



JHARKHAND URBAN INFRASTRUCTURE DEVELOPMENT COMPANY LIMITED

(A Government of Jharkhand Undertaking)

3rd Floor, Pragati Sadan, Kutchery Chowk, Ranchi-834001

Ph no.- 0651-2225878, E-Mail Id- juidcolimited@gmail.com

CIN: U45200JH2013SGC001752,



Reference No.- JUIDCO/NIT/CHIRKUNDA SEPTAGE/TENDER/1810/2019/213

Date:08/02/2019

Tender Notice

IMPORTANT INFORMATION FOR BIDDING

1	Name of Work	Construction & Commissioning of Faecal Sludge Treatment Plant of 12 m ³ /day capacity at Chirkunda town (Jharkhand) followed by Operation & Maintenance for 6 years including DLP of 3 months.
2.	Mode of Bid Submission	e-tendering (http://jharkhandtenders.gov.in)
3	Estimated Cost (INR)	Estimated Cost: ₹3,15,29,040/- including OPEX for 6 years (Estimated O&M cost of Rs. 1,14,14,784/-)
4	Bid Security (INR)	₹ 3,16,000/- (Rupees Three Lakh Sixteen Thousand) only
5	Cost of Bid Document (INR)	₹ 10,000/- (Rupees Ten Thousand) only; Non-refundable
6	Time of Completion	10 months construction including 1 month trial run followed by 6 years of O & M including initial 3 months of DLP.
7	Date & time of e-publication of tender	09.02.2019, 17:00 Hrs
8	Last date of submission of Pre-bid queries	16.02.2019, 17:00 Hrs
9	Pre bid meeting date, Time & Venue	18.02.2019, 14:00 Hrs at Conference Hall, 3 rd Floor Pragati Sadan, Near Kutchery Chowk, JUIDCo Ltd Ranchi -834001.
10	Bid submission end date	02.03.2019, 17:00 Hrs
11	Last day for the submission of Bid Security, cost of bid document	05.03.2019, 17:00 Hrs
12	Bid opening date (online)	05.03.2019, 17:30 Hrs

Complete bid document is available on website <http://Jharkhandtenders.gov.in> & <http://juidcojharkhand.gov.in>
Other details can be seen in the bidding documents.

*Bid security 1% of Bid amount.

09/02/2019

1. Cost of bidding document for a non-refundable fee as indicated shall be in the form of Demand Draft of any Scheduled Indian Bank, payable at Ranchi in favour of Managing Director, Jharkhand Urban Infrastructure Development Company Ltd (JUIDCO).

2. Bids must be accompanied by Security amount specified as mentioned in table, payable at Ranchi and drawn in favour of Managing Director, Jharkhand Urban Infrastructure Development Company Ltd, Ranchi Bid security will have to be in anyone of the forms as specified in the bidding document and shall have to be valid for 45 days beyond the validity of the bid.

3. Cost of bidding document and Bid Security shall be deposited in the office of the Managing Director, JUIDCO, e-Procurement Cell, Jharkhand Urban Infrastructure Development Company Ltd (JUIDCO) on all working days between **09.02.2019** to **05.03.2019** up to **17.00 Hrs** either by registered post /Speed post or by hand. Only those applications will be entertained where cost of bidding document and bid security is received before **17.00 Hrs.** on **05.03.2019**. JUIDCO will not be held responsible for the postal delay, if any, in the delivery of the document or non-receipt of the same.

4. Tenderer(s) shall upload Scanned copy in PDF format/Digitally Signed copy of his/her Valid DD, Bid Security, Credit Facility, TIN, PAN, Five Years Audited Turnover, Character Certificate, Work Experience, Partnership Deed or Article of Association / Memorandum , Undertakings, Affidavits, E.P.F.,etc.

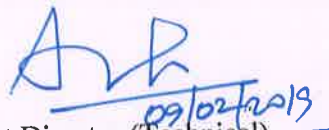
5. Bids shall be submitted online on the website <http://jharkhandtenders.gov.in>.

6. Uploaded documents of successful bidder will be verified with the original before signing the agreement. The successful bidder has to provide the originals to the concerned authority on receipt of such a letter, which will be sent though registered post or speed post or delivered by hand.

7. Bidders in order to participate in the bidding process have to get 'Digital Signature Certificate (DSC)' as per Information Technology Act-2000 to participate in online bidding. This certificate will be required for digitally signing the bid. Bidders can get the above mentioned digital Signature certificate from any approved vendors (CCA). Bidders, who already possess valid Digital Certificates, need not procure new Digital Certificate.

8. Bidders have to submit their bids online in electronic format with Digital Signature. Bids without Digital Signature will not be accepted. No bid will be accepted in Physical Form.

9. A pre-bid meeting shall be held as scheduled above in table in the office of Jharkhand Urban Infrastructure Development Company Ltd (JUIDCO) Conference hall/ Project Director (Technical) to clarify the issues and to answer questions on any matter that may be raised at that stage as stated in Clause 9.2 of the 'Instructions to Bidders' of the bidding document. Complete bid document is available on website <http://Jharkhandtenders.gov.in> & <http://juidco.jharkhand.gov.in>.


Project Director (Technical)

JUIDCO Ltd, Ranchi.

PRICE SCHEDULE						
Tender Inviting Authority: Jharkhand Urban Infrastructure Development Company Limited, Ranchi.						
Name of the work: Construction, Commissioning of Fecal Sludge Treatment Plant at Chirkunda town and Operation and Maintenance for 6 years.						
Tender Reference No: JUIDCO/NIT/Chirkunda Septage/Tender/1810/2019/213 dated 09.02.2019.						
Bidder's Name:						
(This BOQ template must not be modified/replaced by the bidder and same should be uploaded after filling the relevant columns, else the bidder is liable to be rejected for this tender. Bidders are allowed to enter Bidder's name and values only.)						
NUMBER#	TEXT#	NUMBER#	TEXT#	NUMBER#	NUMBER#	TEXT#
SI No	Item Description	Quantity	Unit	Rate(with GST/Taxes)	Amount (With taxes in figures to be entered by the bidder)	Amounts (With taxes in words to be entered by the bidder)
	Earthwork- Excavation					
1	Earth work in excavation in open area, STP, WTP, Pumping station with mechanical means including dressing of sides and ramming of bottoms, including getting out the excavated material, disposal of excavated material lead upto 1000m at suitable site as per as per drawing and as per direction of Engineer. (Measurements for payment to be done as per standard drawings).	5338.5	cum			
	Refilling Work					
2	Filling in foundation trenches & plinth in layers not exceeding 150mm thick, well watered, rammed, fully compacted & fine dressed with earth obtained from excavation of foundation within a lead of 50m & lift of 1.50m all complete as per buiding specification and direction of E/I	2295	cum			
	Stone Soling					
3	Random rubble dry stone Kharanja (soling) under floor.	335.33	cum			
	Plain Cement Concrete					
4	Providing PCC in nominal mix of 1:2:4 in foundation with approved quality of stone chips with 20mm to 6mm size graded and clean coarse sand of FM of 2.5 to 3 including screening , shuttering, mixing cement concrete & placing in position , striking, vibrating, curing, taxes & royalty all complete as per building specification & direction of Engineer in charge	146.55	cum			

5	Providing PCC in nominal mix of 1:3:6 in foundation with approved quality of stone chips with 20mm to 6mm size graded and clean coarse sand of FM of 2.5 to 3 including screening , shuttering, mixing cement concrete & placing in position , striking, vibrating, curing, taxes & royalty all complete as per building specification & direction of Engineer in charge	98.25	cum			
	Reinforced Cement Concrete					
6	Providing and laying in position machine batched and machine mixed design mix M-30 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer-in-charge.“(Note :- Cement content considered in M-30 is @ 340 kg/cum)	29.16	cum			
7	Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer-in-charge.“(Note :- Cement content considered in M-25 is @ 330 kg/cum)	275.1	cum			
	Reinforcement					
8	Supplying, fitting & placing HYSD bar reinforcement in sub structure complete as per drawing and technical specification	38.11	MT			
	Centering/Shuttering					
	Centring and shuttering with plywood or steel sheet upto two stories or height upto 7.5 metre above plinth level including strutting, propping etc. and removal of form for :					
9	Foundations, footings, bases of columns, etc. for mass concrete	103.49	sqm			
10	Columns, Pillars, Piers, Abutments, Posts and Struts	364.92	sqm			
11	Suspended floors, roofs, landings, balconies and access	66.34	sqm			
12	Walls (any thickness) including attached pilasters, buttresses,	150.88	sqm			
13	Lintels, beams, plinth beams, girders, bressumers and cantilevers	90	sqm			
	Solid Block masonry					

	Providing and fixing up to floor five level precast cement concrete solid block, including hoisting and setting in position with cement mortar 1:3 (1 cement : 3 coarse sand), cost of required centering, shuttering complete :					
14	1:1½:3 (1 Cement: 1½ coarse sand(zone-III) : 3 graded stone aggregate 20 mm nominal size).	254.2	cum			
	BRICK MASONRY					
15	providing designation 75A brick work in CM (1:3) in foundation & plinth with approved quality of clean coarse sand of FM 2 to 2.5 including providing 10mm thick mortar joints , cost of screening materials, rating out joints to 15mm depth , curing taxes & royalty all complete as per building specification and direction of E/I	220.6	cum			
	Random Rubble Stone Masonry					
16	Providing random rubble stone masonry in CM (1:4)in foundation & plinth with hammer dressed stone of less than 0.03cum in volume and clean coarse sand of FM 2 to 2.5 including cost of screening , raking out joints to 20mm depth , curing , taxes & royalty all complete as per building specification and direction of E/I	138.2	cum			
	Plastering with mortar, 1:4					
17	Providing 19mm thick water proof cement plaster (1:3) with clean coarse sand of FM 1.5 including screening, curing, with all leads and lifts of water, scaffolding taxes and royalty all complete as per building specification and direction of E/I	4466.95	sqm			
	Manholes					
	Supplying and fixing D.I cover without frame for manholes:					
18	D.I manhole cover with frame 300X300mm size(33kgs)	48	Nos			
19	D.I manhole cover with frame 450X600mm size(30kgs)	12	Nos			
20	D.I manhole cover with frame 600X600mm size(65kgs)	2	Nos			
	White wash					
21	White washing three coats over new surface with approved quality of lime including cost of cleaning surface thoroughly and removing the scales of smoke and mosh marks with jhama rubbing , scaffolding, washing of floors and taxes all complete as per building specification and direction of E/I	163	sqm			
	Doors and Windows					
22	Providing and fixing 1mm thick M.S. sheet door with frame of 40x40x6mm angle iron and 3 mm M.S. gusset plates at the junctions and corners,all necessary fittings complete, including applying a priming coat of approved steel primer.Using flats 30x6mm for diagonal braces and central cross piece.	2	sqm			

23	Providing and fixing double leaf Window wooden shutters made of 1st grade wood as per traditional design (Desi pattern) planks thickness 25mm and width of Binies, Andheri 35mm and 25mm, including Adwa etc. with fittings (nails, sankal, kunda, cheri, handle and patti etc.) as per existing matching/ as per approved design with moulding/ carving complete in all respect : Sheesham wood grade 1st. MP teak wood grade 1st	3.2	Sqm			
	Ladder					
24	Providing, fabricating and erecting MS ladder of 450mm wide made of 65 x 65 x 6mm angle iron and 20mm MS bars for walkway to top of the room including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer complete in all respect as per specifications and the direction of the Engineer.	3	m			
	Cement Concrete Flooring					
25	KSRB 14.7-1 : Providing and laying flooring with M15 cement concrete, 40mm thick using broken granite 20 mm and down size laid to line and level in one layer and finish with a floating coat of neat cement, including cost of materials, labour, curing, complete as per specifications. Specification No. KBS 14.3	137	sqm			
	Roofing					
26	Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.	21500	kg			
27	Providing corrugated G.S. sheet roofing including vertical / curved surface fixed with polymer coated J or L hooks, bolts and nuts 8mm diameter with bitumen and G.I. limpet washers or with G.I. limpet washers filled with white lead, including a coat of approved steel primer and two coats of approved paint on overlapping of sheets complete (up to any pitch in horizontal/ vertical or curved surfaces), excluding the cost of purlins, rafters and trusses and including cutting to size and shape wherever required.	1031.5	sqm			
	Pavement					
	Sub Grade					
28	Preparation and consolidation of sub grade with power road roller of 8 to 12 tonne capacity after excavating earth to an average of 22.5 cm depth, dressing to camber and consolidating with road roller including making good the undulations etc. and re-rolling the sub grade and disposal of surplus earth with lead upto 50 metres.	1278.95	sqm			
	Granular Sub base					

29	Construction of granular sub-base by providing close graded Material, mixing in a mechanical mix plant at OMC, carriage of mixed material to work site, spreading in uniform layers of specified thickness with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per clause 401, for grading (iii material)	428.5	cum			
	Wet Mix Macadam					
	Providing, laying, spreading and compacting graded stone aggregate to wet mix macadam specification including premixing the material with water at OMC in mechanical plant carriage of mixed material by tipper to site, for all leads & lifts, laying in uniform layers with paver in sub-base / base course on well prepared surface and compacting with vibratory roller to achieve the desired density.					
30	with smooth 3 wheeled steel roller	288	cum			
	Bituminous Macadam					
	Providing and laying bituminous macadam with 100-120 TPH hot mix plant producing an average output of 75 tonnes per hour using crushed stone aggregates of specified grading premixed with bituminous binder, transported to site, laid over a previously prepared surface with paver finisher to the required grade, level and alignment and rolled as per clauses 501.6 and 501.7 to achieve the desired compaction					
31	for grading I (40mm nominal size)	64	cum			
	Bituminous Concrete					
	Providing and laying bituminous macadam with 100-120 TPH hot mix plant producing an average output of 75 tonnes per hour using crushed stone aggregates of specified grading premixed with bituminous binder @ 5.4 to 5.6% of mix and filler, transporting the hot mix to site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory & tandem rollers to achieve the desired compaction as per MORTH specification clause No 509 complete in all respects.					
32	for grading -I (13mm nominal size)	25.61	cum			
	Filter Media					
	Providing and laying of coarse aggregate size as below after washing & sieving to make it free from fines & dust.					
33	Aggregates 70 mm to 50 mm	202	cum			
34	Aggregates 12 mm to 16 mm	288	cum			
35	Aggregates 5 mm to 7 mm	96	cum			
36	Aggregates 90 mm to 120 mm	5.51	cum			
37	Aggregates 20 mm to 16 mm	14.6	cum			

38	Aggregates 10 mm to 12 mm	15.1	cum			
39	Coarse Sand	195	cum			
	Waste Water Pipes					
	Providing at site, lowering & laying in trenches, aligning & jointing of PVC-U pipes (SN 8) as per IS 15328 (amended up to date) and as per specifications with rubber rings with socket and spigot joint, (EPDM/SBR) for all depths for pipe length as per drawing and specification including hydraulic field testing (including the cost and conveyance of water to site for testing) and commissioning etc complete as directed by Engineer. Note : E/w to be measured and paid separately					
40	110mm dia UPVC pipe	716	metre			
41	4 inch elbow	110	each			
42	110mm dia Tee pipe	24	each			
43	160mm dia pipe	6	metre			
44	End cap to sampling pipe	2	each			
45	Elbow	6	each			
	Providing and fixing UPVC SOIL / VENT / WASTE SWR pipe of required diameter conforming to I.S.-13592, and I.S.-4985 to withstand continuous internal hydraulic pressure of 6 kg/cm ² including necessary fixtures and fittings, such as bends, tees, single junctions, double junctions and joining with rubber rings and lubricants, on wall by means of clips or in ground including necessary excavation, laying refilling, trench testing etc. complete. (Prior approval of sample and brand by Engineer in charge is necessary before use.)					
46	6 inch dia pipe	6	Rmt			
	Borewell Works					
47	Conduct Hydrogeological investigation to determine the most probably spot for bore hole to obtain water. The scientific investigation is to be carried in the presence and in the directions of the engineer and using specialised resistivity measuring instruments.	1	Nos			

48	Construction of Tube-well upto 100 Meter depth and above in all type of rocks by DTH system and over burden to accommodate casing pipe of following sizes in all types of soils and over burden including lowering of casing pipes,excluding the cost of casing pipes as per IS : 2800 (Part I & II) 1979 specifications. The work would be completed after obtaining sand free water and as per direction of the engineer. The tube well should have a throughout bore as per nominal dia of casing pipe:150 mm dia nominal bore	35	m			
49	Supply of ERW M.S black casing pipe ISI marked (IS: 4270/1992) of grade Fe410 of following nominal bore sizes at site of work - 150 mm diameter	26.2	m			
50	Supply of strainer pipes made of ERW M.S. black pipe ISI mark of following sizes at the site of work including required size of slotting as per IS: 8110 -1985 of following nominal bore sizes at site of work. Nominal bore dia: 150 mm	5	m			
51	Testing verticality of tube well by plumbing system and yeild test and draw down test by pumping system as per IS: 2800 (part II) 1979	1	Nos			
52	Supply and fixing of tube well cover of M.S sheet(6 mm thick) with nuts and bolts complete for casing size of 150 mm dia	1	nos			
53	Supply and fixing of MS clamp set of 50 x 6 mm flat iron with nuts and bolts etc for holding the riser pipe assembly of submersible pump set	1	each set			
54	Providing and lowering of GI flange pipe B class including rubber washer and nuts of 8 mm dis complete in all respect - 50 mm	32	metre			
	Water Supply Works (Water Storage Tank)					
55	Providing and fixing of Sintex Tank (3 layers) 2000 liters capacity next to the bore well under the ground as a sump tank. includes cost and conveyance of all materials like valve and brackets etc. complete as directed by the Engineer In charge	2000	Litre			
	Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes, having thermal stability for hot & cold water supply including all CPVC plain & brass threaded fittings This includes jointing of pipes & fittings with one step CPVC solvent cement, trenching, refilling & testing of joints complete as per direction of Engineer in Charge.					

56	32mm dia CPVC pipes	188	RMT			
57	Providing and fixing of 15mm dia brass bib Cock water tap	5	Nos			
58	Dry stone pitching 22.5 cm thick including supply of stones and preparing surface complete	55	sqm			
	Gate at the entrance on compund wall					
59	Providing and fixing M.S. Gate as per chief architect drawing, using 50x50mm 14 guage MS hollow pipe frame work bent to ornamental shape as shown in drawing and 35mmx6mm and 16mmx16mm square rods for verticlas alternatively spaced at 4cm c/c in two halves and 40mmx6mm MS flats for horizontal members and at the top cast iron spikes are provided at alternate vartical members as shown in the drawing etc. complete. All the steel surface should be thoroughly cleaned free of rust and painted with anti corrosive paint(Shop paint) etc. complete. the work includes the cost of all materials, labor charges for all items of work, hire charges for welding, cutting and grinding equipment, and electricity charges, with lead and lift, loading and loading charges etc.complete as per specification	500	kg			
	Sanitary Fittings					
	Providing and fixing wash basin with C.I. brackets, 15 mm C.P. brass pillar taps,32 mm C.P. brass waste of standard pattern, including painting of fittings and brackets, cutting and making good the walls wherever require :					
60	White Vitreous China Wash basin size 630x450 mm with a single 15 mm C.P. brass pillar taps.	1	Nos.			
	Providing and fixing water closet squatting pan (Indian type W.C.pan) with 100 mm sand cast Iron P or S trap, 10 litre low level white P.V.C. flushing cistern, including flush pipe, with manually controlled device (handle lever) conforming to IS : 7231, with all fittings and fixtures complete, including cutting and making good the walls and floors wherever required:					
61	White Vitreous china Orissa pattern W.C. pan of size 580x440 mm with integral type foot rests	1	Nos.			
	Filter material for Anaerobic Filter					
62	Providing and laying Cinders as a Filter Material In AF as per the instruction given by the site engineer in charge.	6	cum			

	Plants					
63	Providing and planting common reeds or other rhizome with nine plant per square metre	240	Nos			
	Providing and fixing mild steel grill work for screening of wastewater as per drawing including fixtures, necessary welding and painting with one coat of zinc chromite primer and two coats of epoxy painting complete.(As per instruction of site engineer)					
64	Weld grill with vertical sloping 10 mm thick bar placed at a distance of 2.5 cms and dimensions of 690 mm x 500 mm	12	Nos.			
65	Weld grill with vertical sloping 10 mm thick bar placed at a distance of 2.5 cms and dimensions of 690 mm x 500 mm	12	Nos.			
	Drainage					
	Making soak pit 2.5 m diameter 3.0 metre deep with 45 x 45 cm dry brick honey comb shaft with bricks and S.W. drain pipe 100 mm diameter, 1.8 m long complete as per standard design.					
66	With common burnt clay F.P.S. (non modular) bricks of class designation 7.5	1	Nos			
	ELECTRICAL					
67	Ceiling fan 120mm	1	each			
68	P & F 1.6 mm thick M.S. Recessed fan box, hexagonal/ round of size 100 mm dia, depth 75mm, 12 mm dia rod fan hook with 100 mm length extended on each side .	1	each			
69	4*40 watt patty type single tubelight fitting	2	each			
70	36/40 Watt tube light.	2	each			
71	Recess mounting LED round down light 12 W	1	each			
72	G.I. Earth pipe electrode with salt/charcoal: earthing with GI earth pipe 4.5 mtr long,40mm dia including accessories, and providing masonry enclosure with cover plate having locking arrangement and watering pipe etc with charcoal and salt as required.	1	each			
	Point wiring in PVC conduit, with piano type switch:- Wiring for light point/fan point/ exhaust fan point/ call bell point with 1.5 sq mm FR PVC insulated copper conductor single core cable in surface/ recessed PVC conduit, with piano type switch, phenolic laminated sheet,suitable size PVC/GI box etc.					
73	Group C.	4	per point			
74	S.P 5/6 amps, one way modular switch , ISI marked.	4	nos			
	S/F Piano type switch socket:- Supplying and fixing of following piano type switch /socket on the existing switch box cover including connections etc as required					
75	Electronic step fan regulator,deluxe	1	nos			

76	P & F 18 SWG Sheet steel boxes duly finished with two coats of red oxide and with earthing terminal of following sizes (nominal size) on surface or in recessed as required. Size: 150 x 75 x 60 mm	1	nos			
	S/F 'C' series, MCB:- Supplying and fixing following, 240 volts, 'C' series, miniature circuit breaker suitable for inductive loads of following poles in the existing MCB DB complete with connections, testing and commissioning etc as required.					
77	40 amps,SPN	1	nos			
78	Supply of 7.5KVA Silent DG.set with comprising of Mahindra make Engine Model 1125GR, 12BHP @ NTP 1500RPM coupled to 7.5KVA Mahindra approved make 3-Phase, 415V, 50Hz alternator mounted on a common Base frame along with other accessories i.e., Fuel tank, Manual Control Panel, Battery with leads and acoustic enclosure.	1	No			
	MECHANICAL WORK					
	Supply of pumps					
79	Submersible pump @3cum/hr, 5 m head, 1.1 HP single phase	1	Nos			
	Supply, installation and commissioning of FRP sand carbon filter with loaded graded material					
80	Provide sand and carbon along with necessary accessories such as pumps, multiport valves and piping. To include all installations, testing and commissioning of the set up. Description of the item as mentioned in bid document	1	Nos			
81	Installation of submersible motor pump set in tube well complete (labour charges only) including transportation of tripod, pulley block, and any other material required for lowering purpose	1	each			
	Project Cost (Including GST/taxes & Labour Cess)(CAPEX)					
	Operation and Maintenance for Fecal Sludge Treatment Plants, Trucks Operations, Project Office etc all complete.					
82	First(1st) Year	1	Job			
83	Second(2nd) Year	1	Job			
84	Third(3rd) Year	1	Job			
85	Fourth(4th) Year	1	Job			
86	Fifth(5th) Year	1	Job			
87	Sixth(6th) Year	1	Job			
	Project Cost (Including GST/taxes & Labour Cess)(OPEX)					

GOVERNMENT OF JHARKHAND
Jharkhand Urban Infrastructure Development
Company Limited

BIDDING DOCUMENT

for the

Construction, Commissioning of Fecal Sludge Treatment Plant of Capacity 12 m³/day at Chirkunda town (Jharkhand) and Operation and Maintenance for 6 years

Part 1– Volume 1: Technical Bid

Employer: Jharkhand Urban Infrastructure Development Company Limited

3rd FLOOR, PRAGATI SADAN, KUTCHERY CHOWK

RANCHI 834 002, JHARKHAND.

PH: +91 651 2243203, E-MAIL: juidcolimited@gmail.com

Country: India

Table of Contents

Section 1: Instruction to Bidders	11
A. General	11
1. Scope of Bid	11
2. Source of Funds	11
3. Eligible Bidders	11
B Contents of Bidding Document	17
9. Clarification of Bidding Document.....	18
C Preparation of Bids	19
D. Submission and Opening of Bids	23
E. Evaluation and Comparison of Bids.....	25
F. Award of Contract	30
APPENDIX to ITB	35
ANNEXURE I: List of Key Plant & Equipment to be deployed on Contract work	37
ANNEXURE II: List of key Personnel to be deployed on Contract Work.....	38
SECTION – 2	1
QUALIFICATION INFORMATION.....	1
QUALIFICATION INFORMATION.....	2
SAMPLE FORMAT FOR EVIDENCE OF ACCESS TO OR.....	9
AVAILABILITY OF CREDIT FACILITIES	9
BID SECURITY (BANK GUARANTEE)	10
AFFIDAVIT	12
UNDERTAKING	13
SECTION – 3.....	1
GENERAL CONDITIONS OF CONTRACT	1
General Conditions of Contract	2
A. GENERAL.....	4
1. Definitions	4
2. Interpretation	5
3. Language and Law	6
4. Engineer’s Decisions.....	6
5. Delegation.....	6
6. Communications	6
7. Sub-Contracting	6
8. Other Contractors.....	7

9.	Personnel	7
10.	Employer's and Contractor's Risks.....	7
11.	Employer's Risks	7
12.	Contractor's Risks	7
13.	Insurance.....	8
14.	Site Investigation Reports	8
15.	Queries about the Contract Data	8
16.	Contractor to Construct the Works.....	8
17.	The Works to be completed by the Intended Completion date.....	8
18.	Approval by the Engineer	9
19.	Safety	9
20.	Discoveries.....	9
21.	Possession of the Site	9
22.	Access to the Site	9
23.	Instructions.....	9
24.	Deleted.....	10
25.	Deleted.....	10
26.	Deleted.....	10
B.	TIME CONTROL	10
27.	Programme	10
28.	Extension of the Intended Completion Date.....	10
29.	Deleted.....	11
30.	Delays Ordered by the Engineer	11
31.	Management Meetings.....	11
32.	Early Warning	11
C.	QUALITY CONTROL.....	11
33.	Identifying Defects	11
34.	Tests.....	11
35.	Correction of Defects.....	12
36.	Uncorrected Defects	12
D.	COST CONTROL.....	12
37.	Bill of Quantities	12
38.	Changes in the Quantities	12
39.	Variations.....	12
40.	Payments for Variations	13

41.	Cash Flow Forecasts.....	13
42.	Payment Certificates.....	13
43.	Payments.....	13
44.	Deleted.....	14
45.	Tax.....	14
46.	Currencies.....	14
47.	Deleted.....	14
48.	Retention.....	14
49.	Liquidated Damages.....	15
50.	Bonus.....	15
51.	Advance Payment.....	16
52.	Securities.....	16
53.	Deleted.....	17
54.	Cost of Repairs.....	17
E.	FINISHING THE CONTRACT.....	17
55.	Completion.....	17
56.	Taking Over.....	17
57.	Final Account.....	17
58.	Operation and Maintenance Manuals.....	17
59.	Termination.....	18
60.	Payment upon Termination.....	18
61.	Property.....	19
62.	Release from Performance.....	19
	SECTION – 4.....	1
	CONTRACT DATA.....	1
	CONTRACT DATA.....	2
	SECTION 5.....	11
	SPECIAL CONDITIONS OF CONTRACT.....	11
	SECTION 6.....	23
	EMPLOYER'S REQUIREMENTS.....	23
	Section 6 - Employer's Requirements.....	24
	1.1 Scope of Services.....	25
	1.1.1 Project Background.....	25
	1.1.2 Chirkunda: An Overview.....	25
	1.1.3 General Scope.....	25

1.1.4 Specific Scope	26
1.1.5 Outcome and Benefits from Project	26
1.2 SPECIFICATION	26
1.2.1 Standard Specification	26
SECTION 7: PARTICULAR SPECIFICATION	28
Section 7: Particular Specification	29
1. GENERAL RESPONSIBILITY OF CONTRACTOR	29
1.1 Contractor's Office Location and Labour Camp	29
1.2 Contractor's Submittals	29
1.3 Sample of Materials	30
1.4 Work Program	31
1.5 Personal Requirement of Contractor	31
1.6 Equipment Requirements	31
1.7 Project Sign Board	31
1.8 Quality Assurance	32
1.9 Safety Assurance	32
1.10 Project Site Office for Employer	33
1.11 Storage Facilities	34
1.12 Temporary Electricity Provision	34
1.13 Temporary Water and Sanitation Provision	34
1.14 Removal of Camps	35
1.15 Topographical Survey for Verification	35
1.16 Soil Investigation	35
1.17 Handing Over of Project Site to Contractor	35
1.18 Completeness of Work	36
1.19 Clarification	36
2. GENERAL CIVIL ENGINEERING WORKS	36
2.1 Material and Standard	36
2.2 Earthwork	37
2.3 Fill, Backfilling and Site Grading	39
2.4 Reinforced Cement Concrete	42
2.5 Design Mix Concrete	44
2.6 Plain Cement Concrete	54
2.7 Structural Steel Works	54
2.8 Brickwork	58

2.9 Mortar	58
2.10 Un-Coursed Random Rubble Masonry	61
2.11 Damp Proof Course	62
2.12 Floor Hardener Topping	63
2.13 Cement Plastering Works	63
2.14 Cement Pointing.....	65
2.15 Water Proofing Admixtures.....	66
2.16 Painting of Surfaces.....	66
2.17 Sanitary Appliances.....	67
2.18 Construction Joints.....	67
2.19 Water Proofing	68
2.20 Roofing	69
3. ROAD AND PAVEMENT WORKS	69
3.1 Granular Sub-Base	69
3.2 Wet Mix Macadam Sub-Base/Base	71
3.3 Surface Base and Surface Courses (Bituminous prime coat).....	74
3.4 Dense Graded Bituminous Macadam.....	76
3.5 Bituminous Concrete.....	79
4. PIPES AND PIPE LAYING	82
4.1 HDPE Pipes:	82
4.2 Unplasticized Polyvinyl Chloride (U-PVC) Pipes	89
4.3 Laying and Jointing of Waste Pipes	90
4.4 Bedding of Waste Pipe Lines.....	91
4.5 Precast RCC Chambers/Manholes	91
4.6 Polyethylene Manholes.....	92
4.7 Chamber/Manhole Frame and Cover	96
4.8 Fibre Reinforced Plastic	96
5. TUBEWELL/BOREWELL CONSTRUCTION.....	98
6. SANITARY APPLIANCES	98
6.1 General.....	98
6.2 Sanitary Installation.....	99
7 ELECTRO-MECHANICAL WORKS	104
7.1 Wastewater Pump.....	104
7.2 Tubewell Pump	105
8 FAECAL SLUDGE TREATMENT PLANT (FSTP).....	107

8.1 TREATMENT OBJECTIVE.....	107
8.2 CONCEPT - PDB METHOD.....	108
8.3 DESIGN DESCRIPTION FOR THE PROPOSED TREATMENT MODULES- CONCEPT.....	109
8.4 AREA REQUIREMENTS OF MODULES.....	114
8.5 INTEGRATED FSTP AND TRUCK OPERATIONS.....	114
9. DRAWINGS.....	119
10 Personnel Requirement.....	119
11. EQUIPMENT REQUIREMENT.....	120
Draft Format for Memorandum of Understanding for JOINT VENTURE.....	121
TRIPARTITE MAINTENANCE AGREEMENT.....	126
DUTIES, RIGHTS AND OBLIGATIONS OF THE AUTHORITY.....	136



JHARKHAND URBAN INFRASTRUCTURE DEVELOPMENT COMPANY LIMITED

(A Government of Jharkhand Undertaking)

3rd Floor, Pragati Sadan, Kutchery Chowk, Ranchi-834001

Ph no.- 0651-2225878, E-Mail Id- juidcolimited@gmail.com

CIN: U45200JH2013SGC001752,



Reference No.- JUIDCO/NIT/CHIRKUNDA SEPTAGE/TENDER/1810/2019/213

Date:08/02/2019

Tender Notice

IMPORTANT INFORMATION FOR BIDDING

1	Name of Work	Construction & Commissioning of Faecal Sludge Treatment Plant of 12 m ³ /day capacity at Chirkunda town (Jharkhand) followed by Operation & Maintenance for 6 years including DLP of 3 months.
2.	Mode of Bid Submission	e-tendering (http://jharkhandtenders.gov.in)
3	Estimated Cost (INR)	Estimated Cost: ₹3,15,29,040/- including OPEX for 6 years (Estimated O&M cost of Rs. 1,14,14,784/-)
4	Bid Security (INR)	₹ 3,16,000/- (Rupees Three Lakh Sixteen Thousand) only
5	Cost of Bid Document (INR)	₹ 10,000/- (Rupees Ten Thousand) only; Non-refundable
6	Time of Completion	10 months construction including 1 month trial run followed by 6 years of O & M including initial 3 months of DLP.
7	Date & time of e-publication of tender	09.02.2019, 17:00 Hrs
8	Last date of submission of Pre-bid queries	16.02.2019, 17:00 Hrs
9	Pre bid meeting date, Time & Venue	18.02.2019, 14:00 Hrs at Conference Hall, 3 rd Floor Pragati Sadan, Near Kutchery Chowk, JUIDCO Ltd Ranchi -834001.
10	Bid submission end date	02.03.2019, 17:00 Hrs
11	Last day for the submission of Bid Security, cost of bid document	05.03.2019, 17:00 Hrs
12	Bid opening date (online)	05.03.2019, 17:30 Hrs

Complete bid document is available on website <http://Jharkhandtenders.gov.in> & <http://juidcojharkhand.gov.in>
Other details can be seen in the bidding documents.

