing**

(c) **For Thrust Block**

1.0 MATERIALS

1.1 Mild steel bars shall conform to M-14 TMT bar shall conform to M-15, Mild steel binding wires shall conform to M-17.

2.0 WORKMANSHIP

- 2.1 The work shall consist of furnishing and placing reinforcement to the shape and dimensions shown as on the drawings or as directed.
- 2.2 Steel shall be clean and free from rust and loose mill scale at the time of fixing in position and subsequent concreting.
- 2.3 Reinforcing steel shall conform accurately to the dimensions given in the bar bending schedules shown on relevant drawings.
Bars shall be bent cold to specified shape and dimensions or as directed, using a proper bar bender, operated by hand or power to attain proper radius of bends. Bars shall not be bent or straightened in a manner that will injure the material.
Bars bent during transportation or handling shall be straightened before being used on the work. They shall not be heated to facilitate bending. Unless otherwise specified for mild steel a "U" type hook at the end of each bar shall invariably be provided to main reinforcement. The radius of the bend shall not be less than twice the diameter of the round bar and the length of the straight part of the bar beyond the end of the curve shall be at least four times the diameter of the bar. In case of bars which are not round and in case of deformed bars, the diameter shall be taken as the diameter of the circle having an equivalent effective area.
The hooks shall be suitably encased to prevent any splitting of the concrete. The cold twisted steel bars shall be used without hooks at the ends. Deformed bars without hooks shall, however, comply with relevant anchorage requirements.
- 2.4 All the reinforcement bars shall be accurately placed in exactly the same position as shown on the drawings, and shall be securely held in position during placing of concrete by annealed binding wire not less than 1 mm. in size, and by using stay blocks or metal chair spacers, metal hangers, supporting wires or other approved devices at sufficiently close intervals. Bars shall not be allowed to sag between supports nor displaced during concreting or any other operations of the work. All devices used for positioning shall be of non-corrodible material. Wooden and metal supports shall not extend to the surface of the concrete, except where shown on the drawings. Placing bars on layers of freshly laid concrete as the work progresses for adjusting bar spacing shall not be allowed. Pieces of broken stone or brick wooden blocks shall not be used. Layers of bars shall be separated by spacer bars, precast mortar blocks or other approved devices.
Reinforcement after being placed in position shall be maintained in a clean condition until completely embedded in concrete. Special care shall be exercised to prevent any displacement of reinforcement in concrete already placed. To prevent reinforcement from corrosion, concrete cover shall be provided as indicated on drawings. All the bars are to be spliced and which are likely to be exceeding 10 days shall be protected by a thick coat of neat cement grout.
- 2.5 Bars crossing each other where required shall be secured by binding wires (annealed) of size not less than 1 mm. in such a manner that they do not slip over each other at the time of fixing and concreting.

- 2.6 As far as possible, bars of full length shall be used, in case this is not possible, overlapping of bars shall be done as directed. When practicable, overlapping bars shall not touch each other, but be kept apart by 25 mm. or 1.25 times the maximum size of the coarse aggregate whichever is greater between 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 span where neither shear nor bending moment is maximum.
- 2.7 Wherever indicated on the drawings or desired by the Engineer-in-charge bars shall be joined 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 butt-welded so as to transmit their full stresses. Welded joints shall preferably be located at points when steel will not be subjected to more than 75% of the maximum permissible stresses and welds so staggered that at any one section not more than 20% of the rods are welded. Only electric welding using a process which excludes air from molten and conforms to any or all other special provisions for the work shall be accepted.

Suitable means shall be provided for holding bars securely in position during welding. It shall be ensured that no voids are left in welding and when welding is done in two or three stages, previous surface shall be cleaned properly. Ends of the bars shall be cleaned of all loose scale, rust, grease, 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 MEASUREMENT & PAYMENT

- 3.1 For the purpose of calculating consumption, wastage shall not be permitted beyond 7.5%. Excess consumption over 7.5% will be charged at penal rate as per special condition of contract.
- 3.2 Reinforcement shall be measured in length including overlaps, separately for different diameters as actually used in the work. Where welding or coupling is resorted to, in place of 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 tonnes on the same basis of as per M-14 even though steel is supplied to the contractor by the department on actual weight. Length shall include hooks at the ends. Wastage and annealed steel wire for binding shall not be measured and the cost of these items shall be deemed to be included in the rate for reinforcement.
- 3.3 The rate for reinforcement includes cost of steel binding wires, its transporting from departmental store to work site cutting, bending, placing 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.