*Bid security 1% of Bid amount.

1. Cost of bidding document for a non-refundable fee as indicated shall be in the form of Demand Draft of any Scheduled Indian Bank, payable at Ranchi in favour of Managing Director, Jharkhand Urban Infrastructure Development Company Ltd (JUIDCO).

2. Bids must be accompanied by Security amount specified as mentioned in table, payable at Ranchi and drawn in favour of Managing Director, Jharkhand Urban Infrastructure Development Company Ltd, Ranchi Bid security will have to be in anyone of the forms as specified in the bidding document and shall have to be valid for 45 days beyond the validity of the bid.

3. Cost of bidding document and Bid Security shall be deposited in the office of the Managing Director, JUIDCO, e-Procurement Cell, Jharkhand Urban Infrastructure Development Company Ltd (JUIDCO) on all working days between **09.02.2019 to 05.03.2019** up to **17.00 Hrs** either by registered post /Speed post or by hand. Only those applications will be entertained where cost of bidding document and bid security is received before **17.00 Hrs.** on **05.03.2019**. JUIDCO will not be held responsible for the postal delay, if any, in the delivery of the document or non-receipt of the same.

4. Tenderer(s) shall upload Scanned copy in PDF format/Digitally Signed copy of his/her Valid DD, Bid Security, Credit Facility, TIN, PAN, Five Years Audited Turnover, Character Certificate, Work Experience, Partnership Deed or Article of Association / Memorandum , Undertakings, Affidavits, E.P.F.,etc.

5. Bids shall be submitted online on the website <http://jharkhandtenders.gov.in>.

6. Uploaded documents of successful bidder will be verified with the original before signing the agreement. The successful bidder has to provide the originals to the concerned authority on receipt of such a letter, which will be sent though registered post or speed post or delivered by hand.

7. Bidders in order to participate in the bidding process have to get 'Digital Signature Certificate (DSC)' as per Information Technology Act-2000 to participate in online bidding. This certificate will be required for digitally signing the bid. Bidders can get the above mentioned digital Signature certificate from any approved vendors (CCA). Bidders, who already possess valid Digital Certificates, need not procure new Digital Certificate.

8. Bidders have to submit their bids online in electronic format with Digital Signature. Bids without Digital Signature will not be accepted. No bid will be accepted in Physical Form.

9. A pre-bid meeting shall be held as scheduled above in table in the office of Jharkhand Urban Infrastructure Development Company Ltd (JUIDCO) Conference hall/ Project Director (Technical) to clarify the issues and to answer questions on any matter that may be raised at that stage as stated in Clause 9.2 of the 'Instructions to Bidders' of the bidding document. Complete bid document is available on website <http://Jharkhandtenders.gov.in> & <http://juidco.jharkhand.gov.in>.

Sd/-

Project Director (Technical)

JUIDCO Ltd, Ranchi.

SECTION 1: INSTRUCTION TO BIDDERS

Section 1: Instruction to Bidders

A. General

1. Scope of Bid

1.1 The Employer i.e. JUIDCO (named in appendix to ITB) invites bids for the construction and O&M of works (as defined in these documents and referred to as “the works”) detailed in the table given in IFB. The bidders may submit bids for works detailed in the table given in IFB.

1.2 The successful bidder shall be expected to complete the works by the intended completion date specified in the Contract data

1.3 Throughout these bidding documents, the terms ‘bid’ and ‘tender’ and their derivatives (bidder/ tenderer, bid/tender, bidding/tendering, etc.) are synonymous.

2. Source of Funds

2.1 The project is being funded by Government of Jharkhand. This will be provided through an escrow account. The O&M cost will be borne by the Town Municipal Council, Chirkunda which is to be raised from the beneficiaries.

3. Eligible Bidders

3.1. This invitation for Bids is open to all bidders.

3.2. All bidders shall provide in Section 2, Forms of Bid and Qualification Information, a statement that the Bidder is neither associated, nor has been associated, directly or indirectly, with the Consultant or any other entity that has prepared the design, specifications and other documents for the Project or being proposed as Project Manager for the Contract. A firm that has been engaged by the Employer to provide consulting services for the preparation or supervision of the works, and any of its affiliates, shall not be eligible to bid.

4. Qualification of the Bidder

4.1. All bidders shall provide in Section 2, Forms of Bid and Qualification Information, a preliminary description of the proposed work method and schedule, including drawings and charts, as necessary. The proposed methodology should include programme of construction backed with equipment planning and deployment duly supported with broad calculations and quality assurance procedures proposed to be adopted justifying their capability of execution and completion of work as per technical specifications, within stipulated period of completion.

4.2 Deleted

- 4.3 All bidders shall include the following information and documents with their bids in Section 2:
- (a) copies of original documents defining the constitution or legal status, place of registration, and principal place of business; written power of attorney of the signatory of the Bid to commit the Bidder;
 - (b) Total monetary value of construction work performed for each of the last five years.
 - (c) experience in works of a similar nature and size for each of the last five years, and details of works underway or contractually committed; and the name and address of Employers who may be contacted for further information on these contracts;
 - (d) major items of construction equipment proposed to carry out the Contract;
 - (e) qualifications and experience of key site management and technical personal proposed for Contract;
 - (f) reports on the financial standing of the Bidder, such as profit and loss statements and auditor's reports for the past five years;
 - (g) evidence of access to line (s) of credit and availability of other financial resources facilities (10% of contract value), certified by the Bankers(not more than 3 months old)
 - (h) undertaking that the bidder will be able to invest a minimum cash upto 25% of contract value of work, during implementation of work.
 - (i) authority to seek references from the Bidders's bankers;
 - (j) information regarding any litigation, current or during the last five years, in which the Bidder is involved, the parties concerned, and disputed amount;
 - (k) proposals for subcontracting components of the works amounting to more than 10 percent of the Bid Price (for each, the qualifications and experience of the identified sub-contractor in the relevant field should be annexed); **and for all specialized nature of work & new engineering methodology work irrespective of the amount.**
 - (l) the proposed methodology and programme of construction, backed with equipment planning and deployment, duly supported with broad calculations and quality control procedures proposed to be adopted, justifying their capability of execution and completion of the work as per technical specifications within the stipulated period of completion as per milestones (for all contracts over Rs.2.5 Crore).
- 4.4 Bids from Joint ventures are acceptable.

- 4.4.1 Joint Venture partners would be limited to two (including the lead partner)
- 4.4.2 One of the partners, who is responsible for performing a key in contract (lead partner of the JV) management or executing and operation of proposed contract, shall be nominated as being in charge during Bidding periods and in the event of successful Bid, during contract execution. The partner in charge shall be authorized to incur liabilities and receive instructions for and on behalf of the partner(s) of the Joint Venture. This authorization shall be evidenced by submitting a power of attorney signed by legally authorized signatories of all partners.
- 4.4.3 All the partners of Joint Ventures shall be, jointly and severally liable, during the Bidding process and for the execution and operations of proposed works in contract in accordance with the contract terms, and a statement of this affect shall be included in the authorization. The Bid shall be signed so as to legally bind all the partners, jointly and severally.

Bid security and performance guarantee, as required, will be furnished by the lead partner in Joint Venture.

4.4.4. Qualifying criteria for Joint Venture

Joint Venture must comply with the following requirements:-

- (i) The Joint Venture must satisfy collectively the criteria for this purpose the following data of each member of the Joint Venture may be added together to meet the collective qualifying criteria.
- (a) Annual Turnover (Cl. 4.5.A.2(a) of ITB)
 - (b) Particular Construction Experience. (Cl. 4.5.A.2(b) of ITB)
 - (c) Personal Capabilities. (Annexure II)
 - (d) Equipment Capabilities. (Annexure I)
 - (e) Financial Capabilities [Cl.4.3(g) & Cl.4.3(h) of ITB]
- (ii) The each partner shall meet the following qualifying criteria in proportion to the partnership in JV but not less than 30%.

- (a) Annual Turnover. (Cl. 4.5.A.2(a) of ITB)
- (b) Particular Construction Experience. (Cl. 4.5.A.2(b) of ITB)
- (c) Financial Capabilities. [Cl. 4.3 (g) & 4.3 (h) of ITB]

4.4.5 A copy of the Joint Venture Agreement (JVA) entered into the between the partner shall be submitted with the application. Alternatively, a letter of Intent to execute a JVA in the event of successful Bid shall be signed by all partner(s) and submitted with the application together with a copy of the proposed agreement. The JVA shall include among other things a Joint Venture's objectives and proposed management structure, the contribution of each partner to the Joint Venture operation, the commitment of the partner to Joint Venture in the event of the default or withdrawal of any partner an arrangement for providing the required indemnities:

- (i) Stepping into the shoes of the existing partner(s) of JV with all liabilities of the existing partners from the beginning of the contract.
- (ii) With the prior approval of the Employer.
- (iii) Notwithstanding demarcation or allotment of work between two JV partner(s), JV shall be liable for non-performance of the whole contract irrespective of their demarcation or shared of work.

In case of successful Bid being accepted by Employer the payments under the contract will only be made to the lead partner of JV.

4.4.6 Joint Venture Agreement shall contain a Clause to the effect that there shall be a separate JV Bank Account (distinct from the Bank Account of the individual partners) to which the individual partner shall contribute their share / or working capital.

Joint Venture Agreement shall also contain a Clause to the effect that the financial obligations of the JV shall be discharged through the said JV Bank Account only and also all the payments received or paid by the Employer by the JV shall be through that Account alone.

4.5.A. 1 Technical Qualification Criteria

The Bidder shall provide evidence (certified by the relevant and respective Employer) that during last 5 years preceding the bid submissions:

SL No.	Parameter
(a)	Bidder or any one JV Partner Experience of building Faecal Sludge Treatment plant, Sewage treatment plant, solid waste management plant or similar work in last 5 years and undertaken work related to O & M of the plant constructed and desludging vehicles.
(b)	Must have been awarded and undertaken work for O & M of faecal sludge treatment plant or similar plant and desludging vehicles in last 5 year

2. Financial Qualification Criteria

To qualify for award of the contract, each bidder in its name (or combined in case of a JV) must have in the last five years.

- a) Achieved a minimum annual financial turnover (in all classes of civil engineering construction and O&M works as per scope) amount indicated in qualifying criteria in any one year (usually not less than one and a half times the construction cost of the project);
- b) satisfactorily completed (not less than 90% of contract value), as a prime contractor (or as a nominated subcontractor, where the subcontract involved execution of all main items of work described in the bid document, provided further that all other qualification criteria are satisfied) at least :-

(I) Experience in last 5 Years

- 1) Three works each of value not less than INR 80 Lakh for septage treatment, sewage treatment, solid waste or any such similar work

Or

- 2) Two works each of value not less than INR 1.20 Crore for septage treatment, sewage treatment, solid waste or any such similar work

Or

- 3) One work of value not less than INR 1.60 Crore for septage treatment, sewage treatment, solid waste or any such similar work.

4.5. B. Each bidder should further demonstrate.

- a) Availability (either owned or leased or by procurement against mobilization advances) of the following key and critical equipment for this work as per the **Annexure I**.

The bidders should, however, undertake their own studies and furnish with their bid, a detailed construction planning and methodology supported with layout and necessary drawings and calculations (detailed) as stated in clause 4.3(C) above to allow the Employer to review their proposals. The numbers, types and capacities of each plant/equipment shall be shown in the proposals along with the cycle time for each operation for the given production capacity to match the requirements.

- c) Availability for this work of personnel with adequate experience as required; as per Annexure-II.
- d) Liquid assets and/or availability of credit facilities of no less than amount indicated in Appendix (credit lines/letter of credit/certificates from Banks for meeting the funds requirements etc.-usually the equivalent of the estimated cash flow for 3 months in peak construction period.)

4.5.C To qualify for a package of contracts made up of this and other contracts for which bids are invited in the NIT/IFB, the bidder must demonstrate having experience and resources sufficient to meet the aggregate of the qualifying criteria for the individual contracts.

4.6 Sub-contractors' experience and resources shall not be taken into account in determining the bidder's compliance with the qualifying criteria except to the extent stated above.

4.7 Bidders who meet the minimum qualification criteria will be qualified only if their available bid capacity is **more than the total bid value excluding O&M cost**. The available bid capacity will be calculated as under:

$$\text{Assessed Available Bid capacity} = (A * N * 2 - B)$$

Where;

A = Maximum value of civil engineering works executed in any one year during the last five years (updated to the price level of the year indicated in Appendix) taking into account the completed as well as works in progress.

N = Number of years prescribed for completion of the works for which bids are invited i.e. **1 (One)**.

B = Value (updated to the price level of the year indicated in Appendix) of existing commitments and on-going works to be completed during the next **1 year** (period of completion for construction/O&M period of the works for which bids are invited)

Note:

The statements showing the value of existing commitments and on-going works as well as the stipulated period of completion remaining for each of the works listed should be countersigned by the Engineer in Charge / Executive Engineer/ Employer

- 4.8. Even though the bidders meet the above qualifying criteria, they are subject to be disqualified if they have :
- made misleading or false representations in the forms, statements and attachments in proof of the qualification requirements; and/or
 - record of poor performance such as abandoning the works, not properly completing the contract, inordinate delays in completion, litigation history, or financial failures etc.; and/or
 - participated in the previous bidding for the same work and had quoted unreasonable bid prices (**too High or too Low**) and could not furnish rational justification to the Employer.

5. One Bid per Bidder

- 5.1. Each bidder shall submit only one bid for one package. A bidder who submits or participates in more than one Bid (other than as a subcontractor or in cases of alternatives that have been permitted or requested) will cause all the proposals with the Bidder's participation to be disqualified.

6. Cost of Bidding

- 6.1. The bidder shall bear all costs associated with the preparation and submission of his Bid, and the Employer will in no case be responsible and liable for those costs.

7. Site Visit

The Bidder, at the Bidder's own responsibility and risk is encouraged to visit and examine the Site of Works and its surroundings and obtain all information that may be necessary for preparing the Bid and entering into a contract for construction of the Works. The costs of visiting the Site shall be at the Bidder's own expense.

B Contents of Bidding Document

8. Content of Bidding Documents

- 8.1. The set of bidding documents comprises the documents listed below and addenda issued in accordance with Clause 10:

Section	Particulars	Volume No.
	Notice Inviting Bid /	
1	Instruction to Bidders	
2	Qualification Information, and other	I

	Forms	
3	Conditions of Contract	
4	Contract Data	
5	Technical Specifications	II
6	Form of Bid	
7	Securities and other forms	III
8	Drawings	IV
9	Documents to be furnished by bidder	V

- 8.2. Each of the Volumes I, II, III, IV will be available online on website <http://jharkhandtenders.gov.in> for bidder(s). Documents to be submitted by the bidder(s) in compliance to section 2 will be prepared by him and submitted online as per instruction given in addendum to ITB.
- 8.3. The bidder is expected to examine carefully all instructions, conditions of contract, contract data, forms, terms, technical specifications, bill of quantities, forms, Annexes and drawings in the Bid Document. Failure to comply with the requirements of Bid Documents shall be at the bidder's own risk. Pursuant to clause 26 hereof, bids which are not substantially responsive to the requirements of the Bid Documents shall be rejected.

9. Clarification of Bidding Document

9.1 A prospective bidder requiring any clarification of the bidding documents may notify the Employer in writing or by cable (hereinafter "cable" includes telex, facsimile and email) at the Employer's address indicated in the invitation to bid. The Employer will respond to any request for clarification which is received earlier than 15 days prior to the deadline for submission of bids. Copies of the Employer's response will be forwarded to all purchasers of the bidding documents, including a description of the enquiry but without identifying its source.

9.2 Pre-bid meeting

- 9.2.1. The bidder or his official representative is invited to attend a pre-bid meeting which will take place at the address, venue, time and date as indicated in appendix.
- 9.2.2. The purpose of the meeting will be to clarify issues and to answer questions on any matter that may be raised at that stage.

9.2.3. The bidder is requested to submit any questions in writing or by cable (**cable as defined in 9.1**) to reach the Employer not later than one week before the meeting.

9.2.4 Minutes of the meeting, including the text of the questions raised (without identifying the source of enquiry) and the responses given will be transmitted without delay to all purchasers of the bidding documents. Any modification of the bidding documents listed in sub-Clause 8.1 which may become necessary as a result of the pre-bid meeting shall be made by the Employer exclusively through the issue of an Addendum pursuant to Clause 10 and not through the minutes of the pre-bid meeting. Amendment/Corrigendum of Bidding Document.

9.2.5 Non-attendance at the pre-bid meeting will not be a clause for disqualification of a bidder.

10. **Amendment of Bidding Documents**

10.1 At any time prior to the deadline for submission of Bids, the Employer may amend the Bidding Document by issuing addenda.

10.2 Any such addendum/corrigendum/clarification has to be approved by the Secretary, UD&HD, GoJ.

10.3 Any addendum issued shall be part of the Bidding Document and shall be communicated in writing to all who have obtained the Bidding Document from the Employer in accordance with ITB 5.3. Prospective bidders shall acknowledge receipt of each addendum in writing to the Employer. The Employer will assume no responsibility for postal delays.

10.4 To give prospective bidders reasonable time in which to take an addendum into account in preparing their bids, the Employer may, at his discretion, extend as necessary the deadline for submission of bids, in accordance with Sub-Clause 20.2 below.

C Preparation of Bids

11. **Language of the Bid**

11.1. All documents relating to the bid shall be in the English language.

12. **Documents Comprising the Bid**

- 12.1. The bid shall be submitted by the bidder online as per instruction contained in addendum to ITB.
- 12.2. Bidder shall submit bid online.
- 12.3. Following documents, which are not submitted with the bid, will be deemed to be part of the bid.

Section	Particulars	Volume No.
	Notice Inviting Tender (NIT)	Volume I
1	Instruction to Bidders	
3	Conditions of Contract	
4	Contract Data	
5	Specifications	Volume II
8	Drawings	Volume IV

13. Bid Prices

- 13.1. The contract shall be for the whole works as described in Sub-Clause 1.1. based on the priced Bill of Quantities submitted by the Bidder.
- 13.2. The bidder shall fill in rates in figures only as the rate in words will be generated automatically in the BOQ template. Items for which no rate or price is entered by the bidder will not be paid for by the Employer when executed and shall be deemed covered by the other rates and prices in the Bill of Quantities.
- 13.3. All duties, taxes, and other levels payable by the contractor under the contract, or for any other cause shall be included in the rates, prices and total Bid Price submitted by the Bidder.
- 13.4.* The rates and prices quoted by the bidder shall be fixed for the duration of the Contract and shall not be subject to adjustment **on** any account.

14. Currencies of Bid and Payment

- 14.1.** The unit rates and the prices shall be quoted by the bidder entirely in Indian Rupees. All payment shall be made in Indian Rupees.

15. Bid Validity

- 15.1. Bids shall remain valid for a period not less than 180 days after the bid submission end date specified in **Clause 20**. A bid valid for a shorter period shall be rejected by the Employer as non-responsive. In case of discrepancy in bid validity period between that given in the undertaking pursuant to clause 12.1 (v) and the Form of Bid submitted by the bidder, the latter shall be deemed to stand corrected in accordance with the former and the bidder has to provide for any additional security that is required.
- 15.2. In exceptional circumstances, prior to expiry of the original time limit, the Employer may request that the bidders may extend the period of validity for a specified additional period. The request and the bidders' responses shall be made in writing or by cable. A bidder may refuse the request without forfeiting his bid security. A bidder agreeing to the request will not be required or permitted to modify his bid, but will be required to extend the validity of his bid security for a period of the extension, and in compliance with Clause 16 in all respects.
- 15.3 Bid evaluation will be based on the bid prices without taking into consideration the above correction.

16. Bid Security

- 16.1. The Bidder shall furnish, as part of his Bid, a Bid security in the amount as shown in column 4 of the table of IFB for this particular work. This bid security shall be in favour of Employer as named in Appendix and may be in one of the following forms:
- (i) Receipt in challan of cash deposit in the Govt. Treasury in India.
 - (ii) Deposit-at-call receipt from any of the Scheduled Bank situated **within the territory of India**.
 - (iii) Indian Post Office/**Fixed Deposit**/National Savings Certificates duly endorsed by the competent Postal Authority in India.
 - (iv) Bank Guarantee from any Scheduled Indian Bank from any of the branches of Scheduled Bank situated within the territory of India in the format given in Section 8.
 - (v) Fixed deposit receipt, a certified cheque or an irrevocable letter of credit, issued by any scheduled Indian Bank approved by the Reserve Bank of India.

- 16.2. Bank guarantees (and other instruments having fixed validity) issued as surety for the bid shall be valid for 45 days beyond the validity of the bid.
- 16.3. Any bid not accompanied by an acceptable Bid Security and not secured as indicated in Sub-Clauses 16.1 and 16.2 above shall be rejected by the Employer as non-responsive.
- 16.4. The Bid security of unsuccessful bidders will be returned within 28 days of the end validity period specified in sub-Clause 15.1.
- 16.5. The Bid security of the successful bidder will be discharged when the bidder has signed the Agreement and furnished the required Performance Security.
- 16.6. The Bid security may be forfeited
 - (a) if the Bidder withdraws the Bid after Bid opening during the period of Bid validity;
 - (b) if the Bidder does not accept the correction of the Bid Price, pursuant to Clause 27; or
 - (c) in the case of a successful Bidder, if the Bidder fails within the specified time limit to
 - (i) sign the Agreement; or
 - (ii) furnish the required Performance Security.

17. Alternative Bids

17.1 Bidders shall submit offers that fully comply with the requirements of the bidding documents, including the conditions of contract (including mobilization advance or time for completion), basic technical design as indicated in the drawing and specifications. Conditional offer or alternative offers will not be considered further in the process of tender evaluation.

18. Format and Signing of Bid

- 18.1 The bidder shall submit the bids as per addendum to instruction to bidder.
- 18.2 Instruction to Bidders(for SBD contract) to be followed. Bid submitted online has to be digitally signed by the bidder.

- 18.3 Bidders shall follow the Method of submission of bid as mentioned in Instruction to Bidders(for SBD contract)

D. Submission and Opening of Bids

19. (A) Instructions & documents to be furnished for online bidding
- 19.1 **Guidelines for online submission of bids can be downloaded from the website <http://jharkhandtenders.gov.in>**
- 19.2 Interested bidders can download the bid from the website <http://jharkhandtenders.gov.in>
- 19.3 Bidders in order to participate in the bidding process have to get ‘Digital Signature Certificate (DSC)’ as per Information Technology Act-2000 to participate in online bidding. This certificate will be required for digitally signing the bid. Bidders can get the above mentioned digital signature certificate from any approved vendors. Bidders, who already possess valid Digital Certificates, need not procure new Digital Certificate.
- 19.4 Bidders have to submit their bids online in electronic format with digital Signature. Bids without digital signature will not be accepted. No proposal will be accepted in physical form.
- 19.5 Bids will be opened online as per time schedule mentioned in the Invitation for Bids (IFB).
- 19.6 Bidders should be ready with the scanned copies of cost of documents & bid security as specified in the tender document. Before submission of bids online, bidders must ensure that scanned copies of all the necessary documents have been attached with bid.
- 19.7 Bidders have to produce original Demand Draft towards cost of Bid Document & bid security as mentioned in the Invitation for Bids (IFB) to the **Nodal Officer**, e-Procurement Cell during the period & time as mentioned in the I.F.B. failing which bid will not be accepted. The details of cost of documents, bid security specified in the tender documents should be the same as submitted online (scanned copies), otherwise bid will summarily be rejected.
- 19.8 Uploaded documents of successful bidder will be verified with the original before signing the agreement. The successful bidder has to provide the originals to the concerned authority.

- 19.9 The department will not be responsible for delay in online submission of bids due to any reason, what so ever.
- 19.10 All required information for bid must be filled and submitted online.
- 19.11 Other details can be seen in the bidding documents.
- 19.12 Only online withdrawal or modification of bids, if any, in pursuance of relevant clauses of the SBD is acceptable.

19. (B)Details of documents to be furnished for online bidding

- 19.1. Scanned copies of the following documents to be up-loaded in .pdf format on the website <http://jharkhandtenders.gov.in> in technical bid folder.
- i. D.D. towards cost of Bid Document.
 - ii. Bid security in the form specified in Section-8 of SBD.
 - iii. Qualification information and supporting documents as specified in Section-2 of SBD.
 - iv. Certificates, undertakings, affidavits as specified in Section-2.
 - v. Any other information pursuant to Clause-4.2 of ITB.
 - vi. Undertakings that the bid shall remain valid for the period specified in Clause-15.1 of ITB.
- 19.2. Scanned copies of the following documents to be up-loaded on the website <http://jharkhandtenders.gov.in> in financial bid folder.
- 19.2.1. Form of bid has specified in Section-6 in pdf format.
- 19.3. Duly filled in & digitally signed BOQ.
- 19.4. Uploaded documents of successful bidder will be verified with the original before signing the agreement. The successful bidder has to provide the originals to the concerned authority on receipt of such a letter, which will be sent though registered post or speed post or delivered by hand.
- 19.5. Each uploading shall be digitally signed by the bidders.

20. Deadline for Submission of the Bids

20.1. Bidders shall follow the Method of submission of bid as mentioned in NIT/IFB.

The Employer may extend the deadline for submission of bids by issuing an amendment in accordance with **Clause 10**, in which case all rights and obligations of the Employer and the bidders previously subject to the original deadline will then be subject to the new deadline.

21. Late Bids

21.1. Any Bid received by the Employer after the deadline prescribed in Clause 20 will be returned to the bidder.

22. Modification and Withdrawal of Bids

22.1. Bidders may modify or withdraw their bids by giving notice in writing before the deadline prescribed in Clause 20 or pursuant to Clause 23.

22.2. Bidders shall follow the Method of submission modification & withdrawal of bid as mentioned in Instruction to Bidders(for SBD contract)

22.3. No bid may be modified after the deadline for submission of Bids except in pursuance of Clause 23.

22.4. Withdrawal or modification of a Bid between the deadline for submission of bids and the expiration of the original period of bid validity specified in Clause 15.1 above or as extended pursuant to clause 15.2 may result in the forfeiture of the Bid security pursuant to Clause 16.

E. Evaluation and Comparison of Bids

23. Bid Opening

23.1 The Employer will open all the Bids submitted online including modification made pursuant to Clause 22, in the manner specified in Clause 20 and 23.3. In the event of the specified date of Bid opening being declared a holiday for the Employer, the Bids will be opened at the appointed time and location on the next working day. A notice for the same shall be posted on the website.

23.2. Withdrawn bids shall be opened and read out first. Bids for which an acceptable notice of withdrawal has been submitted pursuant to clause 22 shall not be opened.

23.3 “Technical bid” shall be opened first. The amount, form and validity of the bid security furnished with each bid will be announced. If the bid security furnished does not conform to the amount and validity period as specified in the Invitation for Bid (ref. Column 4 and paragraph 3), and has not been furnished in the form specified in Clause 16, the said bid shall be outrightly rejected ~~not be opened~~/and processed further.

23.4.(i) Subject to confirmation of the bid security by the issuing bank, the bids accompanied with valid security will be taken up for evaluation with respect to the Qualification Information and other information furnished in Part I of the bid pursuant to clause 12.1.

(ii) After receipt of confirmation of the bid security, the bidder will be asked in writing/e-mail (usually within 10 days of opening of the Technical Bid) to clarify or modify his technical bid, if necessary, with respect to any rectifiable defects.

(iii) The bidders will respond by e-mail in not more than 7 days of issue of the clarification letter, which will also indicate the date, time and venue of opening of the Financial Bid (usually on the 21st day of opening of the Technical bid)

(iv) Immediately (usually within 3 or 4 days), on receipt of these clarifications the Evaluation Committee will finalize the list of responsive bidders whose financial bids are eligible for consideration.

23.5If, as a consequence of the modifications carried out by the bidder in response to sub-clause 23.4, the bidders desire to modify their financial bid, they will submit the modification online before the opening of the financial bid as intimated in the clarification letter (refer sub-clause 23.4).

23.6At the time of opening of “Financial Bid”, the names of the bidders found responsive in accordance with Clause 23.4(iv) will be announced. The bids of only these bidders will be opened. The remaining bids will remain unopened. The responsive Bidders’ names, the bid prices, the total amount of each bid, any discounts, Bid Modifications and withdrawals, and such other details as the Employer may consider appropriate, will be announced by the Employer at the opening. Any Bid price or discount, which is not read out and recorded will not be taken into account in Bid Evaluation.

23.7In case bids are invited in more than one package, the order for opening of the “Financial Bid” shall be that in which they appear in the “Invitation For Bid”.

23.8 The Employer shall prepare minutes of the Bid opening, including the information disclosed to those present in accordance with Sub-clause 23.6.23.

24. Process to be Confidential

24.1 Information relating to the examination, clarification, evaluation, and comparison of Bids and recommendations for the award of a contract shall not be disclosed to Bidders or any other persons not officially concerned with such process until the award to the successful Bidder has been announced. Any effort by a Bidder to influence the Employer's processing of Bids or award decisions may result in the rejection of his Bid.

25 Clarification of Financial Bids

25.1 To assist in the examination, evaluation, and comparison of Bids, the Employer may, at his discretion, ask any Bidder for clarification of his Bid, including breakdowns of unit rates. The request for clarification and the response shall be in writing or by cable, but no change in the price of substance of the Bid shall be sought, offered, or permitted except as required to confirm the correction of arithmetic errors discovered by the Employer in the evaluation of the Bids in accordance with Clause 27.

25.2 Subject to sub-clause 25.1, no Bidder shall contact the Employer on any matter relating to his bid from the time of the bid opening to the time the contract is awarded. If the bidder wishes to bring additional information to the notice of the Employer, it should do so in writing.

25.3 Any effort by the Bidder to influence the Employer in the Employer's bid evaluation, bid comparison or contract award decisions may result in the rejection of the Bidders' bid.

26 Examination of Bids and Determination of Responsiveness

26.1. During the detailed evaluation of "Technical Bids", the Employer will determine whether each Bid (a) meets the eligibility criteria defined in Clause 3 and 4; (b) has been properly signed; (c) is accompanied by the required securities and; (d) is substantially responsive to the requirements of the Bidding documents. During the detailed evaluation of the "Financial Bid", the responsiveness of the bids will be further determined with respect to the remaining bid conditions, i.e., priced bill of quantities, technical specifications, and drawings.

26.2. A substantially responsive "Financial Bid" is one which conforms to all the terms, conditions, and specifications of the Bidding documents, without material deviation or reservation. A material deviation or reservation is one (a) which affects in any substantial way the scope, quality, or performance of the Works; (b) which limits in

any substantial way, inconsistent with the Bidding documents, the Employer's rights or the Bidder's obligations under the Contract; or (c) whose rectification would affect unfairly the competitive position of other Bidders presenting substantially responsive Bids.

If a "Financial Bid" is not substantially responsive, it will be rejected by the Employer, and may not subsequently be made responsive by correction or withdrawal of the non-conforming deviation or reservation.

27. Correction of Errors

27.1. "Financial Bids" determined to be substantially responsive will be checked by the Employer for any arithmetical errors. Errors will be corrected by the Employer as follows:

- a) where there is a discrepancy between the rates in figures and in word, the rate in words will govern; and
- b) where there is a discrepancy between the unit rate and the line item total resulting from multiplying the unit rate by the quantity, the unit rate as quoted will govern.

27.2 The amount stated in the "Financial Bid" will be corrected by the Employer in accordance with the above procedure and the bid amount adjusted with the concurrence of the Bidder in the following manner:

- a) If the Bid price increases as a result of these corrections, the amount as stated in the bid will be the 'bid price' and the increase will be treated as rebate;
- b) If the bid price decrease as a result of the corrections, the decreased amount will be treated as the 'bid price'. Such adjusted bid price shall be considered as binding upon the Bidder. If the Bidder does not accept the corrected amount the Bid will be rejected, and the Bid security may be forfeited in accordance with Sub-clause 16.6(b)

28. Deleted.

29. Evaluation and Comparison of Financial Bids

29.1. The Employer will evaluate and compare only the Bids determined to be substantially responsive in accordance with Sub-Clause 26.2.

29.2 In evaluating the Bids, the Employer will determine for each Bid the evaluated Bid Price by adjusting the Bid Price as follows:

- (i) making any corrections for errors pursuant to clause 27; or
- (ii) making an appropriate adjustments for any other acceptable variations, deviations; and
- (iii) making appropriate adjustments to reflect discounts or other price modifications offered in accordance with Sub-Clause 23.6

In the financial bid, bidder should propose the Capital grant and O&M fee as given in format for financial bid.

The Financial Proposal of all the Bidders shall be evaluated based on the following formula:

Financial Support required from ULB =Capital Grant plus over all O&M Fee

- i. For the purpose of evaluation, O&M Fees shall mean the sum of present value of the amount quoted by the Bidder for the respective financial years multiplied by Volume of water in respective year in KL/day multiplied by 365 days, for 6 years.

O&M Fees = Σ {Present value of the amount of O&M Fees for 6 years} x Volume of water x 365

- ii. In case the Bidder does not quote amount of O&M Fees for any financial year the same will be taken as zero.

The present value of O&M Fees quoted by the Bidder shall be discounted at 5% (Say) would be used for final evaluation.

The present value (PV) of O&M Fees would be computed as

$$PV = O\&M1/(1.05)^1 + O\&M2/(1.05)^2 + O\&M3/(1.05)^3 + O\&M4/(1.05)^4 + O\&M5/(1.05)^5 + O\&M6/(1.05)^6$$

O&M1, O&M2, O&M3, O&M4, O&M5 & O&M6 are the Annual O&M Fees required during year1, year2, and up to year 6.

The evaluation of successful bidder shall be as under:

Total quoted cost for construction of the project (CAPEX) : X

NPV for O&M component: Y

Total cost of the project, $Z = X + Y$

The lowest total cost (Z) quoted by the bidder shall be selected.

- 29.3 The Employer reserves the right to accept or reject any variation or deviation. Variations and deviations and other factors, which are in excess of the requirements of the bidding documents or otherwise result in unsolicited benefits for the Employer shall not be taken into account in Bid evaluation.
- 29.4 The estimated effect of the price adjustment conditions under Clause 47 of the Conditions of Contract, during the period of implementation of the Contract, will not be taken into account in Bid evaluation.
- 29.5 If the Bid on the successful Bidder is seriously unbalanced in relation to the Engineer's estimate of the cost of work to be performed under the contract, the Employer may require the Bidder to produce detailed price analyses for any or all items of the Bill of Quantities, to demonstrate the internal consistency of those prices with the construction methods and schedule proposed. After evaluation of the price analyses, the Employer may require that the amount of the performance security set forth in clause 34 be increased at the expense of the successful Bidder to a level sufficient to protect the Employer against financial loss in the event of default of the successful Bidder under the Contract.
- 29.6 A bid which contains several items in the Bid Quantities which are unrealistically priced low and which cannot be substantiated satisfactorily by the bidder, may be rejected as non-responsive.

30. Deleted.

F. Award of Contract

31. Award of Criteria

31.1 Subject to Clause 30, the Employer will award the Contract to the Bidder whose Bid has been determined

- (i) to be substantially responsive to the bidding documents and who has offered the lowest evaluated Bid Price in accordance with the Clause no 29.2 ITB
- (ii) to be within the available bid capacity adjusted to account for his bid price which is evaluated the lowest in any of the packages opened earlier than the one under consideration. In no case, the contract shall be awarded to any bidder whose available bid capacity is less than the evaluated bid price, even if the said bid is the lowest evaluated bid. The contract will in such cases be awarded to the next lowest bidder at his evaluated bid price.

32. Employer's Right to accept or Reject any Bid or all Bids along with blacklisting for concealing any fact. In case the Bidder (By itself or in a Consortium or JV) is found to have been debarred or blacklisted by Union Government or any State Government or any Undertaking /PSU of the Union Government or any State Government.

32.1. Notwithstanding Clause 31, the Employer reserves the right to accept or reject any Bid to cancel the bidding process and reject all bids, at any time prior to the award of Contract, without thereby incurring any liability to the affected Bidder or Bidders or any obligation to inform the affected Bidder or Bidders of the grounds for the Employer's action.

32.2. Bidder would give an undertaking mentioning all the ongoing projects in detail. If it is found that any bidder has not mentioned even one ongoing project the bid will be rejected, if due to this the Bid capacity gets manipulated.

32.3. After Award of contract, if the Bidder is found to have concealed any fact relevant to projects, the Employer may blacklist the Bidder or Bidders within 180 days, with due process as -

- i) 3 Years Blacklisting for the Project Cost Rs. 2.50 Crore to Rs. 10.00 Crore
- ii) 5 Years Blacklisting for the Project Cost above Rs. 10.00 Crore to Rs. 100.00 Crore
- iii) 10 Years Blacklisting for the Project Cost above Rs. 100.00 Crore

33. Notification of Award and Signing of Agreement

- 33.1. The Bidder whose Bid has been accepted will be notified of the award by the Employer prior to expiration of the Bid validity period by cable, telex or facsimile confirmed by registered letter. This letter (hereinafter and in the Conditions of Contract called the “Letter of Acceptance”) will state the sum that the Employer will pay the contractor in consideration of the execution, completion, and maintenance of the Works by the contractor as prescribed by the contract (hereinafter and in the contract called the “Contract Price”).
- 33.2. The notification of award will constitute the formation of the Contract, subject only to the furnishing of a performance security in accordance with the provisions of Clause 34.
- 33.3. The Agreement will incorporate all agreements between the Employer and the successful Bidder. It will be signed by the Employer and sent to the successful Bidder, within 28 days following the notification of award along with the Letter of Acceptance. Within 21 days of receipt, the successful Bidder will sign the Agreement and deliver it to the Employer.
- 33.4. Upon the furnishing by the successful Bidder of the Performance Security, the Employer will promptly notify the other Bidders that their Bids have been unsuccessful.

34. Performance Security

- 34.1. Within 21 days of receipt of the Letter of Acceptance, the successful Bidder shall deliver to the Employer a Performance security in any of the forms given below. The performance security shall be of two types. First one shall be for an amount equivalent to 3% of the Capital cost plus additional security for unbalanced Bids in accordance with clause 29.5 of ITB and Clause 52 of Conditions of Contract. The second one shall be for an amount equivalent to 3% of O&M cost of two years and shall be submitted with revised amount after every two years.

A bank guarantee from any of the branches of Scheduled Bank situated within **territory of India** in the form given in Section 8; or Certified Cheque/Bank Draft as indicated in Appendix.

34.2. If the performance security is provided by the successful Bidder in the form of a Bank Guarantee, it shall be issued from any of the branches of Scheduled Bank situated within **territory of India**.

34.3. Failure of the successful Bidder to comply with the requirements of Sub-Clause 32.1 shall constitute grounds for cancellation of the award and forfeiture of the Bid Security.

34.3. Advance Payment and Security

35.1. The Employer will provide an Advance Payment on the Contract Price as stipulated in the Conditions of Contract, subject to maximum amount, as stated in the Contract Data.

36. Deleted.

37. Corrupt or Fraudulent Practices

37.1 The Employer will reject a proposal for award if it determines that the Bidder recommended for award has engaged in corrupt or fraudulent practices in competing for the contract in question and will declare the firm ineligible, either indefinitely or for a stated period of time, to be awarded a contract with National Highways Authority of India/State PWD and any other agencies, if at any time determines that the firm has engaged in corrupt or fraudulent practices in competing for the contractor, or in execution.

37.2 Furthermore, Bidders shall be aware of the provision stated in Sub-Clause 23.2 and Sub-Clause 59.2 of the Conditions of Contract.

38. Information Provided by the Employer/Bidders Due Diligence

38.1 Each Bidder is solely responsible for conducting its own independent research, due diligence, and any other work or investigations and for seeking any other independent advice necessary for the preparation of Bids, negotiation of agreements, and the subsequent delivery of all services to be provided by the Bidder that has been successful in the bidding process (the "Successful Bidder").

38.2 No representation or warranty, express or implied, is made and no responsibility of any kind is accepted by the Employer or its advisors, employees, consultants or agents, for the completeness or accuracy of any information contained in the Bidding Documents or the Response to Questions Document, or provided during the bidding process or during the term of the Contract. The Employer and its advisors, employees, consultants and agents shall not be liable to any person or entity as a result of the use of any information contained in the Bidding Documents or the Response to Questions Document, or provided during the bidding process or during the term of the Contract.

- 38.3 Bidders shall not rely on any oral statements made by the Employer or its advisors, employees, consultants or agents.
- 38.4 All Bidders shall, prior to submitting their Bid, review all requirements with respect to corporate registration and all other requirements that apply to companies that wish to conduct business in the Employer's country. The Bidders are solely responsible for all matters relating to their legal capacity to operate in the jurisdiction to which this bidding process applies.

APPENDIX to ITB

Clause Reference with respect to
Section-I

1. Name of the Employer is **JHARKAND URBAN INFRASTRUCTURE DEVELOPMENT COMPANY LIMITED, RANCHI** [Cl. 1.1]

2. The last five years' turnover (Contractor to submit the turnover statements duly signed by Chartered Accountant & for the cost of works executed and financial figure to a common base value for works completed)

Escalation factor

	Years before	multiplying factor
<input type="checkbox"/> 2013-2014	Five	1.61
<input type="checkbox"/> 2014- 2015	Four	1.46
<input type="checkbox"/> 2015- 2016	Three	1.33
<input type="checkbox"/> 2016- 2017	Two	1.21
<input type="checkbox"/> 2017-2018	One	1.10

3.	This average annual financial turn over amount is Rs 3,00,00,162/-	[Cl.4.5A.2(a)]
	(In Words: Rupees Three Crore One Hundred and Sixty Two Only)	
4.	Value of work is Rs. 3,15,29,040.00/-	[Cl.4.5A.2(b)]
	(In words: Rupees Three Crore Fifteen Lakhs Twenty Nine Thousand Eight Hundred and Ninety Two Only)	
5.	The Bidder shall provide evidence (certified by the relevant and respective during last 5 years preceding the bid submissions:	
	SL No.	Parameter

	(a)	Bidder or any one JV Partner Experience of building Faecal Sludge Treatment plant, Sewage treatment plant, solid waste management plant or similar work in last 5 years and undertaken work related to O & M of the plant constructed and desludging vehicles.	[Cl.4.5A.1]
	(b)	Must have been awarded and undertaken work for O & M of faecal sludge treatment plant or similar plant and desludging vehicles in last 5 year	[Cl.4.5A.1]
6, 7 and 8 Deleted			
9.		Liquid Assets and/or availability of credit facility is Rs. 31,52,904/-	[Cl. 4.5B(C)]
10.		Price level of the financial year 2018-2019.	[Cl. 4.7]
11.		*The pre-bid meeting will take place at Jharkhand Urban Infrastructure Development Company Ltd., 3rd Pragati Sadan (RRDA Building), Kutchery Chowk, Ranchi-834001 (Address of the venue) on 18.02.2019 at 14.00 Hrs. (time and date)	[Cl.9.2.1]
12.		The Technical bid will be opened at the office of the Project Director (T) , 3rd Pragati Sadan (RRDA Building), Kutchery Chowk, Ranchi 834001 On 05.03.2019 at 17.30 Hrs.	[Cl .23.1.]
13.		Address of the Employer- Managing Director, Jharkhand Urban Infrastructure Development Company Ltd., 3rd floor, Pragati Sadan (RRDA Building), Kutchery Chowk, Ranchi-834001.	
14.		Identification : Bid for Detailed procurement of equipment construction of FSTP and other allied structures, collection and transportation of septage from every house hold, Faecal Sludge treatment Plant including operation and maintenance of above system for Chirkunda Town for a period of 6 Years. (Name of Contract) Bid reference No. : JUIDCO/NIT/CHIRKUNDA SEPTAGE/TENDER/1810/2019/213 Do not open before 05.03.2019 at 17.30 Hrs (time and date)	[Cl. 19.2(b)]
15.		The bid should be submitted online latest by 02.03.2019 upto 17.00 Hrs (date and time)	[Cl. 20.1(a)]
16.		The Technical bid will be opened at the office of the Project Director (T), 3rd Pragati Sadan(RRDA Building), Kutchery Chowk, Ranchi-834001 on 05.03.2019 at 17.30 Hrs.	[Cl.23.1]
17.		The Bank draft in favour of Managing Director, Jharkhand Urban Infrastructure development Corporation Ltd., Ranchi , Payable at - Ranchi.	[Cl.34.1]
18.		Deleted	

ANNEXURE I: List of Key Plant & Equipment to be deployed on Contract work

(Reference: Section 3. Cl 1.1)

S.no	List of Equipments	Units
1	Concrete mixer - mechanical or hydraulic operated. Minimum capacity - 10 Cu.feet	3 nos
2	Vibrating Roller	1 nos
3	Backhoe loader	2 nos
4	Tractor with trailer	2 nos
5	Tipper - With payload capacity of minimum 10 tons	2 nos
7	Water tanker Truck mounted - minimum capacity 5 litres	1 nos
8	Formwork for concrete applications	1000 sq.m
9	Drilling machining - hole sizes 5 mm to 25 mm	2 nos
10	Total station survey theodolite	1 nos

Note*: Above mentioned equipments are minimum requirement and not limited to above numbers. Contractor may increase (but not reduce) as per requirement for the smooth construction activities.

** Slight modification in capacity and numbers may be allowed as per Bidder's design on approval of Employer.

ANNEXURE II: List of key Personnel to be deployed on Contract Work

S.no	List of personnel during Construction	Units
1	Site engineer - Minimum qualification - BE Civil engineering with 5 year experience in site	1
2	Site supervisor - Minimum qualification - Diploma in civil engineering with 10 year site experience	1
S.no	List of personnel during O&M	Units
1	Plant manager - Environmental engineering with 2 year experience of operating a Sewage treatment plant	1
2	Plant operator - Diploma with 5 years' experience in STP operations	2

Note*: Above mentioned staffs are minimum requirement and not limited to above personnel/numbers and contractor may increase (but not reduce) as per requirement for the smooth construction activities.

SECTION – 2
QUALIFICATION INFORMATION

QUALIFICATION INFORMATION

The information to be filled in by the bidder in the following pages will be used for purposes of post qualification as provided for in Clause 4 of the Instructions to Bidders. This information will not be incorporated in the Contract.

1. For Individual Bidders

1.1. Constitution or legal status of Bidder

[Attach copy]

Place of registration: _____

Principal place of business: _____

Power of attorney of signatory of Bid

[Attach]

1.2.	Total value of construction and O&M	2013- 2014
	Works (sewerage and septage sector) performed in the last five years**	2014- 2015
	(in Rs. Million)	2015- 2016
		2016- 2017
		2017- 2018

1.3.1. Work performed as prime contractor, work performed in the past as a nominated JV partners will also be considered provided the JV partners involved execution of all main items of work described in the bid document, provided further that all other qualification criteria are satisfied (in the same name) on works of a similar nature over the last five years.**

Project Name	Name of the Employer*	Description of work	Contract No.	Value of Contract (Rs crore)	Date of issue of work order	Stipulated Period of completion	Actual date of completion*	Remarks Explaining Reasons For delay & work Completed

* Attach certificate(s) from the Engineer(s)-in-Charge/EE from any Department / ULBs/RDA etc.

** Immediately preceding the financial year in which bids are received.

ᵇ Attach certificate from Chartered Accountant

#1.3.2. Capacities of work executed as prime contractor, work performed in the past as a nominated JV Partners, will also be considered provided the JV partners involved execution of all main items of work described in the bid document, provided further that all other qualification criteria are satisfied (in the same name and style) in the last five years**(only those projects are to presented which are required to satisfy the eligibility criteria.

Year	Name of the work	Name of the Employer*	Capacities of work performed @		Remarks* (indicate contract Ref)
			Capacities of STP (MLD)	Capacities of SWM Works (TPD)	
2013-2014					
2014-2015					
2015-2016					
2016-2017					
2017-2018					

1.4 Information on Bid capacity (works for which bids have been submitted and works which are yet to be completed) as on the date of this bid.

(A) Existing commitments and on-going works:

Description of works	Place & State	Contract No.	Name & Address of Employer	Value of Contract (Rs Cr)	Stipulated Period of Completion	Value of Works* remaining To be completed (Rs Cr)	Anticipated date of completion
1	2	3	4	5	6	7	8

* Attach certificate(s) from the Engineer(s)-in-Charge/EE/Employer

@ the item of work for which data is requested should tally with that specified in ITB clause 4.5 A.1.

** immediately preceding the financial year in which bids are received .

Delete, if prequalification has been carried out

Works for which bids already submitted:

Description Of work	Place & State	Name & Address of Employer	Estimated value of Works (Rs Cr)	Stipulated period of completion	Date when decision is expected	Remarks If any
1	2	3	4	5	6	7

1.5 Availability of key items of Contractor's Equipment essential for carrying out the Works (including Execution and O&M) [ref. Clause 4.5(B)(a). The Bidder should list all the information requested below. Refer also to Sub Clause 4.3(d) of the Instructions to Bidders.

Item of Equipment	Requirement		Availability Proposals			Remarks (from whom to be purchased)
	No.	Capacity	Owned/Leased to be procured	Nos./Capacity	Age/Condition	

1.6 Qualifications and experience of key personnel required for administration and execution and O&M of the Contract [Ref. Clause 4.5(B)(b)]. Attach biographical data. Refer also to sub Clause 4.3 (e) of instructions to Bidders and Sub Clause 9.1 of the Conditions of Contract.

Position	Name	Qualification	Year of Experience (General)	Years of experience in the Proposed position
For Construction Phase				
Project manager				
Etc...				
For Operational Phase				
Note Please add line as per requirement				

1.7. Proposed sub-contracts and firms involved. [Refer ITB Clause 4.3(k)]

Sanctions of the works	Value of Sub-contract	Sub-contractor (Name & Address), Contact Details	Experience in similar Work

--	--	--	--

1.8. Financial reports for the last five years: balance sheets, profit and loss statements, auditors’ reports (in case of companies/corporation), etc. List them below and attach copies.

1.9. Evidence of access to financial resources to meet the qualification requirements:

Cash in hand, lines of credit, etc. List them below and attach copies of support documents.

1.10. Name, address, and telephone, telex, and fax numbers of the Bidders’ bankers who may provide references if contacted by the Employer.

1.11. Information on litigation history in which the Bidder (both Lead and JV partners) is involved.

Lead And JV Partners	Employer	Cause of Dispute	Amount involved	Remarks showing Present Status

1.12. Statement of compliance under the requirements of Sub Clause 3.2 of the instructions to Bidders. (Name of Consultant engaged for project preparation is **)

1.13. Proposed work methods and schedule. The Bidder should attach descriptions, drawings and charts as necessary to comply with the requirements of the Bidding documents. [Refer ITB Clause 4.1 & 4.3 (1)]

1.14. Programme

1.15. Quality Assurance Programme

2. Additional Requirements.

2.1. Bidders should provide any additional information required to fulfill the requirements of Clause 4 of the Instructions to the Bidders, if applicable.

(i) Affidavit

(ii) Undertaking

*** (iii) Update of original pre qualification application

*** (iv) Copy of original pre qualification application

*** (v) Copy of pre qualification letter

(vi) Copy of letter of association in the form of agreement with subcontractor for the work defined or for any specialize / new engineering methodology work.

** Fill the Name of Consultant.

*** Delete, if pre qualification has not been carried out.

**SAMPLE FORMAT FOR EVIDENCE OF ACCESS TO OR
AVAILABILITY OF CREDIT FACILITIES**

(Clause 4.2 (i) OF ITB)

BANK CERTIFICATE

This is to certify that M/s. _____ is a reputed Company with a good financial standing.

If the contract for the work, namely _____ is awarded to the above firm, we shall be able to provide overdraft/credit facilities to the extent of Rs. _____ to meet their working capital requirements for executing the above contract during the contact period.

(Signature) Name of Bank

Senior Bank Manager Address of
the Bank

BID SECURITY (BANK GUARANTEE)

WHEREAS, _____ [name of Bidder] (hereinafter called "the Bidder") has submitted his Bid dated _ [date] for the construction of _____ [name of Contract hereinafter called "the Bid"].

KNOW ALL PEOPLE by these presents that We _____
[name of Bank] of _____ [name of country] having our registered office at _____ (hereinafter called "the Bank") are bound unto _____ [name of Employer's Representative] (hereinafter called "the Employer's Representative") in the sum of _____ * for which payment well and truly to be made to the said Employer's Representative the Bank itself, his successors and assigns by these presents.

SEALED with the Common Seal of the said Bank this _____ day of _____, 20_

THE CONDITIONS of this obligation are:

(1) If after Bid opening the Bidder withdraws his bid during the period of Bid validity specified in the Form of Bid;

OR

(2) If the Bidder having been notified to the acceptance of his bid by the Employer during the period of Bid Validity:

(a) fails or refuses to execute the Form of Agreement in accordance with the Instructions to Bidders, if required; or

(b) fails or refuses to furnish the Performance Security, in accordance with the Instructions to Bidders; or

(c) does not accept the correction of the Bid Price pursuant to Clause 27.

We undertake to pay to the Employer up to the above amount upon receipt of his first written demand, without the Employer having to substantiate his demand, provided that in his demand the Employer will note that the amount claimed by him is due to him owing to the occurrence of one or any of the three conditions, specifying the occurred condition or conditions.

This Guarantee will remain in force up to and including the date

_____ ** days after the deadline for submission of Bids as such deadline is stated in the Instructions to Bidders or as it may be extended by the Employer, notice of which extension(s) to the Bank is hereby waived. Any demand in respect of this guarantee should reach the Bank not later than the above date.

DATE SIGNATURE _____

WITNESS _____ SEAL _____

[Signature, name and address]

* The Bidder should insert the amount of the guarantee in words and figures denominated in Indian Rupees. This figure should be the same as shown in Clause 16.1 of the Instructions to Bidders.

** 45 days after the end of the validity period of the Bid. Date should be inserted by the Employer before the Bidding documents are issued.

AFFIDAVIT

1. I, the undersigned, do hereby certify that all the statements made in the required attachments are true and correct.

2. The undersigned also hereby certifies that neither our firm M/S _____ have abandoned any work of any Board, Corporation, and Government Undertaking /Organizations of State & Central government including all Public Sector Units /**Jharkhand Urban Infrastructure Development Company Ltd., Ranchi, Jharkhand** or any contract awarded to us for such work have been rescinded, during last five years prior to the date of this bid.

3. The undersigned hereby authorize(s) and request(s) any bank, person, firm or corporation to furnish pertinent information deemed necessary and requested by the Department to verify this statement or regarding my (our) competence and general reputation.

4. The undersigned understand and agrees that further qualifying information may be requested, and agrees to furnish any such information at the request of the Department/Project implementing agency.

(Signed by an authorized Officer of the Firm)

Title of officer

Name of Firm

DATE

UNDERTAKING

I, the undersigned do hereby undertake that our firm M/s _____
_____ would invest minimum cash up to 25% of the value of the work during
implementation of the Contract.