3.4 The rate shall be for unit of one MT.

Note :-Read M.S.Binding wire instead of G.I. binding wire when and where specified

DTS No. 14

**Providing & constructing brick work using Fly ash bricks having crushing strength not less than 35 kg/sqcm in foundation and plinth in CM (1:6) (1 cement : 6 fine sand)
Conventional**

1.0 MATERIALS

Water shall conform to M-1, Cement shall conform to M-3, Sand shall conform to M-5, Flyash Flyash building bricks shall conform to M-12, Cement mortar shall conform to M-8.

2.0 WORKMANSHIP

2.1 Proportion : The proportion of cement mortar shall be 1:6 (1 cement, 6 fine sand) by volume.

2.2 Wetting of Flyash building bricks : The Flyash building bricks required for masonry work shall be thoroughly wetted with clean water for about two hours before use or as directed. The cessation of bubbles, when the Flyash building bricks are wetted with water, is an indication of thorough wetting of Flyash building bricks.

2.3 Laying : Flyash building bricks shall be laid in English bond unless directed otherwise. Half or cut Flyash building bricks shall not be used except when necessary to complete the bond. Closures in such case shall be cut to required size and used near the ends of the walls.

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

The walls shall be taken up truly in plumb. All courses shall be 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 Flyash building bricks course shall be kept in uniform.

The Flyash building bricks shall be laid with frogs up wards. A set of tools comprising of wooden straight edges, manson's spirit level, square half metre rub, and pins, string and plumb shall be kept on the site of work for frequent checking during the progress of work.

Both the faces of walls of thickness greater than 23 cms. shall be kept in proper place. All the connected Flyash building bricks work shall be kept not more than one metre over the rest of the work. Where this is not possible, the work shall

beraked back according to bond (and not left toothed) at an angle not steeper than 45 degrees. All fixtures, pipes, outlet 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 : Flyash building bricks shall be so laid that all joints are quite flush with mortar. Thickness of joints shall not exceed 12 mm. The face joints shall be raked out as directed by raking tool daily during the progress of work, when the mortar is still green so as to provide key for plaster or pointing to be done.

The face of Flyash building bricks shall be cleaned the very day on which the Flyash Building brick work is laid and all mortar dropping removed.

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

- 2.6 Preparation of Foundation Bed : If the foundation is to be laid, directly on the excavated bed, the bed shall be levelled, cleared of all loose materials, cleaned and wetted before starting masonry.

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

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

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

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

3.0 MODE OF MEASUREMENTS & PAYMENT :

3.1 The measurements of this item shall be taken in cubic meter and for the Flyash building bricks masonry fully completed for limiting dimensions not exceeding those shown on the plans or as directed shall be final.

3.2 No deductions shall be made from quantity of Flyash building bricks work. No extra payment will be made for embedding in masonry holes in respect of the following items -

- i] Ends of joints, beams, posts, girders, rafters, purlins, trusses, corbel, steps etc. where cross sectional area does not exceed 500 Sq.Cm.
- ii] Opening not exceeding 1000 Sq.Cm.
- iii] Wall plate, sand bed plates, bearing of slab, chajjas, and like whose thickness does not exceed 10 Cms. and the bearing does not extend the full thickness of wall.
- iv] Drainage holes and recesses for cement concrete blocks to embed hold fasts for doors, windows etc.
- v] Iron fixtures; pipes upto 300 mm. dia. hold fasts of doors and windows built into masonry and pipes etc. for concealed wiring.
- vi] Forming charges of section not exceeding 350 Sq.Cm. in masonry.
- vii] Apertures for fire places, shall not be deducted nor shall extra labour required to make splaying of jambs, throating and making arches over the aperture be paid for separately.

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

DTS No. 15

Providing and applying 10 mm thick cement plaster in single coat on brick / concrete walls similar surface for plastering and finished even and smooth with a floating coat of neat cement slurry mixed with admixture of lime or neeru required proportion etc. complete in C.M. 1:3 (1 cement : 3 sand) as directed by the Engineer-in-charge.

1.0 MATERIALS

Water shall conform to M-1. The cement mortar of proportion 1:3 shall conform to M-8.

2.0 WORKMANSHIP

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

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

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

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

2.3 APPLICATION OF PLASTER

The plaster about 15 x 15 Cms. shall be first applied horizontally and vertically at not more than 2 metres intervals over the entire surface to serve as gauge. The surface gauges shall be truly in place 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 of wooden flat according as a smooth or a sandy granular texture is required. Excessive trowelling 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 Rounding or chamfering, corners, junctions etc. shall be carried out with proper templates to the size required.