(Signed by an Authorized Officer of the Firm)

Title of Officer

Name of Firm

DATE

SECTION – 3
GENERAL CONDITIONS OF CONTRACT

General Conditions of Contract

Table of Contents

A. General	C. Quality Control
1. Definitions	33. Identifying Defects
2. Interpretation	34. Tests
3. Language and Law	35. Correction of Defects
4. Engineer's Decisions	36. Uncorrected Defects
5. Delegation	
6. Communications	D. Cost Control
7. Sub-contracting	37. Bill of Quantities
8. Other Contractors	38. Change in the Quantities
9. Personnel	39. Variations
10. Employer's & Contractor's Risks	40. Payments for Variations
11. Employer's Risks	41. Cash Flow Forecasts
12. Contractor's Risks	42. Payments Certificates
13. Insurance	43. Payments
14. Site Investigation Reports	44. Deleted
15. Queries about the Contract Data	45. Tax
16. Contractor to Construct the Works	46. Currencies
17. The Works to be completed by the intended Completion Date	47. Price Adjustment
18. Approval by the Engineer	48. Retention
19. Safety	49. Liquidated Damages
20. Discoveries	50. Bonus
21. Possession of the Site	51. Advance Payment
22. Access to the Site	52. Securities
23. Instructions	53. Deleted
24. Deleted	54. Cost of Repairs
25. Deleted	
26. Deleted	E. Finishing the Contract
	55. Completion
	56. Taking Over
	57. Final Account

B. Time Control	58.	Operating and Maintenance
27. Programme		Manuals
28. Extension of the Intended Completion Date	59.	Termination
29. Deleted	60.	Payment upon Termination
30. Delays Ordered by the Engineer	61.	Property
31. Management Meetings	62.	Release from Performance
32. Early Warning		

GENERAL CONDITIONS OF CONTRACT

A. GENERAL

1. Definitions

1.1 Terms which are defined in the Contract data are not also defined in the Conditions of Contract but keep their defined meanings. Capital initials are used to identify defined terms.

1.1.1. **The Adjudicator/ Arbitrator** synonymous with (Dispute Review Expert) is the person appointed jointly by the Employer and the contractor to resolve disputes in the first instance, as provided for in clause 24 and 25. It is to be conducted under the rules of Indian Arbitration and Conciliation Act, 1996 (26 of 1996) any statutory modifications or re-enactment thereof.

1.1.2. **Bill of Quantities** means the priced and completed Bill of Quantities forming part of the Bid.

1.1.3. The **Completion Date** is the date of completion of the Works as certified by the Engineer in accordance with Sub clause 55.1.

1.1.4. The **Contract** is the contract between the Employer and the Contractor to execute, complete and maintain the Works. It consists of the documents listed in Clause 2.3 below.

1.1.5. The **Contract Data** defines the documents and other information which comprise the Contract.

1.1.6. The **Contractor** is a person or corporate body whose Bid to carry out the Works has been accepted by the Employer.

1.1.7. The **Contractor's Bid** is the completed Bidding document submitted by the Contractor to the Employer and includes Technical and Financial bids.

1.1.8. The **Contract Price** is the price stated in the Letter of Acceptance and thereafter as adjusted in accordance with the provisions of the Contract.

1.1.9. **Days** are calendar days; **months** are calendar months.

1.1.10. A **Defect** is any part of the Works not completed in accordance with the Contract.

1.1.11. The **Defects Liability Period** is the period named in the contract Data and calculated from the date of completion of Construction.

1.1.12. The **Employer** is JUIDCo Ltd. (Jharkhand Urban Infrastructure Development Company), Ranchi, Jharkhand - who will employ the contractor to carry out the Works and monitor the capital works (construction phase and DLP). A tripartite agreement shall be signed between the main employer JUIDCo, the contractor and the ULB (Urban Local Body) of that town before the commencement of O&M works. Through this agreement, the ULB shall perform the role of employer during the O&M phase.

1.1.13. The **Employer's representative** will be the Project Manager, concerned to be notified by the Employer. The Employer's representative will act on behalf of Employers.

1.1.14. The **Engineer** is the person named in the Contract Data Awarding contract on behalf of Employer (or any other competent person appointed and notified to the contractor to act in replacement of the Engineer) who is responsible for supervising the Contract, administering the Contract, certifying payments due

- to the Contractor, issuing and valuing Variations to the Contract, awarding extensions of time & valuing the compensation events.
- 1.1.15. **Equipment** is the Contractor's machinery and vehicles brought temporarily to the Site to construct the Works.
- 1.1.16. The **Initial Contract Price** is the Contract Price listed in the Employer's Letter of Acceptance.
- 1.1.17. The **Intended Completion Date** is the date on which it is intended that the Contractor shall complete the Works. The Intended Completion Date is specified in the Contract Data. The Intended Completion date may be revised only by the Engineer by issuing an extension of time.
- 1.1.18. **Materials** are all supplies, including consumables, used by the contractor for incorporation in the Works.
- 1.1.19. **Plant** is any integral part of the Works which is to have a mechanical, electrical, electronic or chemical or biological function.
- 1.1.20. The **Site** is the area defined as such in the Contract Data.
- 1.1.21. **Site Investigation Reports** are those which were included in the Bidding documents and are factual interpretative reports about the surface and the sub-surface conditions at the site.
- 1.1.22. **Specification** means the Specification of the Works included in the Contract and any modification or addition made or approved by the Engineer.
- 1.1.23. The **Start Date** is given in the Contract Data. It is the date when the Contractor shall commence execution of the works. It does not necessarily coincide with any of the Site Possession Dates.
- 1.1.24. A **Subcontractor** is a person or corporate body who has a contract with the Contractor to carry out a part of the work in the Contract which includes work on the Site.
- 1.1.25. **Temporary Works** are works designed, consulted, installed, and removed by the contractor which are needed for construction or installation of the Works.
- 1.1.26. A **Variation** is an instruction given by the Engineer, which varies the works.
- 1.1.27. The **Works** are what the Contract requires the Contractor to construct, install, and turn over to the Employer, as defined in the Contract Data.
- 1.1.28. The **ULB** is Urban Local Body of a town - which under this contract is Chirkunda Municipal Corporation / Nagar Parishad/Nagar Panchayat.

2. Interpretation

- 2.1 In interpreting these Conditions of Contract, singular also means plural, male also means female or neuter, and the other way around. Headings have no significance. Words have their normal meaning under the language of the Contract unless specifically defined. The Engineer will provide instructions clarifying queries about the Conditions of Contract.
- 2.2 If sectional completion is specified in the Contract Data, references in the Conditions of Contract to the Works, the Completion Date, and the Intended Completion Date apply to any Section of the Works (other than references to the Completion date and Intended Completion date for the whole of the works).

2.3 The documents forming the Contract shall be interpreted in the following order of priority:

- (1) Agreement
- (2) Letter of Acceptance, notice to proceed with the works
- (3) Contractor's Bid
- (4) Contract Data
- (5) Conditions of Contract including Special Conditions of Contract
- (6) Specifications
- (7) Drawings
- (8) Bill of Quantities and
- (9) Any other document listed in the Contract Data as forming part of the Contract including IFB & ITB.

3. Language and Law

3.1 The language of the Contract and the law governing the contract are stated in the Contract Data.

4. Engineer's Decisions

4.1 Except where otherwise specifically stated, the Engineer will decide contractual matters between the Employer and the Contractor in the role representing the Employer.

5. Delegation

5.1 The Engineer may delegate any of his duties and responsibilities to other people after notifying the Contractor and may cancel any delegation after notifying the Contractor.

6. Communications

6.1 Communications between parties which are referred to in the conditions are effective only when in writing. A notice shall be effective only when it is delivered (in terms of Indian Contract act).

7. Sub-Contracting

7.1 The Contractor may sub-contract any portion of work, up to a limit specified in Contract Data, with the approval of the Engineer but may not assign the Contract without the approval of the Employer in writing. Sub-contracting does not alter the Contractor's obligations. Maximum number of Sub Contractor will be two and they

will have to meet all qualifying criteria in the ratio of work allotted. Peripheral works will only be permitted for sub-contracting and major works not to be considered. Peripheral works will not include work of High yield Tube well/Intake well/ Infiltration well/ Water Treatment Plant/ Pump machinery/ ESR/ UGR/Rising and Distribution main etc.

8. Other Contractors

8.1 The Contractor shall cooperate and share the site with other contractors, public authorities, utilities, and the Employer between the dates given in the Schedule of other Contractors. The contractors shall as referred to in the Contract Data, also provide facilities and services for them as described in the Schedule. The Employer may modify the schedule of other contractors and shall notify the contractor of any such modification.

9. Personnel

9.1 The Contractor shall employ the key personnel named in the Schedule of Key Personnel as referred to in the Contract Data to carry out the functions stated in the Schedule or other personnel approved by the Engineer. The Engineer will approve any proposed replacement of key personnel only if their qualification, abilities, and relevant experience are substantially equal to or better than those of the personnel listed in the schedule.

9.2 If the Engineer asks the Contractor to remove a person who is a member of the Contractor's staff of his work force stating the reasons the Contractor shall ensure that the person leaves the Site within seven days and has no further connection with the work in the Contract.

10. Employer's and Contractor's Risks

10.1 The Employer carries the risks which this Contract states are Employer's risks, and the contractor carries the risks which this Contract states are Contractor's risks.

11. Employer's Risks

11.1 The Employer is responsible for the expected risks which are (a) in so far as they directly affect the execution of the Works in India, the risks of war, hostilities, invasion, act of foreign enemies, rebellion, revolution, insurrection or military or usurped power, civil war, riot commotion or disorder (unless restricted to the Contractor's employees), and contamination from any nuclear fuel or nuclear waste or radioactive toxic explosive; or (b) a cause due solely to the design of the Works, other than the Contractor's design.

12. Contractor's Risks

12.1 All risks of loss or damage to physical property and of personal injury and death which arise during and in consequence of the performance of the Contract other than the excepted risks are the responsibility of the Contractor.

13. Insurance

- 13.1 The Contractor shall provide, in the joint names of the Employer and the Contractor, insurance cover from the Start Date to the end of the Defects Liability Period, in the amounts and deductibles stated in the Contract data for the following events which are due to the Contractor's risks:
- a) Loss of or damage to the Works, Plants and Materials;
 - b) Loss of or damage to Equipment;
 - (c) Loss of or damage of property (except the Works, Plant, Materials and Equipment) in connection with the Contract; and
 - (d) Personal injury or death.
- 13.2 Policies and certificates for insurance shall be delivered by the Contractor to the Engineer for the Engineer's approval before the Start Date. All such insurance shall provide for compensation to be payable in the types and proportions of currencies required to rectify the loss or damage incurred.
- 13.3 If the Contractor does not provide any of the policies and certificates required, the Employer may affect the insurance which the Contractor should have provided and recover the premiums the Employer has paid from payments otherwise due to the Contractor or, if no payment is due, the payment of the premiums shall be a debt due.
- 13.4 Alterations to the terms of insurance shall not be made without the approval of the Engineer.
- 13.5 Both parties shall comply with any conditions of the insurance policies.

14. Site Investigation Reports

- 14.1 The Contractor, in preparing the Bid, shall rely on any site investigation reports referred to in the Contract data, supplemented by any information available to the Bidder.

15. Queries about the Contract Data

- 15.1 The Engineer will clarify queries on the Contract Data.

16. Contractor to Construct the Works

- 16.1 The Contractor shall construct and install the Works in accordance with the Specification and Drawings.

17. The Works to be completed by the Intended Completion date

- 17.1 The Contractor may commence execution of the Works on the Start Date and shall carry out the Works in accordance with the programme submitted by the Contractor, as updated with the approval of the Engineer, and complete them by the Intended Completion Date.

18. Approval by the Engineer

- 18.1 The Contractor shall submit Specifications and Drawings, showing the proposed Temporary works to the Engineer, who is to approve them if they comply with the Specifications and Drawings etc.
- 18.2 The Contractor shall be responsible for design of Temporary Works.
- 18.3 The Engineer's approval shall not alter the Contractor's responsibility for design of the Temporary Works.
- 18.4 The Contractor shall obtain approval of Engineer to the design of the Temporary Works where required.
- 18.5 All drawings prepared by the Contractor for the execution of the temporary or permanent Works, are subject to prior approval by the Engineer before their use.

19. Safety

- 19.1 The Contractor shall be responsible for the safety of all activities on the Site.

20. Discoveries

- 20.1 Anything of historical or other interest or of significant value unexpectedly discovered on the site is the property of the Employer. The Contractor is to notify the Engineer of such discoveries and carry out the Engineer's instructions for dealing with them.

21. Possession of the Site

- 21.1 The Employer shall give possession of all parts of the site to the Contractor.

22. Access to the Site

- 22.1 The Contractor shall allow the engineer and any person authorized by the Engineer access to the Site, to any place where work in connection with the contract is being carried out or is intended to be carried out and to any place where materials or plant are being manufactured/ fabricated /assembled for the works.

23. Instructions

- 23.1 The Contractor shall carry out all instructions of the Engineer pertaining to works which comply with the applicable law where the site is located.
- 23.2 The Contractor shall permit the Employer to inspect the Contractor's accounts and records relating to the performance of the Contractor and to have them audited by auditors appointed by the Employer, if so required by the Employer.

24. Deleted.

25. Deleted.

26. Deleted.

B. TIME CONTROL

27. Programme

27.1 Within the time stated in the Contract Data the Contractor shall submit to the Engineer for approval a Programme showing the general methods, arrangements, order, and timing for all the activities in the Works along with monthly cash flow forecast.

27.2 An update of the Programme shall be a programme showing the actual progress achieved on each activity and the effect of the progress achieved on the timing of the remaining work including any changes to the sequence of the activities.

27.3 The Contractor shall submit to the Engineer, for approval, an updated Programme at intervals no longer than the period stated in the Contract data. If the Contractor does not submit an updated Programme within this period, the Engineer may withhold the amount stated in the Contract Data from the next payment certificate and continue to withhold this amount until the next payment after the date on which the overdue Programme has been submitted.

27.4 The Engineer's approval of the Programme shall not alter the Contractor's obligations. The Contractor may revise the Programme and submit it to the Engineer again at any time. A Revised Programme is to show the effect of Variations and Compensation Events.

28. Extension of the Intended Completion Date

28.1 The Engineer shall extend the Intended Completion Date if a Variation is issued which makes it impossible for Completion to be achieved by the Intended Completion Date without the Contractor taking steps to accelerate the remaining work and which would cause the Contractor to incur additional cost.

28.2 The Engineer shall decide whether and by how much to extend the Intended Completion date within 21 days of the Contractor asking the Engineer for a decision upon the effect of a Variation and submitting full supporting information. If the Contractor has failed to give early warning of a delay or has failed to cooperate in dealing with a delay, the delay by this failure shall not be considered in assessing the new Intended Completion Date.

28.3 The Engineer shall within 14 days of receiving full justification from the contractor for extension of Intended Completion Date refer to the Employer his decision. The Employer shall in not more than 21 days communicate to the Engineer the acceptance or otherwise of the Engineer's decision. The contractor will have to extend the date of Performance Security according to new Intended completion date (validity date of Bank Guarantee etc)

29. Deleted

30. Delays Ordered by the Engineer

30.1 The Engineer may instruct the Contractor to delay the start or progress of any activity within the Works.

31. Management Meetings

31.1 Either the engineer or the Contractor may require the other to attend a management meeting. The business of a management meeting shall to review the plans for remaining work and to Deal with matters raised in accordance with the early warning procedure.

31.2 The Engineer shall record the business of management meetings conducted at least once in a month to review progress of work / plan for completion of remaining works and is to provide copies of his record to those attending the meeting and to the Employer. The responsibility of the parties for actions to be taken is to be decided by the Engineer either at the management meeting or after the management meeting and stated in writing to all who attended the meeting.

32. Early Warning

32.1 The Contractor is to warn the Engineer at the earliest opportunity of specific likely future events or circumstances that may adversely affect the quality of the work, increase the Contract Price or delay the execution of works. The Engineer may require the Contractor to provide an estimate of the expected effect of the future event or circumstance on the Contract Price and Completion Date. The estimate is to be provided by the Contractor as soon as reasonably possible.

32.2 The Contractor shall cooperate with the Engineer in making and considering proposals for how the effect of such an event or circumstance can be avoided or reduced by anyone involved in the work and in carrying out any resulting instruction of the Engineer.

C. QUALITY CONTROL

33. Identifying Defects

33.1 The Engineer shall check the Contractor's work and notify the Contractor of any defects that are found. Such checking shall not affect the Contractor's responsibilities. The Engineer may instruct the Contractor to search for a Defect and to uncover and test any work that the Engineer considers may have a Defect.

34. Tests

34.1 If the Engineer instructs the Constructor to carry out a test not specified in the Specification to check whether any work has a Defect and the test shows that it does, the Contractor shall pay for the test and any samples.

35. Correction of Defects

- 35.1 The Engineer shall give notice to the contractor of any Defects before the end of the Defects Liability Period, which begins at completion and is defined in the Contract Data. The defects Liability Period shall be extended for as long as defects remain to be corrected.
- 35.2 Every time notice of a defect is given, the Contractor shall correct the notified Defect within the length of time specified by the Engineer's notice.

36. Uncorrected Defects

- 36.1 If the contractor has not corrected a Defect within the time specified in the Engineer's notice, the Engineer will assess the cost of having the Defect corrected, and the Contractor will pay this amount.

D. COST CONTROL

37. Bill of Quantities

- 37.1 The Bill of Quantities shall contain items for the construction, installation, testing, and Commissioning work etc. to be done by the Contractor.
- 37.2 The Bill of Quantities is used to calculate the Contract Price. The Contractor is paid for the quantity of the work done at the rate in the Bill of Quantities for each item. Cost of Project is to be controlled by controlling the quantities of work mentioned in the Bill of Quantities.

38. Changes in the Quantities

- 38.1 If the final quantity of the work done differs from the quantity in the Bill of Quantities for the particular item by more than 25 percent provided the change exceeds 1% of initial Contract Price, the Engineer shall adjust the rate to allow for the change, duly considering.
- (a) Justification for rate adjustment as furnished by the contractor,
 - (b) Economics resulting from increase in quantities by way of reduced plant, equipment, and overhead costs,
 - (c) Compensation events.
- 38.2 The Engineer shall not adjust rates from changes in quantities if thereby the Initial Contract Price is exceeded by more than 10 percent, except with the Prior approval of the Employer.
- 38.3 If requested by the Engineer, the Contractor shall provide the Engineer with a detailed cost breakdown of any rate in the Bill of Quantities.

39. Variations

- 39.1 All Variations shall be included in updated Programmes produced by the Contractor.

40. Payments for Variations

- 40.1 The Contractor shall provide the Engineer with a quotation (with breakdown of unit rates) for carrying out the Variation when requested to do so by the Engineer. The Engineer shall assess the quotation, which shall be given within seven days of the request or within any longer period stated by the Engineer and before the Variation is ordered.
- 40.2 If the work in the Variation corresponds with an item description in the Bill of Quantities and if, in the opinion of the Engineer, the quantity of work above the limit stated in Sub Clause 38.1 or the timing of its execution do not cause the cost per unit of quantity to change, the rate in the Bill of Quantities shall be used to calculate the value of Variation. If the cost per unit of quantity changes, or if the nature of timing of the work in the Variation does not correspond with items in the Bill of Quantities, the quotation by the contractor shall be in the form of new rates for the relevant items of work.
- 40.3 If the Contractor's quotation is unreasonable, the Engineer may order the Variation and make a change to the Contract Price which shall be based on Engineer's own forecast of the effects of the variation on the Contractor's costs.
- 40.4 The Contractor shall not be entitled to additional payment for costs which could have been avoided by giving early warning.

41. Cash Flow Forecasts

- 41.1 When the Programme is updated, the contractor is to provide the engineer with an updated cash flow forecast.

42. Payment Certificates

- 42.1 The Contractor shall submit to the Engineer monthly statements of the estimated value of the work completed less the cumulative amount certified previously.
- 42.2 The Engineer shall check the Contractor's monthly statement within 14 days and certify the amount to be paid to the Contractor.
- 42.3 The value of work executed shall be determined by the Engineer.
- 42.4 The value of work executed shall comprise the value of the quantities of the items in the Bill of Quantities completed
- 42.5 The value of work executed shall include the valuation of Variations.
- 42.6 The Engineer may exclude any item certified in a previous certificate or reduce the proportion of any item previously certified in any certificate in the light of later information.

43. Payments

- 43.1 Payments shall be adjusted for deductions for advance payments, retention, other recoveries in terms of contract and taxes at source, as applicable under the law. The Employer shall pay the Contractor the amounts certified by the Engineer as soon as possible. No interest/ claim will be entertained by the Dept. for delayed payment.

43.2 Items of the Works for which no rate or price has been entered in will not be paid for by the Employer and shall be deemed covered by other rates and prices in the Contract.

44. Deleted.

45. Tax

- Before submitting a tender, the bidder will be deemed to have satisfied himself by actual inspection of the site and locality of the works, that all conditions liable to be encountered during the execution of the works are taken into account and the rates he enters in the tender forms are adequate and all inclusive to accord with the provision laid down in the Standard Bidding Document (SBD) for the completion of works to the entire satisfaction of the Engineer In-charge.
- Bidders will examine the various provisions of The Central Goods and Service Tax Act, 2017 (CGST)/Integrated Goods and Service Tax Act, 2017 (IGST)/ Union Territory Goods and Service Tax Act, 2017 (UTGST)/ respective state's State Goods and Service Tax Act (SGST) also, as notified by Central/State Govt. and as amended from time to time and applicable taxes before bidding. Bidders will ensure that full benefit of Input Tax Credit (ITC) likely to be availed by them is duly considered while quoting rates.
- The successful bidder who is liable to be registered under CGST/IGST/UTGST/SGST Act shall submit GSTIN along with other details required under CGST/IGST/UTGST/SGST Act to The Jharkhand Urban Infrastructure Development Company Limited (JUIDCo) immediately after the award of contract, without which no payment shall be released to the contractor. The contractor shall be responsible for deposition of applicable GST to the concerned authority.
- In case the successful bidder is not liable to be registered under CGST/IGST/UTGST/SGST Act, JUIDCo shall deduct the applicable GST from his/their bills under reverse charge mechanism (RCM) and deposit the same to the concerned authority.

46. Currencies

46.1 All payments shall be made in Indian Rupees.

47. Deleted

48. Retention

48.1 The Employer shall retain from each payment due to the Contractor the proportion stated in the Contract Data until Completion of the whole of the Works.

48.2 On Completion of the whole of the Works half the total amount retained is repaid to the contractor and half when the Defects Liability Period has passed and the Engineer

has certified that all Defects notified by the Engineer to the Contractor before the end of this period have been corrected.

- 48.3 On request of agency the retention money may be return to him on submission of B.G.of equivalent amount with adequate validity but only after the retention money becomes 50% of the total retention money of the project.

49. Liquidated Damages

- 49.1 The Contractor shall pay liquidated damages to the Employer at the rate per day stated in the Contract data for each day that the Completion Date is later than the Intended Completion Date (for the whole of the works or the milestones as stated in the contract data). The total amount of liquidated damages shall not exceed the amount defined in the Contract Data. The Employer may deduct liquidated damages from payments due to the Contractor. Payment of liquidated damages does not affect the Contractor's liabilities.
- 49.2 If the Intended Completion date is extended after liquidated damages have been paid, the Engineer shall correct any over payment of liquidated damages by the Contractor by adjusting the next payment certificate. The Contractor shall be paid interest on the over payment calculated from the date of payment to the date of repayment at the rates specified in Sub Clause 43.1.
- 49.3 If the Contractor fails to comply with the time for completion as stipulated in the tender, then the contractor shall pay to the Employer the relevant sum stated in the Contract Data as Liquidated damages for such default and not as penalty for everyday or part of day which shall elapse between relevant time for completion and the date stated in the taking over certificate of the whole of the works on the relevant section, subject to the limit stated in the contract data. The Employer may, without prejudice to any other method of recovery deduct the amount of such damages from any monies due or to become due to the contractor as per relevant recovery laws.. The payment or deduction of such damages shall not relieve the contractor from his obligation to complete the works on form any other of his obligations and liabilities under the contract.
- 49.4 If, before the Time for Completion of the whole of the Works or, if applicable, any Section, a Taking – Over Certificate has been issued for any part of the Works or of a Section, the liquidated damages for delay in completion of the remainders of the Works or of that Section shall, for any period of delay after the date stated in such Taking-Over Certificate, and in the absence of alternative provisions in the Contract, be reduced in the proportion which the value of the part so certified bears to the value of the whole of the Works or Section, as applicable. The provisions of this Sub-Clause shall only apply to the rate of liquidated damages and shall not affect the limit thereof.

50. Bonus

- 50.1 If the contractor achieves completion of the whole of the works prior to the Intended Completion date prescribed in Contract Data the Employer shall pay to the contractor a sum stated in Contract Data as bonus for every completed month which shall elapse between the date of completion of all items of works as stipulated in the contract, including variations ordered by the Engineer and the time prescribed in Clause 17.

For the purpose of calculating bonus payments, the time given in the Bid for completion of the whole of the works is fixed and unless otherwise agreed, no adjustments of the time by reason of granting an extension of time pursuant to Clause 28 or any other clause of these conditions will be allowed. Any period falling short of a complete month shall be ignored for the purpose of computing the period relevant for the payment of bonus.

51. Advance Payment

51.1 The Employer shall make advance payment to the Contractor of the amounts stated in the Contract Data by the date stated in the Contract Data, against provision by the Contractor of an Unconditional Bank Guarantee in a form and by a bank acceptable to the Employer in amounts and currencies equal to the advance payment. The guarantee shall remain effective until the advance payment has been repaid, but the amount of guarantee shall be progressively reduced by the amounts repaid by the Contractor. Interest will not be charged on the advance payment.

51.1.1 The Mobilization Advance will be interest bearing at an interest rate of 10% per annum.

51.1.2 The Bank Guarantee taken towards security of Mobilization Advance shall be 110% of the advance

51.1.3 Mobilization Advance shall be released in not less than two equal installments subject to the submission of certificate on part of the Agency relating to the progress of work and Mobilization of required equipments (Utilization Certificate of the first installment).

51.2 The Contractor is to use the advance payment only to pay for Equipment, Plant and for Mobilization expenses required specifically for execution of the works. The Contractor shall demonstrate that advance payment has been used in this way by supplying copies of invoices or other documents.

51.3 The advance payment shall be repaid by deducting proportionate amounts from payments otherwise due to the Contractor, following the schedule of completed percentages of the Works on a payment basis. No account shall be taken of the advance payment or its repayment in assessing valuations of work done, Variations, price adjustments, or Liquidated Damages.

51.4 Deleted

52. Securities

52.1 The Performance Security (including additional security for unbalanced bids) shall be provided to the Employer no later than the date specified in the Letter of Acceptance and shall be issued in an amount and form and by a bank or surety acceptable to the Employer, and denominated in Indian Rupees. The Performance Security shall be valid until a date 28 days from the date of expiry of Defects Liability Period and the additional security for unbalanced bids shall be valid until a date 28 days from the date of issue of the certificate of completion.

52.2 The person/persons whose tender(s) may be accepted (hereinafter called the contractor) shall permit Government at the time of making any payment to him for work done under the contract to deduct a sum of 9% (Nine percent) from the gross

amount of each running bill till full amount of security deposit 10% (ten percent) of agreement value or value of work (whichever is higher) is reached. If value of work exceeds the agreement value, security deposit (10%) will be recovered for the exceeded work

53. Deleted

54. Cost of Repairs

- 54.1 Loss or damage to the Works or Materials to be incorporated in the Works between the Start Date and the end of the defects Correction periods shall be remedied by the Contractor at the Contractor's cost if the loss or damage arises from the Contractor's acts or omissions.

E. FINISHING THE CONTRACT

55. Completion

- 55.1 The Contractor shall request the Engineer to issue a Certificate of Completion of the Works and the Engineer will do so upon deciding that the Work is completed.

56. Taking Over

- 56.1 The Employer shall take over the Site and the Works within seven days of the Engineer issuing a certificate of Completion.

57. Final Account

- 57.1 The Contractor shall supply to the Engineer a detailed account of the total amount that the Contractor considers payable under the contract before the end of the Defects Liability Period. The Engineer shall issue a Defect Liability Certificate and certify any final payment that is due to the Contractor within 56 days of receiving the Contractor's account if it is correct and complete. If it is not, the Engineer shall issue within 56 days a schedule that states the scope of the corrections or additions that are necessary. If the Final Account is still unsatisfactory after it has been resubmitted, the Engineer shall decide on the amount payable to the Contractor and issue a payment certificate, within 56 days of receiving the Contractor's revised account.

58. Operation and Maintenance Manuals

- 58.1 If "as built" Drawings and/or operating and maintenance manuals are required, the Contractor shall supply them by dates stated in the Contract Data.
- 58.2 If the Contractor does not supply the Drawings and/or manuals by the dates stated in the Contract Data, or they do not receive the Engineer's approval, the Engineer shall withhold the amount stated in the Contract Data from payments due to the Contractor.

59. Termination

59.1 The Employer or the Contractor may terminate the Contract if the other party causes a fundamental breach of the Contract.

59.2 Fundamental breaches of Contract include, but shall not be limited to the following:

- (a) The Contractor stops work for 28 days when no stoppage of work is shown on the current Programme and the stoppage has not been authorized by the Engineer;
- (b) The Engineer may instruct the Contractor to delay the progress of the Works and the instruction is not withdrawn within 28 days;
- (c) The Employer or the Contractor is made bankrupt or goes into liquidation other than for a reconstruction or amalgamation;;
- (d) A payment certified by the Engineer is not paid by the Employer to the Contractor within 56 days of the date of the Engineer's certificate.
- (e) The Engineer gives Notice that failure to correct a particular Defect is a fundamental breach of Contract and the Contractor fails to correct it within a reasonable period of time determined by the Engineer.
- (f) The Contractor does not maintain a security which is required;
- (g) The Contractor has delayed the completion of works by the number of days for which the maximum amount of liquidated damages can be paid as defined in the Contract data; and
- (h) If the Contractor, in the judgment of the Employer has engaged in corrupt or fraudulent practices in competing for or in executing the Contract.

For the purpose of this paragraph: "corrupt practice" means the offering, giving, receiving or soliciting of anything of value to influence the action of a public official in the procurement process or in contract execution. "Fraudulent practice" means a misrepresentation of facts in order to influence a procurement process or the execution of a contract to the detriment of the Borrower, and includes collusive practice among Bidders (prior to or after bid submission) designed to establish bid prices at artificial non-competitive levels and to deprive the Borrower of the benefits of free and open competition."

59.3 When either party to the Contract gives notice of a breach of contract to the Engineer for a cause other than those listed under Sub Clause 59.2. above, the Engineer shall decide whether the breach is fundamental or not.

59.4 Notwithstanding the above, the Employer may terminate the Contract for convenience.

59.5 If the Contract is terminated the Contractor shall stop work immediately, make the Site safe and secure and leave the Site as soon as reasonably possible.

60. Payment upon Termination

60.1 If the Contract is terminated because of a fundamental breach of Contract by the Contractor, the Engineer shall issue a certificate for the value of the work done less advance payments received up to the date of the issue of the certificate, less other

recoveries due in terms of the contract, less taxes due to be deducted at source as per applicable law and less the percentage to apply to the work not completed as indicated in the Contract Data. Additional Liquidated Damages shall not apply. If the total amount due to the Employer exceeds any payment due to the Contractor shall be a debt payable to the Employer.

- 60.2 If the Contract is terminated at the Employer's convenience or because of a fundamental Breach of Contract by the Employer, the Engineer shall issue a certificate for the value of the work done, the cost of balance by the contractor and available at site, the reasonable cost of removal of Equipment, a repatriation of the Contractor's personnel employed solely on the Works, and the Contractor's costs of protecting and securing the Works and less advance payments received due in terms of the contract and less taxes due to be deducted at source as per applicable law.

61. Property

- 61.1 All materials on the Site, Plant, Equipment, Temporary Works and Works are deemed to be the property of the Employer, if the Contract is terminated because of a Contractor's default.

62. Release from Performance

- 62.1 If the Contract is frustrated by the outbreak of war or by any other event entirely outside the control of either the Employer or the Contractor the Engineer shall certify that the Contract has been frustrated. The Contractor shall make the Site safe and stop work as quickly as possible after receiving this certificate and shall be paid for all work carried out before receiving it and for any work carried out afterwards to which commitment was made.

**SECTION – 4
CONTRACT DATA**

CONTRACT DATA

Clause Reference With respect to section 3

Items marked "N/A" do not apply in this contract.

1. The Employer is [Cl.1.1.12]

Name: **JUIDCo Ltd Ranchi.**

Address: JUIDCo Ltd, 3rd Floor, Pragati Sadan, Kachahari Chawk Ranchi-834001

Name of Employer's Representative:- Project Director (Technical) JUIDCO Ltd Ranchi

2. The Engineer is:- To be Informed Later . [Cl.1.1.14]

3. The dispute review expert appointed by as per [Cl. 1. 1.1]

Name -----NA-----

Address -----

4. The Defects Liability Period (DLP) is 90 days from the date of Construction completion. These 3 months includes one month of Trail run. [Cl. 1. 1.10]

5. The Start Date shall be 07 days for the date of issue of the Notice to proceed with the work. [Cl.1.1.23]

6. The Intended Completion Date for the whole of the Works is 10 months construction including 1 month trial run followed by 6 years of O & M including initial 3 months of DLP.

[Cl.1.1.17&17, &28]

Months after start of work with the following milestones: [Cl.1.9 & 49.1]

Physical works to be completed. Period from the start date

Milestone dates: [Cl.1.9 &49.1]

As per Clause No 42 of Contract Data

- 7 The Site is located at Chirkunda town area as shown in the location Map [Cl. 1.1.28]

8. The name and identification number of the Contract is as per Tender Notice

[Refer NIT]

9. The works consist of **Fecal Sludge Management Scheme, Jharkhand - including:**

- a) **Procurement of equipments and provision of services for collection and transportation of septage from households;**
- b) **Supply, construction, installation, testing and commissioning of septage treatment plant at Chirkunda Town; and**
- c) **Operation and maintenance of the above system for 06 years including public outreach activities and collection of user charges from consumers.**

Under Urban Development Department Jharkhand.

The works shall, inter alia, include the following, as specified or as directed:

10. Scope of work:

Fecal Sludge Management Scheme of Chirkunda, Jharkhand - including:

- a) **Procurement of equipments and provision of services for collection and transportation of Septage from Households;**
- b) **Supply, Construction, installation, testing and commissioning of Septage Treatment Plant at Chirkunda; and**
- c) **Operation and maintenance of the above system for 06 years including public outreach activities and collection of user charges from consumers.**

And as per detailed Technical Specifications presented in Section 6 of this bid document

Other Items:

Any other items as required to fulfill all contractual obligations as per the Bid documents.

The following documents also form part of the Contract: [Cl. 2.3 & (9)]

- a) Standard drawings released for tender purpose
- b) -
- c) -

.....

- 11. The law which applies to the Contract is the law of Union of India [Cl. 3.1]
- 12. The language of the Contract documents is English [Cl. 3.1]

13. Limit of subcontracting 10 % of the Initial Contract Price only for transportation of sewage from house hold to treatment plant. [Cl. 7.1]

14. The Schedule of Other Contractors ----- [Cl. 8]

Clause Reference: With respect to Section3

15. The Schedule of Key Personnel As per Annex.-II to Section I [Cl.9]

16. The minimum insurance cover for physical property, injury and death [Cl.13]

is Rs.2.5 lakhs per occurrence with the number of occurrences limited to four. After each occurrence, contractor will pay additional premium necessary to make insurance valid for four occurrences always.

17. Site investigation report. [Cl.14]

18. The Site Possession Dates shall be [Cl.21]

19. *Deleted*

20. *Deleted*

21. The period for submission of the programme for approval of Engineer shall be 21 days from the issue of Letter of Acceptance. [Cl.27.1]

22. The period between programme updates shall be 90 days. [Cl.27.3]

23. The amount to be withheld for late submission of an updated programme shall be Rs. 1.00 Lakhs per occurrence limited to maximum 10% of the contract value.

24. *Deleted*

25. The currency of the Contract is Indian Rupees. [Cl. 46& 46.1]
clause Reference with respect to section 3

26. *Deleted* [Cl. 47]

27. The proportion of payments retained (retention money) shall be 9 % from each bills subject to a maximum of 10% of final contract price including Performance Security money. [Cl. 48]

28. Amount of liquidated damages for delay in completion of works: [Cl.49]

For whole of work: $(1/2000)^{\text{th}}$ of the Initial Contract Price, rounded off to the nearest Thousand, per day.

For part completion: $(1/200)^{\text{th}}$ of Initial Contract Price, rounded off to the nearest Thousand per day.

29. Maximum limit of liquidated damages for delay in completion of work. [Cl. 49]
10 per cent of the Initial Contract Price rounded off to the nearest thousand.

30. Amount of Bonus for early completion
1 per cent of the Initial Contract Price (excluding O&M cost) (part of a month to be excluded), rounded off to the nearest thousand per month. [Cl. 50]

32. Maximum limit of bonus for early completion
6 per cent of the Contract Price rounded off to the nearest thousand. (excluding O&M cost) [Cl. 50]

32. The amounts of the advance payment are: [Cl. 51 & 52]

Nature of Advance	Amount (Rs.) Conditions to be fulfilled
i. Mobilization – 10% of the Construction Contract price (CAPEX)	On submission of un-conditional Bank Guarantee, (to be drawn before the end of 20% of Contract period). The contractor will furnish part ‘Bank Guarantees’ (BGs) against the Mobilization advance shall be taken in as many numbers as the proposed milestones in Contract Data

33. Repayment of advance payment for mobilization and equipment: [Cl. 51.3]

The advance loan shall be repaid with percentage deductions from the interim payments certified by the Engineer under the Contract. Deductions shall commence in the next Interim Payment Certificate following that in which the total of such payments to the contractor has reached not less than 20 per cent of the Contract Price or 6 months from the date of payment first installment of advance, whichever period concludes earlier, and shall made at the rate of 20 per cent of the amounts of all Interim Payment Certificates until such time as the loan has been repaid, always provided that the loan shall be completely repaid prior to the expiry of the original time for completion pursuant to Clauses 17 and 28 (COC). In case of non-achievement of milestone and accordingly non-production of running bills and consequently non-recovery of Mobilization advance, the part BG against the Mobilization advance to that extent shall be forfeited.

35. The Securities shall be for the following minimum amounts equivalent as a percentage of the Contract Price: [Cl. 52]

Performance security (Capital Works):

The additional performance security in accordance with ITB Clause No. 29.5 for Capital Works shall be arrived as below:

The maximum rates against capex i.e. construction cost shall not exceed +/- 10% of the estimated cost of capex as defined in the tender notice of the Standard Bidding Document (SBD). The bidder quoting more than +/- 10% of the estimated cost of capex as construction cost shall submit rate justification. Further, the bidder will also be asked to furnish additional performance guarantee of difference of amount between bidders quoted price for the capex and the estimated cost of capex as defined in SBD to JUIDCo as on demand.

JUIDCo at their own discretion may also ask to furnish additional performance guarantee of the difference amount with respect to bidder's quoted price for capex and the estimated cost for capex as defined in this Standard Bidding Document (SBD). The additional performance guarantee, if asked, shall be inclusive of the overall ceiling of +/- 10%.

Example:

Estimated Cost for Capex : Rs. 30.00 Cr

Acceptable Limit for bidder's quoting rate : Not to exceed Rs. 33.00 Cr on higher side

Not to exceed Rs. 27.00 Cr on lower side

Case-1 Bidder Quoting More Than 10% Rates for Capex:

Quoted Rate by Bidder for Capex :Rs. 35.00 Cr

Above/Below wrt estimated cost of capex :(+) 16.67%

Additional Performance Guarantee Required:Rs. 35.00 Cr – Rs. 33.00 Cr = Rs. 2.00 Cr

Case-2 Bidder Quoting Less Than 10% Rates for Capex:

Quoted Rate by Bidder for Capex :Rs. 26.00 Cr

Above/Below wrt estimated cost of capex :(-) 13.33%

Additional Performance Guarantee Required:Rs. 27.00 Cr – Rs. 26.00 Cr = Rs. 1.00 Cr

Performance security (O&M Works):

This shall be for an amount equivalent to 3% of O&M cost of two years and shall be submitted with revised amount after every two years.

The standard form of Performance Security acceptable to the Employer shall be an unconditional Bank Guarantee of the type as presented in Section 8 of the Bidding Documents. [Cl 50][Cl.50]

36. The Schedule of Operation and Maintenance Manuals _____ [Cl.58]
As specified in Technical specification
37. The date by which "as-built" drawings (in scale as directed) in 2 sets are required is within 28 days of issue of certificate of completion of whole or section of the work, as the case may be. [Cl. 58]
38. The amount to be withheld for failing to supply "as built" drawings by the date required is Rs 2.00 Lakhs. [Cl. 58]
39. The following events shall also be fundamental breach of contract: [Cl.59.2]
"The Contractor has contravened Sub-clause 7.1 and Clause 9 of GCC."
40. The percentage to apply to the value of the work not completed representing the Employer's additional cost for completing the Works shall be 20 per cent. [Cl. 60]
41. In the Price Schedules, Bidders shall give the required details and a breakdown of their prices as follows:
- (i) Price for Construction Services shall be quoted Item wise.
 - (ii) Price for Operations and Maintenance Services shall be quoted as per year O&M cost.

42. Terms of Payment

1.1 General

The Employer shall pay the Operator in the manner and at the times set out in this Terms and Procedures of Payment.

1.2 Payment during construction period.

(a) Mobilisation Advance:

- (i) The Mobilization Advance will be interest bearing at an interest rate of 10% per annum on submission of un-conditional Bank Guarantee, (to be drawn before the end of 20% of Contract period). The contractor will furnish part 'Bank Guarantees' (BGs) against the Mobilization advance shall be taken in as many numbers as the proposed milestones in Contract Data
- (ii) The Bank Guarantee taken towards security of Mobilization Advance shall be 110% of the advance.
- (iii) Mobilization Advance shall be released in not less than two equal installments subject to the submission of certificate on part of the Agency relating to the progress of work and Mobilization of required equipments (Utilization Certificate of the first installment).

(b) Repayment of Mobilisation advance

The advance loan shall be repaid with percentage deductions from the interim payments certified by the Engineer under the Contract. Deductions shall commence in the next Interim Payment Certificate following that in which the total of such payments to the contractor has reached not less than 20 per cent of the Contract Price or 6 months from the date of payment first instalment of advance, whichever period concludes earlier, and shall made at the rate of 20 per cent of the amounts of all Interim Payment Certificates until such time as the loan has been repaid, always provided that the loan shall be completely repaid prior to the expiry of the original time for completion pursuant to Clauses 17 and 28 (COC). In case of non-achievement of milestone and accordingly non-production of running bills and consequently non-recovery of Mobilization advance, the part BG against the Mobilization advance to that extent shall be forfeited

(c) Payment for construction period

The payment shall be made as per the measurement.

1.3 User Charges

It will be Contractor's responsibility to ensure user charges from customer/ household. Contractor to deploy dedicated team to collect the user charges, pursue with household owner in case of non-payment; and deposit revenue accrue to Escrow Account.

The Contractor shall collect the user charges as below. The mentioned user charges are provided for year 2018.

A tripartite agreement between the Contractor, ULB and JUIDCO binds the ULB's support for the collection of User fees. The tripartite agreement is in Section 9 – Contract Forms

User Charges[#]

Sl.No.	Type of User User Charges	Rs./Trip*
1	Residential Buildings	1100
2	Institutional and commercial buildings	3500
3	Restaurants and Hotels	3000

*One trip – the truck collects septage and disposes it in the FSTP once. A septic tank may need more than one trip to be emptied completely.

#The User Charges may be updated by Chirkunda Nagar Parishad as and when required

1.4 Payment during the Operation Period

In respect of the Operations Services performed by the Operator after the Operations Starting Date, the Employer shall pay the Operator on monthly basis (Monthly Operations Payment). For this purpose, monthly bills for the Operations services performed by the Operator shall be submitted to the PMC at the end of each month and the bills will include the fee calculated in the following manner.

Treatment fees payment will be calculated based on the quantity of septage treated at SeTP facility per month.

Payment shall be made after review of Key Performance Indicators (KPIs) set out for this contract as per Clause no. 3 in Special Conditions of Contract.

SECTION 5
SPECIAL CONDITIONS OF CONTRACT

SECTION 5

SPECIAL CONDITION OF CONTRACT

1. OPENING OF ESCROW ACCOUNT

1.1 Definition

“**Escrow Account**” means an account opened with a nationalized bank, prior to start of work, in which all inflows and outflows of cash on account of capital and revenue receipts and expenditure shall be credited and debited, as the case may be, in accordance with the provisions of this Agreement.

“**Project Completion Period**” shall mean the period commencing from the day immediately following the Active Operations Period and ending on the 10th anniversary of the said day.

1.2 PAYMENTS OF CAPITAL GRANT, O&M CHARGES

1.2.1 Payment of capital grant for construction and procurement phase

The capital cost of the project shall be the estimated project cost as per the DPR prepared by consultant and approved by the UDD. The capital cost shall be provided through the UDD grant.

The Grant shall be credited to the Escrow Account in the form of payment made for actual work done as per the payment terms set out in Clause 42 of Contract Data.

1.2.2 Measurement of Works

Measurement of work shall be done as per the actual progress of work and standards of work done by contractor and approved by PMC and Employer. Each milestone shall represent percentage of work completed till that milestone.

1.2.3 Payments

Contractor shall prepare monthly running for the work actually done during previous month on the basis of BOQ prepared by Contractor and approved by PMC and Employer. The bill shall be submitted by contractor on or before 7th day of each month. The Contractor shall submit three numbers of hard copies and one soft copy of floppy/ CD for all bills. After certification of bills by PMC and Employer, payment shall be made to contractor after applicable deductions. All other statutory deductions shall be made on the basis of prevailing taxation rules of GOI and GOJ. The payment due to the contractor shall be made within Thirty days of bill submission.

All running payments shall be regarded as payments by way of advance against the final grant/payment only and not as payments for work actually done and completed

and / or accepted by Employer and shall not preclude the recovery for bad, unsound and imperfect or unskilled work to be removed and taken away and reconstructed or re-erected or be considered as an admission of the due performance of the contract, or any part thereof, in this respect, or the accruing of any claim, nor shall it conclude, determine or affect in any way the powers of the Employer under these conditions or any of them as to the final settlement and adjustments of the accounts or otherwise, or in any other way vary/ affect the contract. The final bill for grant shall be submitted by the contractor within three months of the completion of work, otherwise GNP's certificate of the measurement and of the total amount payable for the work accordingly shall be final and binding on contractor Each Running Bills should be accompanied by two sets of at-least 20 (twenty) photographs as per direction of Project in charge taken from various points depicting status of work as on Report/ Bill date along with Monthly Progress Report for the concerned month in the pro-forma to be given/ approved by Engineer-in-Charge. Intermittent progress Photographs as and when required shall also be provided by the Contractor at his own cost as per direction of Engineer-in-Charge. No payment of running account bill shall be released unless it is accompanied by progress photographs and Monthly Progress Report as above.

All payments shall be released by Employer by Payee's Account Cheque or through transfer in Payees account. In case of Payments is made by Demand Draft at the request of the Contractor, Bank Commission charges shall be debited to the account of contractor.

1.3 Mechanism of Payment

During Construction phase, payment to the Contractor shall be made as per details in Clause 42(c) of Contract Data, whereas in O&M phase, it shall be **as per** rate quoted per year basis linked with key performance Indicators.

(a) Employer shall, within 30 days from the date of receipt of the invoice supported by necessary documents, Pay to the Contractor, only in Escrow account.

(b) Any delay in making any payment in accordance with the invoice shall, without prejudice to any other consequences under this Agreement, entail payment of interest on the amount in default at prevailing annual prime lending rate of State Bank of India calculated for the duration of delay. The period of delay shall be counted from 60 days after; the day of submission of the Invoice.

(d) All payments to the Contractor shall be made in Escrow account by way of Cheque/electronic transfer.

2. USER CHARGES

It will be contractor's responsibility to collect user charges from customer/ household. Contractor to deploy dedicated team to collect the user charges, pursue with household owner in case of non-payment; and deposit revenue accrue to Escrow Account.

The Contractor shall collect the user charges as per **Clause No.2 of SCC**. The mentioned user charges are provided for year 2019. User charges may be escalated @ 10% per year on prior approval from Employer.

3. PERFORMANCE BASED PAYMENTS

The following Key Performance Indicators (KPIs) are framed for this tender:

1. Coverage of HH and Frequency of septage collection
2. Quantity of total septage to be treated at FSTP
3. Efficiency in consumer complaint redressal
4. Achieving quality of effluent at the outlet of FSTP as stipulated in tender
5. Collection efficiency of User Charges

There shall be 50% fixed pay and 50% performance linked pay - with 10% linked to each of the 5 KPIs. These KPIs will be monitored by the PMC before releasing any payment against O & M bills submitted by the contractors.

S. N O	Indicator	Annual Cumulative Targets					Monitoring Systems
		FY 2019		FY 2020	FY 2021	FY 2022-24	
		1st half	2nd half				
1	Coverage of HH and Frequency of septage collection	30%	50%	80%	100%	100% once in two years	Number of households covered shall be based on validation of receipts produced by the operator duly signed by the Employer. Frequency shall also be verified through supporting receipts produced by the operator.
2	Quantity of total septage to be treated at FSTP (cum)	3.6	6	8	9	10	Inflow : Measurement of each lot of septage at entry to FSTP. Outflow: Measurement of dried sludge

							And flow measurement of treated effluent for disposal / reuse
3	Efficiency in consumer complaint redressal (%)	70 %	90%	100%	100%	100%	Checking of Complaint redressal receipts against the complaints received.
4	Achieving quality of effluent and Sludge at the outlet of FSTP (%)	100%	100%	100%	100%	100 %	FSTP O&M Database
5	Collection efficiency of User Charges (%)	15%	20%	30%	50%	75%	Comparison of logbook of household covered for cleaning and logbook of revenue collection.

These calculation will assist in understanding KPIs applicability contractor/Engineer.

4. INCENTIVES

Employer shall reward contractor with incentives as per the following for their out of box thinking / marketing skill:

4.1 On Sale of Composted Sludge

Contractor shall be rewarded for revenue generation from the sale of Composted Sludge with 50% of the revenue generation as reward through Escrow Account only.

5. OTHER CONDITIONS

a) In case of inspection by Project Monitoring Consultant on particular day after the work is completed, if work is not found satisfactory on measurement through marks/points, the amount in accordance to the loss of points for that day, shall be deducted from the monthly running bills.

b) In case of Employer's representative not available for the joint inspection with the Independent Consultant, the evaluation carried out by the Project Monitoring Consultant shall be taken for processing the payment.

6. ROLE OF PMC

For monitoring the progress and over all works, Employer has appointed M/s Tata Consulting Engineers Limited, Noida, as Project Monitoring Consultant (PMC) for the monitoring overall engineering, procurements and construction and initial operation period. Detailed roles and responsibilities of the PMC are provided in Technical Specifications of Tender Documents.

7. CONDUCTING PUBLIC OUTREACH ACTIVATES

Role of I.E.C Activities in the Project

Information, Health Education and Communication I.E.C activities shall play crucial role in the successful implementation of the proposed project. Community participation in implementation of the project is proposed to ensure right from the planning stage through competent & experienced teams. The main objective of I.E.C activities is the support of the operation and maintenance of the septage management project ensuring the sustainability of the project, collect revenue from the users and to maximize its benefits for the target population.

Scope of Work

The broader objective of community participation is to assure sustainability of the project by involving the community in town level planning, implementation and management of sanitation services. The communities will be trained, empowered

and motivated to take up these tasks. In the process of community participation the involvement of women and weaker section will be assured in the decision making.

Septage Management

The activities under this component will primarily be focussed for building environment for project acceptance. A town level committee will be formed in every project town. If similar committee already exists in the town though any other sanitation programme being carried out in the town, then that committee can be used. This committee will take-up all the tasks related the project.

Through this committee, the Contractor will collect monthly water charges. The public will be explained about the septage management system being adopted in the town and the direct and indirect benefits of the same for the entire town. The members of committee will be trained and facilitated to take up all these tasks. Following will be the major steps under this

i. Environment Building for project acceptance:

- Minimum 3 nos. of meetings with people are required for each sector of residents and women participation with at least 30% representation from total households of town in each meeting. Meetings of 2 sectors can be held on the same day but in different shifts. These meetings should be continued till the town become positive for accepting concept of the project.
- Additional 2-meetings/ get together with the students in school should also be kept. This component also includes designing projects and message specific posters (at least 2 different types) in consultation with the department.
- Pasting of such posters at different places in the town is required @ one per 100 souls rounded off to next integer. This also includes poster pasting in schools and other public building.
- Contractor has to make provision for mass communication with the public by any one of the following three modes i.e. picture show, puppet show or culture show. Such show shall be kept minimum 1 in each ward and shall be project specific/ task specific. All the above activity shall be intimated to the department in advance.
- Town general meeting and committee formation as per latest circulars of department.
- Committee orientation and job distribution
- Habitation wise list of households with name of household, total no. of male/female persons & children's, ward/habitation wise abstract.
- Deciding payment model for monthly user charges as per departmental/ govt. guidelines.
- Community level training programmes on operation, maintenance fault reporting, record keeping etc. One person per 250 population of town with minimum of 2 people in each ward shall be trained.
- Follow-up of regular deposition of monthly user charges.

ii. Women Participation:

Women play an important role in maintaining the health of the family. Hence it is very important to make them aware of the benefits of this scheme. They need to be involved in every step of implementation. In the society they have lesser say in decision making. Therefore, the community participation initiatives will focus on bringing women in the groups and empower them so they can play a pivotal role in town level water supply related decisions. The major steps under women participation components are as follows:

- Environment building among women (identification of issues of women's concern, sensitizing women about project, identification of women about project, identification of women leader, contacting women in small groups)
- Large group meeting and selection of women representative for the committee
- Women Group and Self Help Group formation as per need
- Capacity building measures

iii. Health Education:

The ultimate aim of the project is to improve in the standards of health of the target communities. The health education efforts will focus on educating the people about related health and hygiene practices especially about the water borne & Sewage borne diseases. For each activity draft of various formats, training materials etc. are to be prepared according to latest circulars of the department, in consultations with the department authorities, with the aim to achieve the objects of the project.

iv. Provision of Vehicles & Communication

The contractor shall have to provide one closed body vehicle (Mahindra BOLERO Deluxe or equivalent, closed body) in good running condition with registration not older than 2012, for Engineer In Charge on 10th day of issue of work order for use of supervision of works during contract execution period (including extended period, if any), under the scope of works of this contract which shall include all running expenditure towards, driver, fuel lubricants, repairs and maintenance of vehicle spares, tax of all types including service tax, octroi etc. Average run per month for each of such engaged vehicle shall be limited to 2500 km. All expenses incurred for providing these vehicles as mentioned above shall be borne by the bidder. If contractor will not provide the vehicles, the deduction at the rate of 3000/- per day/vehicle will be deducted from the contractors running bills. The contractor shall provide 2 smart mobile handsets along with SIM & 1 internet data cards. All expenses incurred for providing these facilities as mentioned above shall be borne by the bidder.

1301901037711

v. Link with Swachh Bharat Mission:

The campaign should be linked to the Swachh Bharat Mission and the basic outline of that programme shall be followed as extracted below:

The most important task of IEC/ BCC initiatives is to create a need / demand for toilets and solid waste management facilities by informing the people about the negative impact of open defecation and unsafe disposal of solid waste, and the impact it can have on the health of individuals, especially children. The second task is to create awareness on the benefits of using toilets and safe disposal of solid wastes, and how they can lessen the burden of diseases, uphold dignity of the people of the household, especially that of women and create a positive and healthy environment in the cities, towns and villages.. The third task is to inform the people about the range of technology options for toilets and solid waste management systems, their costs,, and appropriateness of designs and inform the people about various subsidies/ incentives that are being provided by the government to the citizens to build toilets and other sanitation facilities.

The Ministry has always placed a lot of emphasis on IEC and BCC initiatives. A national communication strategy framework (The Sanitation and Hygiene Advocacy and Communication Strategy Framework 2012-17) has been developed by Government of India for rural India. The strategy focuses on three main approaches (1) Creating awareness on critical issues related to safe sanitation behavior, (2) Advocacy initiatives at various level (3) Social and Behavioral Change Communication interventions. The communications strategy also focuses on key areas of intervention with frame works instructing the states on how to develop national level, state level and district level IEC interventions. The states are to evolve their own strategy using folk media, mass media and also outdoor media like wall painting, hoardings etc.

The contractor should work on following methodology:

- Carry out study and thorough analysis of the present status of awareness about this project and Swachh Bharat Mission objectives. This will be termed as situational analysis.
- The contractor will do a holistic CNA (Communication Needs Assessment). The CNA report will identify the media vehicles, most suitable to reach the target audience based on their media habits from the perspective of media strategy.
- Find out the gaps and suggest most effective media-mix for the next phase of intensive media campaign.

8. LABOUR

The Contractor shall, unless otherwise provided in the Contract, make his own arrangements for the engagement of all staff and labour, local or other, and for their payment, housing, feeding and transport.

The Contractor shall, if required by the Engineer, deliver to the Engineer a return in detail, in such form and at such intervals as the Engineer may prescribe, showing the staff and the numbers of the several classes of labour from time to time employed by the Contractor on the Site and such other information as the Engineer may require.

9. COMPLIANCE WITH LABOUR REGULATIONS

During continuance of the contract, the Contractor and his sub-contractors shall abide at all times by all existing labour enactments and rules made there under, regulations, notifications and bye laws of the State or Central Government or local authority and any other labour law (including rules), regulations, bye laws that may be passed or notification that may be issued under any labour law in future either by the State or the Central Government or the local authority. Salient features of some of the major laws that are applicable to construction industry are given below. The Contractor shall keep the Employer indemnified in case any action is taken against the Employer by the competent authority on account of contravention of any of the provisions of any Act or rules made there under, regulations or notifications including amendments. If the Employer is caused to pay or reimburse, such amounts as may be necessary to cause or observe, or for non-observance of the provisions stipulated in the notifications/ byelaws/ Acts/ Rules/ regulations including amendments, if any, on the part of the Contractor, the Engineer/Employer shall have the right to deduct any money due to the Contractor including his amount of performance security. The Employer/Engineer shall also have right to recover from the Contractor any sum required or estimated to be required for making good the loss or damage suffered by the Employer.

The employees of the Contractor and the Sub-Contractor in no case shall be treated as the employees of the Employer at any point of time.

SALIENT FEATURES OF SOME MAJOR LABOUR LAWS APPLICABLE TO ESTABLISHMENTS ENGAGED IN BUILDING AND OTHER CONSTRUCTION WORK

- a) Workmen Compensation Act 1923 :- The Act provides for compensation in case of injury by accident arising out of and during the course of employment.
- b) Payment of Gratuity Act 1972 :- Gratuity is payable to an employee under the Act on satisfaction of certain conditions on separation if an employee has completed 5 years service or more on death, the rate of 15 days wages for every completed year of service. The Act is applicable to all establishments employing 10 or more employees.
- (c) Employees P.F. and Miscellaneous Provision Act 1952: The Act Provides for monthly contributions by the Employer plus workers @ 10% or 8.33%. The benefits payable under the Act are:
 - (i) Pension or family pension on retirement or death, as the case may be.
 - (ii) Deposit linked insurance on the death in harness of the worker, (iii) (iii) Payment of P.F. accumulation on retirement/death etc.
- d) Maternity Benefit Act 1951:- The Act provides for leave and some other benefits to women employees in case of confinement or miscarriage etc.