Cement plaster shall be used within half an hour after addition of water. Any mortar or plaster which is partially set shall be rejected and removed forthwith from the site. 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 scrapped 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 cms. 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 arrises. Horizontal points in plaster work shall not also occur on parapet tops and copings as those invariably lead to leakage. No portion of the surface shall be left out initially to be packed up later on.

Each coat shall be kept damp continuously till the next coat is applied 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 to dry weather shall be prevented by hanging mattings or gunny bags on the outside of the plaster and keeping them wet.

3. 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 metres unless otherwise specified. Length, breadth or height shall be measured correct to a centimetre.

- 3.3 Thickness of the plaster shall be exclusive of the thickness of the key i.e. grooves or open joints in brick work, stone work etc. or space between laths. Thickness of plaster shall be average thickness with minimum 10 mm. at any point on this surface.
- 3.4 This item includes plastering at any level.
- 3.5 For jambs, soffits, sills etc. for openings not exceeding 0.5 Sq.Mts. each in area for ends of joints, beams, posts, girders, step etc. not exceeding 0.5 Sq.Mts. each in area for and for openings exceeding 0.5 Sq.Mts. and not exceeding 3 Sq.Mts. in each area deductions and additions shall be made in the following manner ---
- a] No deductions shall be made for ends of joints, beams, posts etc. and openings not exceeding 0.5 Sq.Mts. each and no addition shall be made for reveals, jambs, soffits, sills etc. of these openings for finish to plaster around ends of joints, beams, posts etc.
 - b] Deduction for openings exceeding 0.5 Sq.Mts. but not exceeding 3 Sq.Mts. each shall be made as follows and no additions shall be made for reveals, jambs, soffits sills etc. of these openings --
 - i] When both faces of all wall are plastered with same plaster, deduction shall be made for one face only.
 - ii] When two faces of wall are plastered with different types of plaster 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 doors, windows etc. on which width of reveals is less than that on the other side but no deduction shall be made on the other side. Where width of reveals on both faces of all are equal, deductions of 50% of area of opening on each face shall be made from areas of plaster and/or pointing as the case may be.
- 3.6 The rate shall be for a unit of one Sq.Mts.

DTS No. 16

Providing & fixing M.S. manhole frame and cover of 0.6 x 0.45 mt.size and approx.50 kg weight with prime coat of red oxide and two coats of oil paint having plate thickness of 12 mm etc. complete as directed by Engineer in charge.

The rate shall be for unit of one Number.

DTS No. 17

Providing & fixing C.I.Steps of Size 500 mm x 150 mm x 22.5 mm.painted with a coat of primer and two coats of oil paint etc. complete as directed by Engineer in charge.

- 1 During the construction of masonry wall of the manhole the cement mortar of required proportion shall be used for embedding the Poly propylene steps in the wall masonry. The spacing of steps in the masonry shall be 300 mm centre to centre in the staggered position in the vertical direction with two staggered raws at 385 mm centre to centre in the horizontal direction the top of the manhole shall not be more than 300 mm above the benching and the centre line of two staggered raws shall be the centre line of the shorter side of manhole frame in the roof of chamber.

The detailed specifications for the "Poly propylene steps as below:

The Polypropylene conforming to an ASTM D-4101, injection molded around a 12 mm dia. IS 1786 grade Fe-415 steel reinforcing bar and should meet the load required 225 Kg. as per IS-5455. The measurement should be as per attached drawing. The tolerance

in the length and width is +/- 5 mm and +/- 1 mm in thickness. The weight of the steps should not be less than 0.900 Kg.

- 2 Unchequered portion of the step shall be inserted with the risk cement mortar during the couse of masonry work so constructed around the steps as to keep the step on its right position. The non-slip grap chequered portion of the steps shall be well kept outside the masonry.
- 3 During fixing of the steps, the shall not be damaged and shall not vibrate or shall not shake during ascents and decents otherwise they shall have to be refixed correctly as per the drawings or as mentioned above.

Providing and fixing C.I.Steps...

C.I. steps of 500 x 150 x 22.5 mm size shall be of best quality.

Painting material for anti-corrosive shall be of best quality.

C.I.Steps shall be fixed as and where directed. The steps shall be ambwedded firming in masonry wall and fixing in horizontal space between two steps shall will be as directed by the Engineer-in-charge.

The rate includes cost of all labours and materials required for completion of this item.

Mode of measurement:-

The rate shall be for a unit of one number.