- e) Contract Labour (Regulation & Abolition) Act 1970:- The Act provides for certain welfare measures to be provided by the Contractor to contract labour and in case the Contractor fails to provide, the same are required to be provided, by the Principal Employer by Law. The Principal Employer is required to take Certificate of Registration and the Contractor is required to take license from the designated Officer. The Act is applicable to the establishments or Contractor of Employer, if they employ 20 or more contract labour.
- f) Minimum Wages Act 1948:- The Employer is supposed to pay not less than the Minimum Wages fixed by appropriate Government as per provisions of the Act, if the employment is a scheduled employment. Construction of Buildings, Roads, Runways are scheduled employments.
- g) Payment of Wages Act 1936:- It lays down as to by what date the wages are to be paid, when it will be paid and what deductions can be made from the wages of the workers.
- h) Equal Remuneration Act 1979 :- The Act provides for payment of equal wages for work of equal nature to Male and Female workers and for not making discrimination against Female employees in the matters of transfers, training and promotions etc.
- i) Payment of Bonus Act 1965: - The Act is applicable to all establishments employing 20 or more employees. The Act provides for payments of annual bonus subject to a minimum of 8.33% of wages and maximum of 20% of wages to employees drawing Rs.3500/-per month or less. The bonus to be paid to employees getting Rs.2500/- per month or above upto Rs.3500/- per month shall be worked out by taking wages as Rs.2500/ -per month only. The Act does not apply to certain establishments. The newly set-up establishments are exempted for five years in certain circumstances. Some of the State Governments have reduced the employment size from 20 to 10 for the purpose of applicability of this Act.
- j) Industrial Disputes Act 1947:- The Act lays down the machinery and procedure for resolution of Industrial disputes, in what situations a strike or lock-out becomes illegal and what are the requirements for laying off or retrenching the employees or closing down the establishment.
- k) Industrial Employment (Standing Orders) Act 1946:- It is applicable to all establishments employing 100 or more workmen (employment size reduced by some of the States and Central Government to 50). The Act provides for laying down rules governing the conditions of employment by the Employer on matters provided in the Act and get the same certified by the designated Authority.
- l) Trade Unions Act 1926: - The Act lays down the procedure for registration of trade unions of workmen and Employers. The Trade Unions registered under the Act have been given certain immunities from civil and criminal liabilities.
- m) Child Labour (Prohibition & Regulation) Act 1986 :- The Act prohibits employment of children below 14 years of age in certain occupations and processes and provides for regulation of employment of children in all other occupations and processes. Employment of Child Labour is prohibited in Building and Construction Industry.

- n) Inter-State Migrant workmen's (Regulation of Employment & Conditions of Service) Act 1979:- The Act is applicable to an establishment which employs 5 or more inter-state migrant workmen through an intermediary (who has recruited workmen in one state for employment in the establishment situated in another state). The Inter-State migrant workmen, in an establishment to which this Act becomes applicable, are required to be provided certain facilities such as housing, medical aid, traveling expenses from home up to the establishment and back, etc.
- o) The Building and Other Construction workers (Regulation of Employment and Conditions of Service) Act 1996 and the Cess Act of 1996 :- All the establishments who carry on any building or other construction work and employs 10 or more workers are covered under this Act. All such establishments are required to pay cess at the rate not exceeding 2% of the cost of construction as may be modified by the Government. The Employer of the establishment is required to provide safety measures at the Building or construction work and other welfare measures, such as Canteens, First-Aid facilities, Ambulance, Housing accommodations for workers near the work place etc. The Employer to whom the Act applies has to obtain a registration certificate from the Registering Officer appointed by the Government.
- p) Factories Act 1948 :- The Act lays down the procedure for approval of plans before setting up a factory, health and safety provisions, welfare provisions, working hours, annual earned leave and rendering information regarding accidents or dangerous occurrences to designated authorities. It is applicable to premises employing 10 persons or more with aid of power or 20 or more persons without the aid of power engaged in manufacturing process.

10. Arbitration

Any dispute between Government and agency regarding works or any matter initially resolved by the adjudicator, if within 30 days adjudicator did not resolved the issue the matter will be finally goes to arbitration. Arbitration will be done according to rule “arbitration and cancellation act 1996”.

SECTION 6
EMPLOYER'S REQUIREMENTS

Section 6 - Employer's Requirements

This Section contains the Specification, the Drawings, Supplementary Information that describe the Works to be procured, the Personnel Requirements, and the Equipment Requirements.

Table of Contents

- 5.1 Scope of Services
- 5.2 Specifications
 - 5.2.1 Standard Specifications
 - 5.2.2 Particular Specification
- 5.3 Drawings (Part I - Volume 2)
- 5.4 Supplementary Information
- 5.5 Personnel Requirements
- 5.6 Equipment Requirements

1.1 Scope of Services

1.1.1 Project Background

The State Urban Development Agency for Jharkhand is keen on implementing a Faecal Sludge Treatment Plant for the un-sewered towns in Jharkhand. These are primarily the towns that have a population less than 1, 00,000, have less than 135 LPCD water supply and are not funded by any of the Central mission projects. The prime objective here is to understand the feasibility of Faecal Sludge Management in Jharkhand and develop Chirkunda as a pilot town for the same. The activity is to specifically provide faecal sludge management solutions for Chirkunda in Jharkhand.

1.1.2 Chirkunda: An Overview

Chirkunda with a population of 45,508 (Census 2011) is located in the district of Dhanbad in Jharkhand. It is positioned in the north eastern part of the state and lies 144 m above the mean sea level. The town is surrounded by the River Khudia in the south, River Barakar in the east, Maithon in the North and Bagmara in the west. The general topography of the town is undulating and is surrounded by small hillocks, rivers, coal mines and forest.

Major industries in and around the area includes refractory making, coal making, iron and steel plants, food processing, retailing and service industry. It is also very close to Maithon Dam and Panchet Dam. In the year 1986 the administrative unit for Chirkunda was a Notified Area Council. It was only in the year 2008 that it was accorded the status of a Nagar Panchayat owing to the addition of surrounding villages to the town area. There is a possibility of conversion of Chirkunda Nagar Panchayat to Nagar Parishad due to addition of surrounding villages. Once this materializes, the population is expected to double. Currently the town is spread across an area of 6.26 Km².

1.1.3 General Scope

Generally the following activities shall be carried out by the Contractor. The scope of work is broadly listed below and shall include, but not be limited to:

- Establishing field office, for the Contractor's staff and the Engineer at the start of the Contract.
- Establishing suitable labor camps with all electrical, water and sanitation facilities required under the relevant Labor laws.
- Submittal of an initial work program and schedule and updating the same every month for approval by the Engineer.
- Verification of spot levels with reference to the bench marks as required to facilitate the construction work is to be carried out by the Contractor
- Conduct Geo-technical Test and then design the structures and design Verification for designs provided in Part 1 & 2 (Drawings)
- The structural designs mentioned above have to be approved by SUDA or PMC
- Submit Revised BoQ based on the findings of Geotechnical & Structural designs.
- Submit any variance in cost thereafter which has to be vetted by SUDA or PMC
- Performing tests on materials received and for the finished works and maintaining complete records and registers required on site as per the Quality Manual.
- Carrying out construction works as per the designs and drawings etc

- Participating in weekly progress meetings with the Employer and Engineer to review the schedule and other pertinent issues.
- Factory and field testing, pre-dispatch inspections, packaging, transportation to the Project Site, providing transit insurance, storage, handling at the sites, installation, trial runs and commissioning of all components/elements of the system.
- Site clearance and restoration of the premises after completion of the work.
- Submission of 'As Built' drawings and Operation and Maintenance Manuals.
- Operation and maintenance of plant for a period of 6 years after Construction
- Any other items, as described elsewhere in the document.
- One ULB truck with the capacity of 3500 Litres will be provided to the contractor.

1.1.4 Specific Scope

Specific scope of this project is given below

1	Construction and Commissioning of Fecal Sludge treatment plant of capacity 12 m³/day : Structural Designing , Construction and Commissioning of Fecal Sludge treatment plant(FSTP)with all appurtenant structures(as mentioned in the design and bill of quantities) and allied works
2	Operation & maintenance of the complete works of FSTP and allied works (Truck Operations) for a period of 6 years after Construction

1.1.5 Outcome and Benefits from Project

The project aimed at improvising a sanitation solution to the areas where conventional sewerage system is not feasible and improve sanitation condition of the area. This contract package area is defined within area of the town. The implementation of this contract package is expected to demonstrate the feasibility of adopting a faecal sludge treatment plant, including providing operations and maintenance of the plant for a period defined in relevant section of the document.

Apart from technical aspects, assessment of pilot scale testing would also look into its influence on the regulatory and institutional arrangements, particularly for operation and maintenance of such systems, and policies and procedures that would be required to ensure sustainability of these schemes. The outcome of successful implementation of such pilot area will be improved urban sanitation service delivery in the state.

The results are intended to facilitate demand for sanitation solutions, thus allowing replication in other project towns.

1.2 SPECIFICATION

1.2.1 Standard Specification

Except where otherwise specified in the bid document plant, materials and workmanship shall comply with the requirements of the relevant Indian Standards (hereinafter referred to as IS) issued by the Bureau of Indian Standards (BIS). Other equivalent National or International Standard Specifications such as those issued by the International Organisation

for Standardisation (ISO) or the International Electro technical Commission (IEC) may be substituted by the Contractor (so as long as they are more stringent than the equivalent IS) at the sole discretion of the Employer's Representative or as may have been agreed in the Contract. All standards used shall be the current and latest version.

SECTION 7: PARTICULAR SPECIFICATION

Section 7: Particular Specification

1. GENERAL RESPONSIBILITY OF CONTRACTOR

1.1 Contractor's Office Location and Labour Camp

The Contractor shall establish his office nearby or within to the project site. The Contractor will be free to use the space available within FSTP campus for constructing and establishing his offices, laboratories, storage spaces and workshop as long as they do not interfere with the layout of the works to be carried out under the Project.

The Contractor is therefore required to set-up their project office, fully equipped and staffed as required. This project office shall be duly backed up by a full service office at the Contractor's headquarters to enable continuous submission, interaction, and timely deliverables.

1.2 Contractor's Submittals

The cost of this activity is deemed to be included in contractor's quoted price, unless it is separately mentioned in the bill of quantities.

1.2.1 As-Built Drawing

The Contractor shall submit to the Engineer within one months of actual completion, "As-Built Drawing" also called as "Completion Drawings" as specified herein for the whole of the works executed. These Drawings shall be accurate and correct in all respects and shall be shown to and approved by the Engineer. Initial Submission of the Drawings shall be approved (with all necessary corrections, if any - incorporated).

Final Drawings shall be submitted in Hard form (2 copies) and One (1) Soft copy in CD. The Number and Size of Drawings to be submitted shall be the same, which have been issued to the Contractor for execution of the works.

The drawings shall be of standardized sizes as instructed by the Engineer and shall contain the following basic information on the Submittal Form:

- i. Project name
- ii. Name and number of the Contract
- iii. Contractor's name
- iv. Number and title of the data sheet or drawing
- v. Date and scale (if applicable)
- vi. Name, address and phone number for the equipment manufacturer or material supplier
- vii. Revision Number (R0 for drawing submitted initially and R1, R2, etc., for drawings submitted subsequently).
- viii. Signature of Contractor's authorized personnel making the submittal

A blank space 75 mm x 50 mm shall be provided immediately above the signature block for the approval stamp. The Contractor shall be responsible for preparation of the submittal data and drawings, as specified in the Contract.

No separate payment shall be made for this activity and it is deemed to be included in Contractor's quoted price.

1.2.2 Geotechnical and other Relevant Testing

After award of contract, Contractor shall carry out independently fresh survey, geotechnical investigation and all other details necessary for proper planning and detailed design.

Geotechnical studies shall be conducted by the contractor to primarily ascertain the SBC value-an important input to the structural design of the hydraulic structures of FSTP.

Based on its finding revised BoQ will be submitted for any revision in cost.

1.2.3 Recording

The Contractor shall maintain an approved system of recording and tracking submissions indicating dates, status (i.e. approved, not approved, approved subject to conditions), quantities, and other details as required. Copies of all approved submissions will be retained securely and properly filed on site, available for reference by the Engineer at any time.

1.3 Sample of Materials

The Engineer may at his discretion request or take samples of any material or product intended for use in the Works. Where samples are requested in the Specifications they shall be submitted in the number requested or if not specified then as directed by the Engineer. Samples shall be of the type and size specified and fully representative of the materials proposed to be used.

Samples of materials requiring prior approval, such as cement, aggregates, reinforcement, building specialties and backfill materials shall be furnished by the Contractor to the Engineer in large enough quantities with descriptive data. Samples shall be submitted at least 7 days before their proposed usage in the work to permit inspection and testing. The samples shall be properly marked to show the name of the material, name of the manufacturer, applicable Specification Subsection, place of origin and application for which it is to be used.

Samples shall be indelibly and clearly marked with the date of submission, material reference and any other data required to determine the source and kind of sample.

One or more samples of each kind submitted will either be returned marked "ACCEPTED" and signed by a representative of the Engineer or the Contractor will be requested to provide new samples and be notified of deficiencies present in the submitted samples.

One or more "accepted" samples will be retained by the Engineer for comparison with materials and workmanship supplied and will form the standard of acceptance.

One or more "accepted" samples shall be retained at the Contractor's site office and be available for reference on request.

The Engineer may reject any materials and goods which in his opinion are inferior to the samples thereof previously approved and the Contractor shall promptly remove such materials and goods from the Site. No separate or additional payment shall be made for the samples or the replacement of defective materials.

Only upon approval by the Engineer, shall be the materials be brought to the Project Site. Samples once approved shall be on exhibition at all times, properly stored and prevented from deterioration for the propose of comparison with the materials brought to site of work from time to time for use in the work.

The Contractor shall provide the Engineer with one copy of orders for the supply of materials and goods if required, in connection with the Works.

Cost of this activity is deemed to be included in Contractors quoted price.

1.4 Work Program

The Contractor shall submit in triplicate the Program and particulars required for carrying out works smoothly within 15 days of receiving the letter of acceptance and before signing of the Contract Agreement. The Contractor shall provide all information needed for fulfillment of the Program in accordance with the Conditions of Contract including the sequence in which the Contractor intends to work including implementation of quality assurance plan. In the Program the Contractor shall provide details of how the Contractor proposes to carry out the Works and how he proposes to adopt a detailed Statement of Construction Management Procedures the Contractor proposes to adopt.

Cost of this activity is deemed to be included in Contractors quoted price.

1.5 Personal Requirement of Contractor

Given elsewhere in the Bidding Document

1.6 Equipment Requirements

The contractor will give an undertaking saying it has leased/owns the equipment required to meet scope of work or has access through subcontractors as need may be.

1.7 Project Sign Board

The Contractor shall erect and maintain notice board/s of size 1.2m (L) x 0.6m (H) at the site, giving details of the contract in the format and wording as directed by the Engineer. These boards shall be erected within 7 days after the Contractor has been given the Possession of Site.

The Contractor shall not erect any advertisement sign board on or along the work without the written approval of the Employer.

All sign boards shall be removed by the Contractor by the end of the Contract Period.

Cost of this activity is deemed to be included in Contractors quoted price.

1.8 Quality Assurance

The Contractor shall prepare a detailed plan for this Contract for Quality Assurance and Quality Control and get it approved by the Engineer. The Contractor shall deploy an adequate number of suitable staff whose sole responsibility shall be to strictly implement the QA/QC Plan and conduct necessary tests to ensure the highest quality standards are being met. All other measures that the Contractor may feel necessary he may add with the approval of the Engineer or as may be directed by the Engineer shall also be implemented.

Cost of this activity is deemed to be included in Contractors quoted price.

1.9 Safety Assurance

The Contractor will take all measures required to maintain the highest level of recognized safety standards on the project site. The measures taken shall include all but not be limited to the relevant provisions of the Local Standards. The Contractor shall prepare a Safety Plan for the project and have it approved by the Engineer prior to starting work on a particular site. The Contractor shall deploy a Safety Officer on each work site to ensure compliance with his Safety Plan.

The Contractor shall be responsible for the safety of all workmen and other persons entering or in the work areas and shall take all measures necessary to ensure their safety at his own expense. Such measures shall include the provisions of helmets (hardhats), the provision of gum-boots to workers engaged in cement concrete, and eye protection (goggles). Scaffolding or other measures required for working at a height shall be load rated and rigid and be provided with suitable and convenient access. Safety measures that the Engineer may direct, depending on the exigencies of the location and nature of work and other relevant factors, shall be provided by the Contractor.

No additional payment will be made for these safety measures as such work will be considered incidental. Cost of this activity is deemed to be included in Contractors quoted price.

1.9.1 First Aid Station

The Contractor shall arrange for medical services to be promptly available when necessary. He shall provide First-Aid stations at suitable locations within easy reach of the workmen and other staff engaged in the work. Each First-Aid station shall be properly equipped and shall be the charge of a suitably qualified supervisory staff member. The Contractor shall also provide for transport of serious cases to the nearest hospital. All these arrangements shall be included in the Contractor's Safety Plan.

1.9.2 First Aid Kit

A first aid kit along with proper medical supplies must be available in the camps for treating injuries or common health problems. Services shall also include on-the-way service and other arrangements required for taking them to the nearest hospital in case of emergency. If imported laborers are required for construction, proper medical tests of the laborers shall be carried out to prevent the spread of diseases such as STD and HIV/AIDS amongst the communities near the construction sites.

The scope of work shall include service of at least one part-time experienced health worker/health assistant with a minimum of once a week full time site visit as work assignment. The Contractor shall also supply and provide adequate medicines and facilities required for standard first aid. The Contractor shall inform the Engineer regarding the medical facility within a week after its establishment and operation.

1.9.3 Fire Fighting

The Contractor shall provide a suitable method for fire-fighting. He shall provide a suitable number of fire extinguishers, axes, shovels, pry bars and an adequate number of buckets, some of which are to be always filled with sand and some with water. This equipment shall be provided at suitable prominent and easily accessible locations at each work site as identified in the Contractor's Safety Plan and shall be properly maintained.

1.9.4 Health and Safety

The Contractor shall at his own expense and throughout the period of the Contract ensure that suitable arrangements are made for the prevention of epidemics and for all necessary welfare and hygiene requirements for his staff and labour, and shall comply with all the regulations and requirements of the local health authorities with respect to disease prevention and control. He shall warn his staff and labour of the dangers of communicable diseases including those transmitted by insects, water, faecal/oral contact and sexual activity.

The Contractor shall take the precautions necessary to protect all staff and labour employed on the Site from insect nuisance, rats and other pests and minimise the dangers to health and the general nuisance caused by the same. Should malaria or other insect-borne diseases be prevalent in the area, he shall provide his staff and labour with suitable prophylactics, equip living accommodation with screens and bed-nets, and carry out spraying with approved insecticides, as appropriate and to the Engineer's satisfaction. All workers shall be provided with adequate safety wear such as gloves, face masks, ear plugs and helmets to prevent injuries and health hazards.

1.10 Project Site Office for Employer

The Contractor shall keep provision for Employers office. One room shall be exclusive for use of the Engineer's Representative during project duration. However, the exact locations of the offices shall be as approved by the Engineer's Representative.

The Contractor shall be responsible for providing 24 hours electricity supply including the costs of installation and maintenance, and payment for all official telephone calls, facsimile, e-mail and internet charges within country. The office shall be equipped with required furniture with minimum two officers, equipment and maintain the services including timely delivery of consumables to enable good working environment to his workers. The contractor should have required apparatus/equipments for carrying out field tests as and when required.

The Contractor shall be responsible for employing watch & ward to ensure safety to the documents in the office and he shall ensure that all the office rooms and yard are cleaned every day. Cost of this activity is deemed to be included in Contractors quoted price.

1.11 Storage Facilities

Space allocated for storage of materials such as cement, gabion wire, reinforcing wire, pipes etc. shall in general be damp-free, rain-proof and away from petroleum products storage. Permission may be granted by the Engineer to erect temporary suitable camps within the right of way free of charge, if such establishments do not cause obstructions to traffic, nuisance to works execution and adverse effect to the environment. Camps must be located in stable areas where there are no possibilities of landslides or erosion.

Cost of this activity is deemed to be included in Contractors quoted price.

1.12 Temporary Electricity Provision

The Contractor shall make his own arrangement for the supply of electrical power that will be required his construction. The Contractor shall provide the power required up through the contract period. Cost of this activity is deemed to be included in Contractors quoted price.

During operation electrical power from the Power Corporation may not be continuously available due to various reasons including load shedding and may not be available to the Contractor. In case of non-availability of electrical power the Contractor will have to generator his own electrical service. The Contractor must include such features in his Bid Price.

1.13 Temporary Water and Sanitation Provision

The Contractor shall provide on the Site at his expense an adequate supply of drinking water for the use of Contractor's staff, Employers representatives and work people, together with sanitary facilities (portable toilets or latrines), to the satisfaction of the Engineer. The Contractor shall also provide any additional treatment or equipment (such as electric water filter) necessary for the provision of drinking water.

The Contractor shall ensure that proper drinking water, waste disposal and toilet facilities are provided to the labour camps. This arrangement shall be enforced to avoid proliferation and generation of various water borne diseases. The Contractor shall inform the Engineer regarding sources, installation and operation of supply of potable water within a week after the supply is commenced.

Provision of toilets for labor and employees shall be made to avoid public nuisance as well as pollution of water courses and air. Toilets shall not be located near streams or rivers. The Contractor shall construct suitable temporary septic tanks and/or soak pits along with room of pit-type latrines. Sufficient water must be provided and maintained in the toilets. Proper methods of sanitation and hygiene should be employed during the whole project duration. The contractor shall provide waste disposal facilities such as dustbins and waste disposal pits.

Cost of this activity is deemed to be included in Contractors quoted price.

1.14 Removal of Camps

On completion of the Works in accordance with Conditions of Contract the Contractor shall remove those facilities not required during the Defects Liability Period. At the end of the Defects Liability Period the Contractor shall remove the remaining facilities from site in accordance with the Conditions of Contract. All furniture and furnishing provided by the Contractor for the use of the Engineer's Representative except those items brought by the Engineer, shall become the property of the Contractor at the end of the Contract.

The Contractor shall take down and remove all structures connected with this camp, and shall take out all pipes, drains and culverts, backfill trenches, fill up all latrine pits, soak ways and other sewage disposal excavations, and shall restore the site as far as practicable to its original conditions and leave it neat and tidy to the satisfaction of the Engineer.

During shifting of the camp all trash and unwanted material must be burnt or disposed off properly. Pit latrines must be adequately covered. Areas without any vegetation must be re-vegetated carrying out appropriate bioengineering works.

Cost of this activity is deemed to be included in Contractors quoted price.

1.15 Topographical Survey for Verification

The contractor needs to verify the various survey data provided in Toposheet/survey drawings with reference to the bench marks established by Thromde. These permanent bench marks and any other temporary bench marks created by the Contractor to facilitate his work needs to be protected by the contractor till the completion of the Project

The topographical survey verification work shall be carried out before and during implementation with Total Stations technology and applicable surveying and mapping software shall be used for creating the required drawings. This survey shall include all physical details, mainly along roads and corridor. In case of confirmatory and additional survey work, the documents and drawings shall be in sufficient detail for review by the Engineer.

Cost of this activity is deemed to be included in Contractors quoted price.

1.16 Soil Investigation

The Contractor shall carry out soil investigation as per instruction and direction of Engineer in Charge. This survey shall include all soil details as per the project requirement. Contractor shall submit report and drawings relevant to soil investigation survey. It shall be paid separately.

1.17 Handing Over of Project Site to Contractor

The sites will be made available on the date of the issuance of the Letter to Proceed and the Contractor can plan his work accordingly. The Employer will make the individual work sites available to the Contractor so that he will have space available for him to carry out his work for at least the next one month unhindered as per the approved work plan.

In the event that some local obstruction/objection arises which would impede the progress of the Contractor's work in any one area, the Contractor will be required to redeploy his resources to other unaffected areas in order to maintain the progress of work so that the overall completion of the whole Project is not affected.

1.18 Completeness of Work

The Contractor shall be fully responsible to ensure that the whole Project including each individual component/stretch, is constructed in a manner so that the system as a whole operates as a fully integrated system which is capable of achieving the required output in an efficient and economical manner, and includes all plant, equipment and accessories required for the safe and satisfactory operation of the facilities.

To achieve this, the Contractor shall ensure that each individual component performs in a manner which is complementary to that of all other components. Any accessories which are not specifically mentioned in the specifications, but which are usual or necessary for completion of the Works and successful performance of the overall system and facilities shall be provided by the Contractor within the Contract Price.

1.19 Clarification

If the bidder or contractor feels lack of transparency or ambiguity in the document, he shall request clarification at least 15 days prior to address or take up the activity and it will be resolved by the Engineer prior to proceeding with the specific work/purpose. In case, he fails to place such ambiguity for clarification before such days prior to proceed for the work, decision of Engineer (or Engineer, or Engineer or Engineer or Project Manager) will be final and contractor has to do the work without additional cost and time.

2. GENERAL CIVIL ENGINEERING WORKS

The "Standard Specifications" (referred elsewhere in the document) issued on behalf of the Employer, establishes the Specifications that shall be followed for the construction of general civil works under the project. Specifications for additional specialized items of civil works and for mechanical and electrical works, shall be as set out in relevant subsections of this Volume.

In the event of any discrepancy between the provisions of the Standard Specifications and the Particular specifications contained herein, the provisions of these Particular specifications shall take precedence.

2.1 Material and Standard

2.1.1 Materials

The term "materials" shall mean all materials, goods and articles of every kind whether raw, processed or manufactured and equipment and plant of every kind to be supplied by the Contractor for incorporation in the Works.

Except as may be otherwise specified for particular parts of the works the provision of clauses in "Materials and Workmanship" shall apply to materials and workmanship for any part of the works.

All materials shall be new and of the kinds and qualities described in the Contract and shall be at least equal to approved samples.

Materials and workmanship shall comply with the relevant Indian Standards (with amendments) current on the date of submission of the tender.

Where the relevant standard provides for the furnishing of a certificate to the Engineer, at his request, stating that the materials supplied comply in all respects with the standard, the Contractor shall obtain the certificates and forward it to the Engineer.

For detail specification of material, Standard Specification shall be followed. If any material is not included either in Particular Specification or Standard specification, but required to for successful completion of work shall comply with the relevant Indian Standards (with amendments upto date).

2.1.2 Samples and Tests of Materials

The Contractor shall submit samples of such materials as may be required by the Engineer and shall carry out the specified tests directed by the Engineer at the Site, at the supplier's premises or at a laboratory approved by the Engineer.

Samples shall be submitted and tests carried out sufficiently early to enable further samples to be submitted and tested if required by the Engineer.

Approval by the Engineer as to the placing of orders for materials or as to samples or tests shall not prejudice any of the Employer's powers under the Contract.

2.1.3 Standards

Materials and workmanship shall comply with the relevant Indian Standards (with amendments upto date).

Where the relevant standard provides for the furnishing of a certificate to the Engineer, at his request, stating that the materials supplied comply in all respects with the standard, the Contractor shall obtain the certificates and forward it to the Engineer.

All standards, specifications, codes of practices referred to herein shall be the latest editions including all applicable official amendments and revisions. In case, the material is not listed under BIS, international standard shall be followed.

If the material is new and innovative in nature, contractor has to furnish appropriate justification and records for its use. It shall only be accepted after approval by the Engineer.

2.2 Earthwork

2.2.1 General

The Contractor shall furnish all tools, plant instruments, qualified supervisory personnel, labour, materials, any temporary works, consumables, any and everything necessary, whether or not such items are specifically stated herein for completion of the work in

accordance with the Department's Requirements for a soil ranging from ordinary soil to rocky soil.

The Contractor shall survey the site before excavation and set out all lines and establish levels for various works such as grading, basement, foundations, plinth filling, roads, drains, cable trenches, pipelines etc. Such survey shall be carried out by taking accurate cross sections of the area perpendicular to established reference/grid lines at 8 m in case of buildings and 30 m in case of roads and pipe lines works intervals or nearer, if necessary, based on ground profile and thereafter properly recorded.

The excavation shall be carried out to correct lines and levels. This shall also include, where required, proper shoring to maintain excavations and also the furnishing, erecting and maintaining of substantial barricades around excavated areas and warning lamps at night.

Excavated material shall be dumped in regular heaps, bunds, riprap with regular slopes and levelling the same so as to provide natural drainage. Rock/soil excavated shall be stacked properly as approved by the Engineer. As a rule, all softer material shall be laid along the centre of heaps, the harder and more weather resisting materials forming the casing on the sides and the top.

Topsoil shall be stock piled separately for later re-use.

2.2.2 Clearing

The area to be excavated/filled shall be cleared of fences, trees, plants, logs, stumps, bush, vegetation, rubbish, slush, etc. and other objectionable matter. If any roots or stumps of trees are encountered during excavation, they shall also be removed. The material so removed shall be disposed off as approved by the Engineer. Where earthfill is intended, the area shall be stripped of all loose/ soft patches, top soil containing objectionable matter / materials before fill commences.

2.2.3 Excavation

Excavation for permanent work shall be taken out to such widths, lengths, depths and profiles as are shown on the approved drawings or such other lines and grades as may be agreed with the Engineer. Rough excavation shall be carried out to a depth of 150 mm above the final level. The balance shall be excavated with special care. Soft pockets shall be removed below the final level and extra excavation filled up with material as approved by the Engineer. The final excavation should be carried out just prior to laying the blinding course. Excavation be taken for extra width and length w.r.t. specified width and pipe length, no payment will be given to the contractor.

To facilitate the permanent works the Contractor may excavate, and also backfill later, outside the lines shown on the approved drawings or as agreed with the Engineer. Should any excavation be taken below the specified elevations, the Contractor shall fill it up with material as approved by EIC upto the required elevation at no cost to the department.

All excavations shall be to the minimum dimensions required for safety and ease of working. Prior approval of the Engineer shall be obtained by the Contractor in each individual case, for the method proposed for the excavation, including dimensions, side

slopes, dewatering, disposal, etc. This approval, shall not in any way relieve the Contractor of his responsibility for any consequent loss or damage. The excavation must be carried out in the most expeditious and efficient manner. Side slopes shall be as steep as will stand safely for the actual soil conditions encountered. Every precaution shall be taken to prevent slips. Should slips occur, the slipped material shall be removed and the slope dressed to a modified stable slope.

Standard specification shall be followed for any other instruction/specification on earthwork in excavation.

2.3 Fill, Backfilling and Site Grading

2.3.1 General

All fill material shall be subject to the Engineer's approval. If any material is rejected by Engineer, the Contractor shall remove the same forthwith from the site. Surplus fill material shall be deposited / disposed off as directed by Engineer after the fill work is completed.

No earth fill shall commence until surface water discharges and streams have been properly intercepted or otherwise dealt with to the approval of the Engineer.

All the trenches will be refilled and compacted in layers as specified in Standard Specifications. Contractor will take regular photographs of refilling in layers and compaction of each layer to required density and will provide with the running payments.

2.3.2 Materials

To the extent available, selected surplus soil from excavations shall be used as backfill. Backfill material shall be free from lumps, organic or other foreign material. All lumps of earth shall be broken or removed unless otherwise stated. Where excavated material is mostly rock, the boulders shall be broken into pieces not larger than 150 mm size, mixed with properly graded fine material consisting of murrum or earth to fill the voids and the mixture used for filling.

If fill material is required to be imported, the Contractor shall make arrangements to bring such material from outside borrow pits. The material and source shall be subject to the prior approval of the Engineer. The approved borrow pit areas shall be cleared of all bushes, roots of trees, plants, rubbish, etc. Topsoil containing foreign material shall be removed. The materials so removed shall be disposed of as directed by Engineer. The Contractor shall provide the necessary access roads to borrow areas and maintain the same if such roads do not exist.

2.3.3 Filling in Pits and Trenches Around Foundations

The spaces around the foundations, structures, pits, trenches, etc., shall be cleared of all debris, and filled with earth in layers not exceeding 15 cm, each layer being watered, rammed and properly consolidated to the satisfaction of Engineer. Earth shall be rammed with approved mechanical compaction machines. Usually no manual compaction shall be allowed unless the Engineer is satisfied that in some cases manual compaction by tampers

cannot be avoided. The final backfill surface shall be trimmed and leveled to a proper profile to the approval of the Engineer.

The filling shall be done after the concrete or masonry is fully set and done in such a manner as not to cause undue thrust on any part of the structure.

2.3.4 Plinth Filling

Plinth filling shall be carried out with approved material such as soil, sand or murum as in layers not exceeding 15 cm, watered and compacted with mechanical compaction machines. When filling reaches the finished level, the surface shall be flooded with water, unless otherwise directed, for at least 24 hours, allowed to dry and then the surface again compacted as specified above to avoid settlement at a later stage. The finished level of the filling shall be trimmed to the level/slope specified.

Compaction of large areas shall be carried out by means of 12 ton rollers smooth wheeled, sheep-foot or wobbly wheeled rollers. In case of compaction of granular material such as sands and gravel, vibratory rollers shall be used. A smaller weight roller may be used only if permitted by the Engineer. As rolling proceeds, water sprinkling shall be done to assist consolidation. Water shall not be sprinkled in case of sandy fills.

The thickness of each unconsolidated fill layer can in this be upto a maximum of 300 mm. The Contractor will determine the thickness of the layers in which fill has to be consolidated depending on the fill material and equipment used and the approval of the Engineer obtained prior to commencing filling.

The process of filling in the plinth, filling upto finished ground level, watering and compaction shall be carried out by the contractor in such a way as not to endanger the foundation columns, plinth walls etc. already built up. Under no circumstances Black cotton soil shall be used for plinth in filling.

Rolling shall commence from the outer edge and progress towards the centre and continue until compaction is to the satisfaction of Engineer, but in no case less than 10 passes of the roller will be accepted for each layer.

The compacted surface shall be properly shaped, trimmed and consolidated to an even and uniform gradient. All soft spots shall be excavated, then filled and consolidated.

At some locations/ areas, it may not be possible to use rollers because of space restrictions, etc. The Contractor shall then be permitted to use pneumatic tampers, rammers, etc. and he shall ensure proper compaction.

2.3.5 Sand Filling

Where backfilling is required to be carried out with local sand it shall be clean, medium grained and free from impurities. The filled-in-sand shall be kept flooded with water for 24 hours to ensure maximum consolidation. The surface of the consolidated sand shall be dressed to required level or slope. Construction of floors or other structures on sand fill shall not be started until the Engineer has inspected and approved the fill.

2.3.6 General Site Grading

Site grading shall be carried out as indicated in the approved drawings. Excavation shall be carried out as specified in the Department's Requirements. Filling and compaction shall be carried out as specified elsewhere in the document.

If no compaction is called for, the fill may be deposited to the full height in one operation and leveled. If the fill has to be compacted, it shall be placed in layers not exceeding 200 mm and leveled uniformly and compacted before the next layer is deposited.

To ensure that the fill has been compacted as specified, field and laboratory tests shall be carried out by the Contractor.

Field compaction tests shall be carried out in each layer of filling until the fill to the entire height has been completed. This shall hold good for embankments as well. The fill will be considered as incomplete if the desired compaction has not been obtained.

The Contractor shall protect the earth fill from being washed away by rain or damaged in any other way. Should any slip occur, the Contractor shall remove the affected material and make good the slip.

2.3.7 Field Density

Unless otherwise specified the compaction, where so called for, shall comply with minimum 90% compaction by Standard Proctor at moisture content differing not more than 4% from the optimum moisture content. The Contractor shall demonstrate adequately by field and laboratory tests that the specified density has been obtained

2.3.8 Timber Shoring

As per Standard specification and the provisions of relevant IS shall apply.

2.3.9 Dewatering

The Contractor shall ensure at his cost that the excavation and the structures are free from water during construction and shall take all necessary precautions and measures to exclude ground/rain water so as to enable the works to be carried out in reasonably dry conditions in accordance with the construction programme. Sumps made for dewatering must be kept clear of the excavations/ trenches required for further work. The method of pumping shall be approved by Engineer, but in any case, the pumping arrangement shall be such that there shall be no movement of subsoil or blowing in due to differential head of water during pumping. Pumping arrangements shall be adequate to ensure no delays in construction. The dewatering shall be continued for at least (7) seven days after the last pour of the concrete. The Contractor shall, however, ensure that no damage to the structure results on stopping of dewatering.

The Contractor shall study the sub-soil conditions carefully and shall conduct any test necessary at the site with the approval of the Engineer to test the permeability and drainage conditions of the sub-soil for excavation, concreting etc., below ground level.

The scheme for dewatering and disposal of water shall be approved by the Engineer. The Contractor shall suitably divert the water obtained from dewatering from such areas of site where a build-up of water in the opinion of the Engineer obstructs the progress of the work, leads to unsanitary conditions by stagnation, retards the speed of construction and is detrimental to the safety of men, materials, structures and equipment.

When there is a continuous inflow of water and the quantum of water to be handled is considered in the opinion of Engineer, to be large, a well point system-single stage or multistage, shall be adopted. The Contractor shall submit to the Engineer, details of his well point system including the stages, the spacing number and diameter of well points, headers etc., and the number, capacity and location of pumps for approval.

If any foundation pits are filled due to accumulation of surface flow during the progress of work or during rainy season, or due to any other cause all pumping required for dewatering the pits & removing silt shall be done without extra cost.

2.3.10 Rain Water Drainage

Grading in the vicinity of excavation shall be such as to exclude rain/ surface water draining into excavated areas. Excavation shall be kept clean of rain and such water as the Contractor may be using for his work by suitably pumping out the same. The scheme for pumping and discharge of such water shall be approved by the Engineer.

2.3.11 Rock Filling

Where backfilling is required to be carried out with local rocks it shall be done with mixture of sand. It shall be clean, medium grained and free from impurities. The filled-in-rock sand mixture shall be kept flooded with water for 24 hours to ensure maximum consolidation. The surface of the consolidated sand shall be dressed to required level. Construction of other structures on fill shall not be started until the Engineer has inspected and approved the fill.

2.4 Reinforced Cement Concrete

2.4.1 General

The aggregates and cement shall be proportioned by weight only. The mixing shall always be carried out in a mechanically operated mixer in such a way so as to avoid any loss of water or cement. The drum of the mixer should be free from holes to avoid any loss of water or cement. No hand mixed concrete will normally be allowed. The concrete so prepared, shall be carefully conveyed, placed in position and compacted using suitable type of mechanical vibrator, as rapidly as practicable, but in no case the time required till compaction shall exceed 30 minutes after mixing. During concreting, standby concrete mixer and vibrator shall be kept available at site. Ordinary Portland Cement (OPC) conforming to IS: 8112-1989 mark (grade-43) shall only be used. Cement manufactured in mini-cement plants shall not be used. All reinforcement used shall be of TMT Steel (Fe-415/Fe500) having ISI mark and shall be clean and free from loose mill scales, rust and coating of oil or other coatings which may destroy or reduce bond. Minimum size of reinforcement bars shall be of 8 mm. Only steel shuttering shall be used. Shuttering shall be new or in a good condition without holes or dents and the Contractor shall get the same approval by the Engineer, before its use. The individual elements of shuttering shall

correctly match with the required shape of structural member to ensure a gap-free shuttering. Suitable systems have to be provided for keeping the shuttering in place and in case of walls, maintaining the supports at an appropriate distance. The construction joints should be predetermined by the Engineer and these have to be executed with utmost care. Before commencing concreting for subsequent lifts/ panels, surface previously concreted member shall be thoroughly cleaned to remove all loose materials in contact with it. Honeycombing has to be avoided by suitably fixing of shuttering, preparation of surface of joints and proper use of vibrators. The exposed surfaces of concrete shall be kept continuously in a wet condition by ponding or covering with a layer of sackings, canvas, Hessian or similar materials and kept continuously wet for at least 21 days from the date of placing of concrete.

To obtain a dense concrete and to reduce chances of honeycombing, adequate admixture approved by Engineer shall be used as integral water proofing compound in concrete work. The quantity of the admixture to be used shall be as prescribed by the manufacturer and approved by the Engineer.

Minimum grade shall be M25.

2.4.2 Materials

All Material shall comply with the relevant specification described in subsequent clauses in standard specification.

2.4.3 Water

Water used for both mixing and curing shall conform to IS : 456-2000 and free from injurious amounts of oils, acids, alkalis, salts, sugar, organic materials that may be deleterious to concrete or steel. The pH value of water shall not be less than 6.

2.4.4 Reinforcement

Reinforcement shall be any of the following:

- Mild Steel and medium tensile bars to IS 432 Part 1.
- High strength deformed bars and wires to IS 1786.
- Rolled steel Grade A made from structural steel to IS 2062.

All reinforcement shall be free from loose mill scales, loose rust and coats of paints, oil, mud or other coatings which may destroy or reduce bond.

2.4.5 Admixtures

Accelerating, retarding, water reducing and air entraining admixtures shall conform to IS: 9103 and integral water proofing admixtures to IS : 2645.

Admixtures may be used in concrete as per manufacturer's instructions only with the approval of the Engineer. An admixture's suitability and effectiveness shall be verified by trial mixes with the other materials used in the works. If two or more admixtures are to be

used simultaneously in the same concrete mix, their interaction shall be checked and trial mixes done to ensure their compatibility. There should also be no increase in risk of corrosion of the reinforcement or other embedment. Calcium chloride shall not be used for accelerating set of the cement for any concrete containing reinforcement or embedded steel parts. When calcium chloride is permitted such as in mass concrete works, it shall be dissolved in water and added to the mixing water by an amount not exceeding 1.5 percent of the weight of the cement in each batch of concrete. The designed concrete mix shall be corrected accordingly.

2.4.6 Samples and Tests of Raw Materials

All materials used for the works shall be tested before use.

Manufacturer's test certificate shall be furnished for each batch of cement /steel and when directed by the Engineer samples shall also be got tested by the Contractor in a laboratory approved by the Engineer.

Sampling and testing shall be as per IS : 2386 under the supervision of the Engineer.

Water to be used shall be tested to comply with requirements of IS : 456.

The Contractor shall furnish manufacturer's test certificates and technical literature for the admixture proposed to be used. If directed, the admixture shall be got tested at an approved laboratory at no extra cost.

2.5 Design Mix Concrete

2.5.1 Mix Design and Testing

For Design Mix Concrete, the mix shall be designed according to IS : 10262 and SP 23 to provide the grade of concrete having the required workability and characteristic strength not less than appropriate values given in IS:456. The design mix shall be cohesive and does not segregate and should result in a dense and durable concrete and also capable of giving the finish as specified. For liquid retaining structures, the mix shall also result in watertight concrete. The Contractor shall exercise great care while designing the concrete mix and executing the works to achieve the desired result.

The minimum cement content for Design Mix Concrete shall be as per IS:456.

The minimum cement content stipulated above shall be adopted irrespective of whether the Contractor achieves the desired strength with less quantity of cement. The Contractor's quoted rates for concrete shall provide for the above eventuality and nothing extra shall become payable to the contractor in this account. Even in the case where the quantity of cement required is higher than that specified above to achieve desired strength based on an approved mix design, nothing extra shall become payable to the contractor.

It shall be the Contractor's sole responsibility to carry out the mix designs at his own cost. He shall furnish to the Engineer at least 30 days before concreting operations, a statement of proportions proposed to be used for the various concrete mixes and the strength results obtained. The strength requirements of the concrete mixes ascertained on 150 mm cubes as per IS : 516 shall comply with the requirements of IS : 456.

2.5.2 Batching and Mixing of Concrete

Proportions of aggregates and cement, as decided by the concrete mix design, shall be by weight. These proportions shall be maintained during subsequent concrete batching by means of weigh batchers capable of controlling the weights within one percent of the desired value.

Amount of water added shall be such as to produce dense concrete of required consistency, specified strength and satisfactory workability and shall be so adjusted to account for moisture content in the aggregates. Water-cement ratio specified for use by the Engineer shall be maintained. Each time the work stops, the mixer shall be cleaned out and while recommencing, the first batch shall have 10% additional cement to allow for sticking in the drum. Arrangement should be made by the Contractor to have the cubes tested in an approved laboratory or in field with prior consent of the Engineer. Sampling and testing of strength and workability of concrete shall be as per IS:1199, IS : 516 and IS : 456.

2.5.3 Mixing

Concrete shall be mixed in a mechanical mixer conforming to IS 1791. The mixing shall be continued until there is uniform distribution of materials and the mass is uniform in colour and consistency. If there is segregation after unloading, the concrete should be remixed.

2.5.4 Formwork

Formwork shall be all inclusive and shall consist of but not be limited to shores, bracings, sides of footings, walls, beams and columns, bottom of slabs etc. including ties, anchors, hangers, inserts, false work, wedges etc.

The design and engineering of the formwork as well as its construction shall be the responsibility of the Contractor. However, if so desired by the Engineer, the drawings and calculations for the design of the formwork shall be submitted to the Engineer for the approval.

Formwork shall be designed to fulfill the following requirements:

- Sufficiently rigid and tight to prevent loss of grout or mortar from the concrete at all stages and appropriate to the methods of placing and compacting.
- Capable of providing concrete of the correct shape and surface finish within the specified tolerance limits.
- Capable of withstanding without deflection the worst combination of self-weight, reinforcement and concrete weight, all loads and dynamic effects arising from construction and compacting activities, wind and weather forces.
- Capable of easy striking out without shock, disturbance or damage to the concrete.
- Soffit forms capable of imparting a camber if required. Soffit forms and supports capable of being left in position if required

- Capable of being cleaned and/or coated if necessary immediately prior to casting the concrete; design temporary openings where necessary for these purposes and to facilitate and the preparation of construction joints.

The formwork may be of timber, plywood, steel, plastic or concrete depending upon the type of finish specified. Sliding forms and slip form may be used with the approval of the Engineer. Timber for formwork shall be well seasoned, free from sap, shakes, loose knots, worm holes, warps and other surface defects. Joints between formwork and structures shall be sufficiently tight to prevent loss of slurry from concrete, using seals if necessary.

The faces of formwork coming in contact with concrete shall be cleaned and two coats of approved mould oil applied before fixing reinforcement. All rubbish, particularly chippings, shavings, sawdust, wire pieces dust etc. shall be removed from the interior of the forms before the concrete is placed. Where directed, cleaning of forms shall be done by blasting with a jet of compressed air at no extra cost.

Forms intended for reuse shall be treated with care. Forms that have deteriorated shall not be used. Before reuse, all forms shall be thoroughly scraped, cleaned, nails removed, holes suitably plugged, joints repaired and warped lumber replaced to the satisfaction of the Engineer. The Contractor shall equip himself with enough shuttering to allow for wastage so as to complete the job in time.

Permanent formwork shall be checked for its durability and compatibility with adjoining concrete before it is used in the structure. It shall be properly anchored to the concrete. Wire ties passing through beams, columns and walls shall not be allowed. In their place bolts passing through sleeves shall be used. Formwork spacers left in-situ shall not impair the desired appearance or durability of the structure by causing spalling, rust staining or allowing the passage of moisture.

For liquid retaining structures, sleeves shall not be provided for through bolts nor shall through bolts be removed if provided. The bolts, in the latter case, shall be cut at 25 mm depth from the surface and the hole made good by cement mortar of the same proportion as the concrete just after striking the formwork.

Where specified all corners and angles exposed in the finished structure shall have chamfers or fillets of 20 mm x 20 mm size.

Forms for substructure may be omitted when, in the opinion of the Engineer, the open excavation is firm enough (in hard non-porous soils) to act as a form. Such excavations shall be larger, as approved by the Engineer, than that required as per drawing to compensate for irregularities in excavation.

The Contractor shall provide adequate props carried down to a firm bearing without overloading any of the structures.

The shuttering for beams and slabs shall be so erected that the side shuttering of beams can be removed without disturbing the bottom shuttering. If the shuttering for a column is erected for the full height of the column, one side shall be built up in sections as placing of concrete proceeds or windows left for placing concrete from the side to limit the drop of concrete to 1.0 m or as approved by the Engineer. The Contractor shall temporarily and

securely fix items to be cast (embedment/ inserts) in a manner that will not hinder the striking of forms or permit loss of grout.

Formwork showing excessive distortion, during any stage of construction, shall be repositioned and strengthened. Placed concrete affected by faulty formwork, shall be entirely removed and formwork corrected prior to placement of new concrete at Contractor's cost.

2.5.5 Preparation Prior To Concrete Placement

Before concrete is actually placed in position, the inside of the formwork shall be cleaned and mould oil applied, inserts and reinforcement shall be correctly positioned and securely held, necessary openings, pockets, etc. provided.

All arrangements- formwork, equipment and proposed procedure, shall be approved by the Engineer. Contractor shall maintain separate Pour Card for each pour as per the format enclosed.

2.5.6 Check for Reinforcement and Concreting

All reinforcement shall be got checked and recorded prior to pouring of concrete, by a representative of the Engineer.

Minimum Requirement for all Reinforced or Plain Concrete Structures

All blinding and leveling concrete shall be minimum 100 mm thick in concrete M10 grade.

All structural reinforced concrete other than for water retaining structures shall at least be of M25 grade with maximum 20mm size downgraded coarse aggregates.

The minimum grade of concrete for water retaining structures shall be M25 having minimum cement content of 360 kg/m³ with maximum 20mm size downgraded coarse aggregates.

Minimum cover to reinforcement for all water retaining structures shall be 40mm including the bottom of the roof. For other structures the minimum clear cover shall be as specified in IS:456 – 2000.

Approved quality water proofing compound (chloride free) shall be added during concreting of all water retaining structure, in the proportion specified by the manufacturer/as per design mix or upto 2% (percent) by weight of cement.

The minimum thickness required for different reinforced concrete members shall be as per the working structural drawings to be provided to him within 15 days of award of the work.

2.5.7 Transportation, Placing and Compacting Concrete

Concrete shall be transported from the mixing plant to the formwork with minimum time lapse by methods that shall maintain the required workability and will prevent segregation, loss of any ingredients or ingress of foreign matter or water. During hot or cold weather,

concrete shall be transported in deep containers other suitable measures to reduce loss of water by evaporation and heat loss in cold weather may also be adopted.

In all cases concrete shall be deposited as nearly as practicable directly in its final position to avoid re-handling. To avoid segregation, concrete shall not be re-handled or caused to flow. For locations where direct placement is not possible and in narrow forms and Contractor shall provide suitable drops and “Elephant Trunks”. Concrete shall not be dropped from a height of more than 1.0 m. Care shall be taken to avoid displacement of reinforcement or formwork.

Concrete shall not be placed in flowing water. Under water, concrete shall be placed in position by tremies or by pipeline from the mixer and shall never be allowed to fall freely through the water.

While placing concrete the Contractor shall proceed as specified below and also ensure the following:

- Continuously between construction joints and pre-determined abutments.
- Without disturbance to forms or reinforcement
- Without disturbance to pipes, ducts, fixings and the like to be cast in; ensure that such items are securely fixed. Ensure that concrete cannot enter open ends of pipes and conduits etc.
- Without dropping in a manner that could cause segregation or shock.
- In deep pours only when the concrete and formwork designed for this purpose and by using suitable chutes or pipes.
- Do not place if the workability is such that full compaction cannot be achieved
- Without disturbing the unsupported sides of excavations; prevent contamination of concrete with earth. Provide sheeting if necessary in supported excavations, withdraw the linings progressively as concrete is placed.
- If placed directly onto hardcore or any other porous material, dampen the surface to reduce loss of water from the concrete.
- Ensure that there is no damage or displacement to sheet membranes.
- Record the time and location of placing structural concrete.

Concrete shall normally be compacted in its final position within thirty minutes of leaving the mixer. Concrete shall be compacted during placing with approved vibrating equipment without causing segregation until it forms a solid mass free from voids thoroughly worked around reinforcement and embedded fixtures and into all corners of the formwork. Immersion vibrators shall be inserted vertically at points not more than 450 mm apart and withdrawn slowly till air bubbles cease to come to the surface, leaving no voids. When placing concrete in layers advancing horizontally, care shall be taken to ensure adequate vibration, blending and melding of the concrete between successive layers. Vibrators shall

not be allowed to come in contact with reinforcement, formwork and finished surfaces after start of initial set. Over-vibration shall be avoided; under vibration is likewise harmful.

The vibrator should penetrate rapidly to the bottom of the layer and atleast 15 cm into the preceding layer if there is any. It should be held generally 5 to 15 sec. until the compaction is considered adequate and then withdrawn slowly at thereof about 8 cm/s.

Concrete may be conveyed and placed by mechanically operated equipment after getting the complete procedure approved by the Engineer. The slump shall be held to the minimum necessary for conveying concrete by this method. When concrete is to be pumped, the concrete mix shall be specially designed to suit pumping. Care shall be taken to avoid stoppages in work once pumping has started.

Except when placing with slip forms, each placement of concrete in multiple lift work, shall be allowed to set for at least 24 hours after the final set of concrete before the start of subsequent placement. Placing shall stop when concrete reaches the top of the opening in walls or bottom surface of slab, in slab and beam construction, and it shall be resumed before concrete takes initial set but not until it has had time to settle as approved by the Engineer. Concrete shall be protected against damage until final acceptance.

2.5.8 Mass Concrete Works

Sequence of pouring for mass concrete works shall be as approved by the Engineer. The Contractor shall exercise great care to prevent shrinkage cracks and shall monitor the temperature of the placed concrete if directed.

2.5.9 Curing

Curing and protection shall start immediately after the compaction of the concrete to protect it from

- premature drying out, particularly by solar radiation and wind;
- If placed directly onto hardcore or any other porous material, dampen the surface to reduce loss of water from the concrete.
- leaching out by rain and flowing water;
- rapid cooling during the first few days after placing;
- high internal thermal gradient;
- low temperature of frost;
- vibration and impact which may disrupt the concrete and interfere with its bond to the reinforcement

After the concrete has begun to harden i.e. 1 to 2 hr. after laying curing shall be started.

All concrete, unless approved otherwise by the Engineer, shall be cured by use of continuous sprays or ponded water or continuously saturated coverings of sacking, canvas, hessian or other absorbent material for the period of complete hydration with a minimum of 10 days. The quality of curing water shall be the same as that used for mixing.

Where a curing membrane is approved to be used by the Engineer, the same shall be of a non-wax base and shall not impair the concrete finish in any manner. The curing compound to be used shall be approved by the Engineer before use and shall be applied with spraying equipment capable of a smooth, even textured coat.

When concrete is used as subgrade for flooring, the flooring may be commenced before the curing period of subgrade is over, but curing of subgrade shall be continued along with the top layer of flooring for a minimum period of 10 days.

Curing may also be done by covering the surface with an impermeable material such as polyethylene, which shall be well sealed and fastened.

2.5.10 Acceptance of Concrete

The concrete tested in accordance with 'Testing of Concrete' clause above, shall meet the criteria for acceptance of concrete as per IS:456-2000. The strength of concrete shall be the average strength of three specimens tested at 28 days and conform to strength requirements for different grades of concrete. If 7 days tests show crushing strengths that are too low than required, corrective measures shall be taken at once, at the Engineers direction, without waiting for the results of the 28 days test.

2.5.11 Failure to Meet Strength of Requirements

In case where concrete tested fails to meet the test requirements, the Engineer shall have the right to require any one or all the following additional tests. The Contractor, at his own expense, shall carry out such tests. The Engineer shall be the final authority for interpreting the results and shall decide upon the acceptance or otherwise.

Curing and load testing of the concrete member concerned represented by the test, which failed.

Replacement of any such portions of the structure - No payment shall be made for the dismantling of the concrete, relevant formwork, or reinforcement. The Contractor at his own expenses shall make good embedded parts and/ or reinforcement that may get damaged during dismantling.

Collecting and testing of a core specimen from the hardened concrete. The location number and size of such specimen shall be taken as directed by the Engineer. Any other test such as, ultrasonic and/ or rebound hammer test, etc. shall be done as decided by the Engineer.

2.5.12 Construction Joints and Keys

The position and arrangement of construction joints shall be as indicated by the contractor in his working drawings dually approved by the department. Concrete shall be placed without interruption until completion of work between construction joints. If stopping of

concreting becomes unavoidable anywhere, a properly formed construction joint shall be made with the approval of the Engineer.

Dowels for concrete work, not likely to be taken up in the near future, shall be coated with cement slurry and encased in lean concrete as indicated on the drawings or as approved by the Project Manager.

Before resuming concreting on a surface which has hardened all laitance and loose stone shall be thoroughly removed by wire brushing/hacking and surface washed with high pressure water jet and treated with thin layer of cement slurry for vertical joints and horizontal layers.

When concreting is to be resumed on a surface, which has not fully hardened, all laitance shall be removed by wire brushing, the surface wetted, free water removed and a coat of cement slurry applied. On this, a layer of concrete not exceeding 150 mm thickness shall be placed and well rammed against the old work. Thereafter work shall proceed in the normal way.

For horizontal joints, the surface shall be covered with a layer of mortar about 10-15 mm thick composed of cement and sand in the concrete mix. This cement slurry or mortar shall be freshly mixed and applied immediately before placing concrete.

2.5.13 Foundation Bedding

All earth surfaces upon which or against which concrete is to be placed, shall be well compacted and free from standing water, mud or debris. Soft or spongy areas shall be cleaned out and filled with either soil-cement mixture, lean concrete or clean sand compacted as approved by the Project Manager. The surfaces of absorptive soils shall be moistened.

Concrete shall not be deposited on large sloping rock surfaces. The rock shall be cut to form rough steps or benches by picking, barring or wedging. The rock surface shall be kept wet for 2 to 4 hours before concreting.

Excavation, in clay or other soils that are likely to be affected by exposure to atmosphere, shall be concreted as soon as they are dry. Alternatively, unless otherwise mentioned the bottom of the excavation shall be protected immediately by 8 cm thick layer of cement concrete not leaner than M10 or in order to obtain a dry hard bottom, the last stretch of excavation of about 10 cm shall be removed just before concreting.

2.5.14 Repair and Replacement of Unsatisfactory Concrete

Immediately after the shuttering is removed, all defective areas such as honey-combed surfaces, rough patches, holes left by form bolts etc, shall be inspected by the Project Manager who may permit patching of the defective areas or reject the concrete work.

All through holes for shuttering shall be filled for full depth and neatly plugged flush with surface.

Rejected concrete shall be removed and replaced by the Contractor at no additional cost to the Employer.

For patching of defective areas all loose materials shall be removed and the surface shall be prepared as approved by the Project Manager.

Bonding between hardened and fresh concrete shall be done either by placing cement mortar or by applying epoxy. The decision of the Project Manager as to the method of repairs to be adopted shall be final and binding on the Contractor. The surface shall be saturated with water for 24 hours before patching is done with cement sand mortar. The use of epoxy for bonding fresh concrete shall be carried out as approved by the Project Manager.

2.5.15 Hot weather Requirements

Concreting during hot weather shall be carried out as per IS 7861 (Part I).

Adequate provision shall be made to lower concrete temperatures, which shall not exceed 40 deg C at time of placement of fresh concrete.

Where directed by the Project Manager, the Contractor shall spray non-wax based curing compound on unformed concrete surfaces at no extra costs.

2.5.16 Cold Weather Requirements

Concreting during cold weather shall be carried out as per IS: 7861(Part II).

The ambient temperature during placement and upto final set shall not fall below 5 deg. C. Approved antifreeze/accelerating additives shall be used where directed.

For major and large scale concreting works the temperature of concrete at times of mixing and placing, the thermal conductivity of the formwork and its insulation and stripping period shall be closely monitored.

2.5.17 Liquid Retaining Structures

The Contractor shall take special care for concrete for liquid retaining structures, underground structures and those others specifically called for to guarantee the finish and water tightness.

The Contractor shall make all arrangements for hydro-testing of structure, all arrangements for testing such as temporary bulk heads, pressure gauges, pumps, pipe lines etc.

The Contractor shall also make all temporary arrangements that may have to be made to ensure stability of the structures during construction.

Any leakage that may occur during the hydro-test or subsequently during the defects liability period or the period for which the structure is guaranteed shall be effectively stopped either by cement/epoxy pressure grouting, guniting or such other methods as may be approved by the Project Manager. All such rectification shall be done by the contractor to the entire satisfaction of the Project Manager at no extra cost to the department.

2.5.18 Water Stops

Material

The material for the PVC water stops shall be a plastic compound with the basic resin of polyvinyl chloride and additional resins, plasticizers, inhibitors, which satisfies the performance characteristics specified below as per IS : 12200. Testing shall be in accordance with IS : 8543

Tensile strength	3.6 N/mm ² minimum
Ultimate elongation	300% minimum
Tear resistance	4.9 N/mm ² minimum
Stiffness in flexure	2.46 N/mm ² minimum
Accelerated extraction	10.50 N/mm ² minimum
i) Tensile strength	250% minimum
ii) Ultimate elongation	
Effect of Alkali	7 days
i) Weight increase	0.10% maximum
ii) Weight decrease	0.10% maximum
iii) Hardness change	± 5 points
Effect of Alkali	28 days
i) Weight increase	0.40% maximum
ii) Weight decrease	0.30% maximum
iii) Dimension change	± 1%

PVC water stops shall be either of the bar type, serrated with centre bulb and end grips for use within the concrete elements or of the surface (kicker) type for external use.

PVC water stops shall be of approved manufacture. Samples and the test certificate shall be got approved by the Project Manager before procurement for incorporation in the works.

Workmanship

Water stops shall be cleaned before placing them in position. Oil or grease shall be removed thoroughly using water and suitable detergents.

Water stops shall be procured in long lengths as manufactured to avoid joints as far as possible. Standard L or T type of intersection pieces shall be procured for use depending on their requirement. Any non-standard junctions shall be made by cutting the pieces to profile for jointing. Lapping of water stops shall not be permitted. All jointing shall be of fusion-welded type as per manufacturer's instructions.

Water stops shall be placed at the correct location/level and suitably supported at intervals with the reinforcement to ensure that it does not deviate from its intended position during concreting and vibrating. Care shall also be taken to ensure that no honeycombing occurs because of the serrations/ end grips, by placing concrete with smaller size aggregates in this region. Projecting portions of the water stops embedded in concrete shall be thoroughly cleaned of all mortar/concrete coating before resuming further concreting operations. The projecting water stops shall also be suitably supported at intervals with the reinforcement to maintain its intended position during concreting so as to ensure that it does not bend leading to formation of pockets. In addition, smaller size aggregates shall be used for concreting in this region also.

2.5.19 Preformed Filler and Joint Sealing Compound

Preformed filler for expansion / isolation joints shall be non-extruding and resilient type of bitumen impregnated fibres conforming to IS : 1838 Part I or IS 1838 Part 2.

Bitumen coat to concrete/masonry surfaces for fixing the preformed bitumen filler strip shall conform to IS:702. Bitumen primer shall conform to IS : 3384.

Sealing compound for filling the joints above the preformed bitumen filler shall conform to Grade 'A' as per IS:1834. Other organic solvents such as polysulphate based joint sealants to IS:1433 Part 1 or IS 12118 Part 1 may be used with the approval of Project Manager.

2.5.20 Nominal Mix Concrete

The above relevant activities shall be applicable for nominal mix concrete.

2.6 Plain Cement Concrete

As per Standard Specification.

2.7 Structural Steel Works

2.7.1 General

As much fabrication work as is reasonably practicable work shall be completed in shops, where steel work is fabricated. All workmanship and finish shall be of the best quality and shall conform to the best approved method of fabrication. All materials shall be finished straight and shall be machined/ground smooth true and square where so specified. All holes and edges shall be free of burrs. Shearing and chipping shall be neatly and accurately done and all portions of work exposed to view shall be neatly finished. Tolerances for fabrication of steel structures conform IS 7215. Tolerances for erection of steel structures shall conform to IS 12843.

2.7.2 Corrosion Protection

Unless, otherwise specified, the thickness of steel section shall be governed as below:

a) Steel work exposed to weather

Where steel work is directly exposed to weather and is fully accessible for clearing and repairing the thickness shall not be less than 6 mm; and where steel is exposed to weather and is not accessible for cleaning and painting, the thickness shall not be less than 8 mm. This shall not apply for hot rolled sections covered by Indian Standards.

b) Steel work not directly exposed to weather

The thickness of steel work not directly exposed to the weather shall be not less than 6 mm. The thickness of steel in secondary members shall be not less than 4.5 mm. For hot rolled sections to Indian Standards, the mean thickness of flange be considered and not the web thickness.

The requirements (a) and (b) above does not apply to light structural work or sealed box section or to steel work in which special provision against corrosion has been made and also in case of steel work exposed to highly corrosive fumes or vapour in which case the thickness shall be as approved by the Project Manager.

2.7.3 Painting

All fabricated steel material, except those galvanised shall receive protective paint coating as prescribed in IS 1477 Parts 1 & 2.

All surfaces to be painted, oiled or otherwise treated shall be dry thoroughly cleaned to remove all loose scale and loose rust.

Shop contact surfaces need not be painted unless otherwise specified.

Surfaces which will not be in contact but inaccessible after shop assembly shall receive full specified protective treatment before assembly. This does not apply to interior of hollow seatings.

Chequered plates shall be painted after the details of painting are approved by the Project Manager.

In case of surfaces to be welded, steel shall not be painted within a suitable distance of any edges to be welded if paint would be harmful to the welder or impair the quality of welds.

Welds and adjacent parent metal shall not be painted prior to slugging, inspection and approved.

Parts to be encased on concrete shall not be painted or oiled.

2.7.4 Surface Treatment

All the surfaces of steel work to be painted shall be thoroughly cleaned of all loose mill scale, rust, grease, dirt and other foreign matter. The type of surface treatment shall be as specified in the respective item of work. The workmanship shall generally conform to the requirements of IS 1477- Part I.

2.7.5 Materials

A. All the materials shall be of the best quality from an approved manufacturer. contractor shall obtain prior approval of the Project Manager for the brand of manufacturer and the colour/shade prior to procurement for usage in the works.

B. Primer and finish paints shall be compatible with each other to avoid cracking and wrinkling. As such it is recommended that the primer and finish paint shall be from the same manufacturer.

C. The colour and shade shall conform to IS Standards referred to in Appendix 'D' of IS 1477-Part II. To facilitate choosing the correct shade/number from the alternatives available, contractor shall adopt trial painting in small patches in consultation with and as directed by the Project Manager.

D. All paint delivered to the fabrication shop/site shall be ready mixed, in original sealed containers, as packed by the manufacturer. Thinner shall not be permitted for usage unless specifically directed by the Project Manager.

E. Paints shall be stirred thoroughly to keep the pigment in suspension.

F. Contractor shall at his own cost arrange for testing of paints as per relevant Indian Standard laboratory whenever Project Manager wants the tests to be carried out for each batch of paints. Test results shall be submitted to the Project Manager for obtaining approval.

2.7.6 Workmanship

1. The type and the number of coats of the primer paint and finish paint shall be as specified in the respective items of work.

2. Painting shall be carried out only on thoroughly dry surfaces.

3. No painting shall be done in frosty/foggy weather or when the humidity is high enough to cause condensation on the surface to be painted. Paint shall not be applied when the temperature of the surface to be painted is at 50 0 C or lower.

4. Primers shall adhere to the surface firmly and offer a key to the subsequent coats.

5. The application of paint film serves the twin purpose of protecting the steel from corrosion and giving the decorative appearance. Paint which gives the steel adequate protection over a long period together with good appearance shall therefore be adopted.

6. Workmanship shall generally conform to requirements specified in IS 1477-Part-II.

7. It is essential to ensure that immediately after preparation of the surfaces, the first coat of primer paint shall be applied by brushing and working it well to ensure a continuous film without “holidays”. After the first coat becomes hard dry a second coat of primer shall be applied by brushing to obtain a film free from holidays.

8. Structural steel surfaces shall be given the first coat of primer at shop and the second coat after it is erected in position. Further, any abraded surfaces of the first coat during transport from shop to site and during erection shall be provided with a touch up coat of the primer.

9. The dry film thickness of each coat of primer shall be not less than 25 microns.

10. Application of finishing paints shall be carried out within the shortest possible time interval after primer since the primer coats are too thin to give adequate corrosion protection to the steel surface over a long duration.

11. Filler coats shall be applied to fill dents and to obtain a smooth finish wherever necessary. Only factory prepared filler suitable for steel work shall be used. Filler prepared by whiting and linseed oil by craftsmen at site shall never be used as such fillers may be unbalanced and incompatible with primer and finishing coats. Application of filler shall be done with good putty knife and necessary skill. Filler applied shall be just sufficient to fill the depression or unevenness and it shall be restricted to the minimum. It shall be applied

in thin layers. In filling depression or unevenness, due as many coats as are necessary may be applied allowing each layer to dry hard. The hardened coat shall be cut down by wet rubbing before the subsequent coat is applied. Where necessary, filler coats shall be applied over the undercoats also.

12. Painting shall be carried out either by brushing or by spraying. contractor shall procure the appropriate quality of paint for this purpose as recommended by the manufacturer.

13. After the second coat of primer is hard dry, the entire surface shall be wet rubbed cutting down to a smooth uniform surface. When the surface becomes dry, the undercoat of paint of optimum thickness shall be applied by brushing/spraying with minimum of brush marks. The coat shall be allowed to hard-dry. The under coat shall then be wet rubbed cutting down to a smooth finish, taking adequate care to ensure that at no place the undercoat is completely removed. The surface shall then be allowed to dry.

14. The first finishing coat of paint shall be applied by brushing or by spraying and allowed to hard dry. The gloss from the entire surface shall then be gently removed and the surface dusted off. The second finishing coat shall then be applied by brushing or by spraying.

15. At least 24 hours shall elapse between the applications of successive coats. Each coat shall vary slightly in shade and this shall be got approved by the Project Manager.

16. Minimum dry film thickness of each coat of finish paint of synthetic enamel shall be 25 microns. Minimum dry film thickness of other finish paints shall be as specified in the respective item of work.

17. Epoxy primer and epoxy paint shall be applied within the specified pot life all as per recommendations of the manufacturer.

18. Surfaces inaccessible after assembly shall receive two coats of primer prior to assembly.

19. Surfaces inaccessible after erection, including top surfaces of floor beams supporting grating or chequered plate shall receive one additional coat of finish paint over and above the number of coats specified prior to erection.

20. Portion of steel members embedded to be encased in concrete shall not be painted. Joints to be site welded shall have no shop paint for at least 50 mm from the welding zone. Similarly, the steel surfaces shall not be painted in areas where connection is by use of friction grip bolts. On completion of the joint, the surfaces shall receive the painting as specified.

21. Maintenance painting of steel structures will become necessary if the painting already carried out shows signs of chalking, hairline cracking, deep checking, fine checking, peeling, blistering and rusting. The breakdown of a paint film is progressive from the top finish paint to the primer coat and the object of maintenance painting is to renovate periodically to effectively check the breakdown and protect the steel surfaces from corrosion. It is essential that same quality of paint as specified earlier need be adopted to ensure compatibility. The general workmanship for maintenance painting shall conform as per Clause 7 of IS 1477 - Part II.

22. Contractor shall provide suitable protection as necessary to prevent paint finishes from splashing on equipment, floors, walls etc.

2.8 Brickwork

2.8.1 Materials

Bricks used in the works shall conform to the requirements laid down in IS : 1077, IS 2180, IS 2222, IS 2691, IS 3952, IS 6165. The class of the bricks shall be as specifically indicated in the respective items of work prepared by the Contractor.

Brick shall be sound, hard, and homogeneous in texture, well burnt in kiln without being vitrified, hand/ machine moulded, deep red, cherry or copper coloured, of regular shape and size and shall have sharp and square edges with smooth rectangular faces. The bricks shall be free from pores, cracks, flaws and nodules of free lime. They shall have smooth rectangular faces with sharp corners and shall be uniform in colour, tolerance of brick dimension shall be $\pm 3\%$ of designation 10 & above and $\pm 8\%$ lower designation. Hand moulded bricks shall be moulded with a frog and those made by extrusion process may not be provided with a frog. Bricks shall give a clear ringing sound when struck.

2.8.2 Compressive Strength

Five bricks shall be tested. The average compressive strength shall be as per class designation.

2.8.3 Water Absorption

Five bricks shall be tested for water absorption and shall not exceed 20 % by weight.

2.8.4 Efflorescence

Five bricks shall be tested for efflorescence. The efflorescence shall be 'nil' to 'moderate'

Sample bricks shall be submitted to the Project Manager for approval and bricks supplied shall conform to approved samples. If demanded by Project Manager, brick samples shall be got tested as per IS : 3495 by Contractor. Bricks rejected by Project Manager shall be removed from the site of works within 24 hours.

Mortar for brick masonry shall consist of cement and sand.

Mortar leaner than 1.5 and richer than 1:3 shall not be used.

2.9 Mortar

2.9.1 Materials

Water

Water used shall be clean and reasonably free from injurious or deleterious materials such as oils, acids, alkalis, salts. The pH value of water shall not be less than 6.

Cement

Cement shall conform to the following:

For Treatment Modules (Screen and Grit chamber, Planted Drying Bed, Integrated Settler and Anaerobic Filter, Planted Gravel Filter): Sulphate resistant cement (SRC) to be used compulsorily

For Ancillary structures

- 33/43/53 Grade Ordinary Portland Cement IS : 8112
- Rapid Hardening cement
- Portland Slag cement(PSC)
- PPC
- Sulphate resistant cement(SRC)

Sand

Sand for masonry mortars shall conform to IS 2116

Mortars shall be prepared and tested as per IS 2250. Mixing of cement mortar shall be done in mechanical mixers.

2.9.2 Workmanship

Workmanship of brick work shall conform to IS: 2212. All bricks shall be thoroughly soaked in clear water for at least one hour immediately before being laid. The cement mortar for brick masonry work shall be as specified in the respective item of work prepared by the Contractor. Brick work 230 mm thick and over shall be laid in English Bond unless otherwise specified. 100mm/ 115 mm thick brickwork shall be laid with stretchers. For laying bricks, a layer of mortar shall be spread over the full width of suitable length of the lower course. Each brick shall be slightly pressed into the mortar and shoved into final position so as to embed the brick fully in mortar. Only full size bricks shall be used for the works and cut bricks utilized only to make up required wall length or for bonding. Bricks shall be laid with frogs uppermost.

All brickwork shall be plumb, square and true to dimensions shown. Vertical joints in alternate courses shall come directly one over the other and be in line. Horizontal courses shall be levelled. The thickness of brick courses shall be kept uniform. In case of one brick thick or half brick thick wall, at least one face should be kept smooth and plane, even if the other is slightly rough due to variation in size of bricks. For walls of thickness greater than one brick both faces shall be kept smooth and plane. All interconnected brickwork shall be carried out at nearly one level so that there is uniform distribution of pressure on the supporting structure and no portion of the work shall be left more than one course lower than the adjacent work. Where this is not possible, the work be raked back according to bond (and not saw toothed) at an angle not exceeding 45 deg. But in no case the level difference between adjoining walls shall exceed one meter. Brickwork shall not be raised more than one metre per day.

Bricks shall be so laid that all joints are well filled with mortar. The thickness of joints shall not be less than 6 mm and not more than 10 mm. The face joints shall be raked to a minimum depth of 10 mm/ 15 mm by raking tools during the progress of work when the mortar is still green, so as to provide a proper key for the plastering/ pointing respectively to be done later. When plastering or pointing is not required to be done, the joints shall be uniform in thickness and be struck flush and finished at the time of laying. The face of brickwork shall be cleaned daily and all mortar droppings removed. The surface of each course shall be thoroughly cleaned of all dirt before another course is laid on top.

During harsh weather conditions, newly built brick masonry works shall be protected by tarpaulin or other suitable covering to prevent mortar being washed away by rain.

Brickwork shall be kept constantly moist on all the faces for at least seven days after 24 hrs of laying. The arrangement for curing shall be got approved from the Project Manager.

Double scaffolding having two sets of vertical supports shall be provided to facilitate execution of the masonry works. The scaffolding shall be designed adequately considering all the dead, live and possible impact loads to ensure safety of the workmen, in accordance with the requirements stipulated in IS : 2750 and IS : 3696 (Part - I). Scaffolding shall be properly maintained during the entire period of construction. Single scaffolding shall not be used on important works and will be permitted only in certain cases as decided by the Project Manager. Where single scaffolding is adopted, only minimum number of holes, by omitting a header shall be left in the masonry for supporting horizontal scaffolding poles. All holes in the masonry shall be carefully made good before plastering/ pointing.

In the event of usage of traditional bricks of size 230 mm x 115 mm x 75 mm, the courses at the top of the plinth and sills as well as at the top of the wall just below the roof/ floor slabs and at the top of the parapet shall be laid with bricks on edge.

All brick work shall be built tightly against columns, floor slabs or other structural members.

To overcome the possibility of development of cracks in the brick masonry following measures shall be adopted.

For resting RCC slabs, the bearing surface of masonry wall shall be finished on top with 12 mm thick cement mortar 1:3 and provided with 2 layers of Kraft paper Grade 1 as per IS : 1397 or 2 layer of 50 micron thick polyethylene sheets.

RCC/ steel beams resting on masonry wall shall be provided with reinforced concrete bed blocks of 150 mm thickness, projecting 150mm on either sides of the beam, duly finished on top with 2 layer of Kraft paper Grade 1 as per IS : 1397 or 2 layers of 50 micron thick polyethylene sheets.

Steel wire fabric shall be provided at the junction of brick masonry and concrete before taking up plastering work.

Bricks for partition walls shall be stacked adjacent to the structural member to predeflect the structural member before the wall is taken up for execution. Further, the top most course of half or full brick walls abutting against either a deshuttered slab or beam shall be

built only after any proposed masonry wall above the structural member is executed to cater for the deflection of the structural element.

Reinforced cement concrete transoms and mullions of dimensions as indicated in the construction Drawings to be prepared by the Contractor are generally required to be provided in the half brick partition walls.

Where the drawings prepared by the Contractor indicate that structural steel sections are to be encased in brickwork, the brickwork masonry shall be built closely against the steel section, ensuring a minimum of 20 mm thick cement-sand mortar 1:4 over all the steel surfaces. Steel sections partly embedded in brickwork shall be provided with bituminous protective coating to the surfaces at the point of entry into the brick masonry.

2.10 Un-Coursed Random Rubble Masonry

2.10.1 Materials

Stones for the works shall be of the specified variety which are hard, durable, fine grained and uniform in colour (for superstructure work) free from defects like cracks, sand holes, patterns of soft / loose materials veins, other defects. Quality and work shall conform to the requirements specified in IS: 1597 (Part-I). The percentage of water absorption shall not exceed 5 percent as per test conducted in accordance with IS : 1124. The Contractor shall supply sample stones to the Project Manager for approval. Stones shall be laid with its grains horizontal so that the load transmitted is always perpendicular to the natural bed.

Cement-sand mortar for stone masonry works shall be as per IS 2250.

2.10.2 Scaffolding

Type of scaffolding to be used shall be as specified in the section of brick masonry

2.10.3 Workmanship

For all works below ground level the masonry shall be random rubble uncoursed with ordinary quarry dressed stones for the hearting and selected quarry dress stones for the facing.

For all R.R. masonry in superstructure the masonry shall be well bounded, faced with hammer dressed stones with squared quoins at corners. The bushing on the face shall not be more than 40 mm on an exposed face and on the face to be plastered it shall not project by more than 12 mm nor shall it have depression more than 10mm from the average wall surface.

Face stones shall extend back sufficiently and bond well with the masonry. The depth of stone from the face of the wall inwards shall not be less than the height or breadth at the face. The length of the stone shall not exceed three times the height and the breadth on base shall not be greater than three-fourths the thickness of wall nor less than 150 mm. The height of stone may be upto a maximum of 300 mm. Face stones or hearting stones shall not be less than 150 mm in any direction.

Chips and spalls shall be used wherever necessary to avoid thick mortar joints and to ensure that no hollow spaces are left in the masonry. The use of chips and spalls in the hearting shall not exceed 20 percent of the quantity of stone masonry. Spalls and chips

shall not be used on the face of the wall and below hearting stones to bring them to the level of face stones.

The maximum thickness of joints shall not exceed 20 mm. All joints shall be completely filled with mortar. When plastering or pointing is not required to be done, the joints shall be struck flush and finished as the work proceeds. Otherwise, the joints shall be raked to a minimum depth of 20 mm by a raking tool during the progress of the work while the mortar is still green.

Through or bond stones shall be provided in wall upto 600 mm thick and in case of wall above 600mm thickness, a set of two or more bond stones overlapping each other by at least 150mm shall be provided in a line from face to back. Each bond stone or a set of bond stones shall be provided for every 0.5 sq.m of wall surface.

All stones shall be sufficiently wetted before laying to prevent absorption of water from the mortar. All connected walls in a structure shall be normally raised uniformly and regularly. However if any part of the masonry is required to be left behind, the wall shall be raked back (and not saw toothed) at an angle not exceeding 45 deg. Masonry work shall not be raised by more than one metre per day.

Green work shall be protected from rain by suitable covering. Masonry work shall be kept constantly moist on all the faces for a minimum period of seven days for proper curing of the joints.

2.11 Damp Proof Course

2.11.1 Material and Workmanship

All the walls in a building shall be provided with damp-proof course covering plinth to prevent water from rising up the wall. The damp-proof course shall run without a break throughout the length of the wall, even under the door or other opening. Damp-proof course shall consist of minimum 100mm thick cement concrete of M-20 mix with nominal reinforcement and approved water-proofing compound admixture conforming to IS:2645 in proportion as directed by the manufacturer. Concrete shall be with 10mm down graded coarse aggregates.

The surface of brick work/stone masonry work shall be levelled and prepared before laying the cement concrete. Side shuttering shall be properly fixed to ensure that slurry does not leak through and is also not disturbed during compaction. The upper and side surface shall be made rough to afford key to the masonry above and to the plaster. Damp-proof course shall be cured properly for at least seven days after which it shall be allowed to dry for taking up further work.

2.11.2 Miscellaneous Inserts, Bolts, Etc.

All the miscellaneous inserts such as bolts, pipes, plate embedments etc., shall be accurately installed in the building works at the correct location and levels, all as detailed in the construction Drawing to be prepared by the Contractor. Contractor shall prepare and use templates for this purpose, if so directed by the Project Manager. In the event, of any of the inserts are improperly installed, contractor shall make necessary arrangement to remove and reinstall at the correct locations/levels all as directed by the Project Manager.

2.11.3 Base Concrete

The thickness and grade of concrete and reinforcement shall be as specified in items of works prepared by the Contractor.

Before placing the blinding concrete, the sub-base of rubble packing shall be properly wetted and rammed. Concrete for the base shall then be deposited between the forms, thoroughly tamped and surface finished level with the top edges of the forms. Two or three hours after the concrete has been laid in position, the surface shall be roughened using steel wire brush to remove any scum or laitance and swept clean so that the coarse aggregates are exposed. The surface of the base concrete shall be left rough to provide adequate bond for the floor finish to be provided later.

2.12 Floor Hardener Topping

2.12.1 Materials and Workmanship

Floor Hardener topping shall be provided either as integrally finished over the structural slab/grade slab or laid monolithically with the concrete/granolithic floor finish on top of hardened concrete base.

Floor hardener of the metallic or non-metallic type suitable for the performance of normal/medium /heavy duty function of the floor, the quantum of ingredients and the thickness of topping shall be as specified in the respective items of work prepared by the Contractor.

For monolithic application with the floor finish/slab the thickness of the layer shall be 15 mm. The topping shall be laid within 2 to 3 hours after concrete is laid when it is still plastic but stiffened enough for the workmen to tread over it by placing planks. The surface for the concrete layer shall be kept rough for providing adequate bond for the topping. Laitance shall be removed before placing the topping. The topping shall be screed and thoroughly compacted to the finished level. Trowelling to smooth finish shall be carried out. After the surface has hardened sufficiently, it shall be kept continuously moist for at least 10 days.

The procedure for mixing the floor hardener topping shall be as per manufacturer's instructions.

Surface shall be prevented from any damages due to subsequent building operations by covering with 75 mm thick layer of sand.

2.13 Cement Plastering Works

2.13.1 Materials

The proportions of the cement mortar for plastering shall be 1:4 (one part of cement to four parts of sand). Cement and sand shall be mixed thoroughly in dry condition and then just enough water added to obtain a workable consistency. The quality of water and cement shall be as per relevant IS standards. The quality and grading of sand for plastering shall conform to IS : 1542. The mixing shall be done thoroughly in a mechanical mixer unless hand mixing is specifically permitted by the Project Manager. If so desired by the Project Manager sand shall be screened and washed to meet the Specifications. The mortar thus mixed shall be used as soon as possible preferably within 30 minutes from the time water

is added to cement. In case the mortar has stiffened due to evaporation of water this may be re-tempered by adding water as required to restore consistency but this will be permitted only upto 30 minutes from the time of initial mixing of water to cement. Any mortar which is partially set shall be rejected and removed forthwith from the site. Droppings of plaster shall not be re-used under any circumstances.

2.13.2 Workmanship

Preparation of surfaces and application of plaster finishes shall generally conform to the requirements specified in IS : 1661 and IS : 2402.

Plastering operations shall not be commenced until installation of all fittings and fixtures such as door/ window panels, pipes, conduits etc. are completed.

All joints in masonry shall be raked as the work proceeds to a depth of 10 mm / 20mm for brick/ stone masonry respectively with a tool made for the purpose when the mortar is still green. The masonry surface to be rendered shall be washed with clean water to remove all dirt, loose materials, etc., Concrete surfaces to be rendered shall be roughened suitably by hacking or bush hammering for proper adhesion of plaster and the surface shall be evenly wetted to provide the correct suction. The masonry surfaces should not be too wet only damp at the time of plastering. The dampness shall be uniform to get uniform bond between the plaster and the masonry surface.

2.13.3 Interior Plain Faced Plaster

This plaster shall be laid in a single coat of 12 mm thickness. The mortar shall be dashed against the prepared surface with a trowel. The dashing of the coat shall be done using a strong whipping motion at right angles to the face of the wall or it may be applied with a plaster machine. The coat shall be trowelled hard and tight forcing it to surface depressions to obtain a permanent bond and finished to smooth surface. Interior plaster shall be carried out on jambs, lintel and sill faces, etc. as shown in the drawing and as directed by the Project Manager.

2.13.4 Plain Faced Ceiling Plaster

This shall be applied in a single coat of 6 mm thickness. Application of mortar shall be as stipulated in above paragraph.

2.13.5 Exterior Plain Faced Plaster

This plaster shall be applied in 2 coats. The first coat or the rendering coat shall be approximately 14 mm thick. The rendering coat shall be applied as stipulated above except finishing it to a true and even surface and then lightly roughened by cross scratch lines to provide bond for the finishing coat. The rendering coat shall be cured for at least two days and then allowed to dry. The second coat or finishing coat shall be 6mm thick. Before application of the second coat, the rendering coat shall be evenly damped. The second coat shall be applied from top to bottom in one operation without joints and shall be finished leaving an even and uniform surface. The mortar proportions for the coats shall be as specified in the respective item of work. The finished plastering work shall be cured for at least 7 days.

Interior plain faced plaster 20 mm thick if specified for uneven faces of brick walls or for random/ coursed rubble masonry walls shall be executed in 2 coats similar to the procedure stipulated in above paragraph.

For external plaster, the plastering operation shall be commenced from the top floor and carried downwards. For internal plaster, the plastering operations for the walls shall commence at the top and carried downwards. Plastering shall be carried out to the full length of the wall or to natural breaking points like doors/ windows etc. Ceiling plaster shall be completed first before commencing wall plastering.

Double scaffolding to be used shall be as specified in clause 6.6.1.8.

The finished plaster surface shall not show any deviation more than 4mm when checked with a straight edge of 2 m length placed against the surface.

To overcome the possibility of development of cracks in the plastering work following measures shall be adopted.

Plastering work shall be deferred as much as possible so that fairly complete drying shrinkage in concrete and masonry works take place.

Steel wire fabric shall be provided at the junction of brick masonry and concrete to overcome reasonably the differential drying shrinkage/ thermal movement.

Ceiling plaster shall be done, with a trowel cut at its junction with wall plaster. Similarly trowel cut shall be adopted between adjacent surfaces where discontinuity of the background exists.

2.14 Cement Pointing

2.14.1 Materials

The cement mortar for pointing shall be in the proportion of 1:3 (one part of cement to three parts of fine sand). Sand shall conform to IS : 1542 and shall be free from clay, shale, loam, alkali and organic matter and shall be of sound, hard, clean and durable particles. Sand shall be approved by Project Manager and if so directed it shall be washed/ screened to meet specification requirements.

2.14.2 Workmanship

Where pointing of joints in masonry work is specified, the joints shall be raked at least 15 mm/ 20 mm deep in brick/ stone masonry respectively as the work proceeds when the mortar is still green.

Any dust/ dirt in the raked joints shall be brushed out clean and the joints shall be washed with water. The joints shall be damp at the time of pointing. Mortar shall be filled into joints and well pressed with special steel trowels. The joint shall not be disturbed after it has once begun to set. The joints of the pointed work shall be neat. The lines shall be regular and uniform in breadth and the joints shall be raised, flat, sunk or 'V' as may be specified in the respective items of work. No false joints shall be allowed.

The work shall be kept moist for at least 7 days after the pointing is completed. Wherever coloured pointing has to be done, the colouring pigment of the colour required shall be

added to cement in such proportions as recommended by the manufacturer and as approved by the Project Manager.

2.15 Water Proofing Admixtures

Water-proofing admixtures shall conform to the requirements of IS : 2645 and shall be of approved manufacture. The admixture shall not contain calcium chloride. The quantity of the admixture to be used for the works and method of mixing etc. shall be as per manufacturer's instructions and as directed by the Engineer.

2.16 Painting of Surfaces

2.16.1 Materials

Oil bound distemper shall conform to IS : 428. The primer shall be alkali resistant primer of the same manufacture as that of the distemper.

Acrylic wood emulsion paint shall be applied to exterior surfaces.

Lead free acid, alkali and chlorine resisting paint shall conform to IS: 9862.

Colour wash shall be made by addition of a suitable quantity of mineral pigment, not affected by lime, to the prepared white wash to obtain the shade/ tint as approved by the Project Manager.

All the materials shall be of the best quality from an approved manufacturer. Contractor shall obtain prior approval of the Project Manager for the brand of manufacture and the colour/ shade. All materials shall be brought to the site of works in sealed containers.

2.16.2 Workmanship

Contractor shall obtain the approval of the Project Manager regarding the readiness of the surfaces to receive the specified finish, before commencing the work on painting.

Painting of new surfaces shall be deferred as much as possible to allow for thorough drying of the sub-strata.

The surfaces to be treated shall be prepared by thoroughly brushing them free from dirt, mortar droppings and any loose foreign materials. Surfaces shall be free from oil, grease and efflorescence. Efflorescence shall be removed only by dry brushing of the growth. Cracks shall be filled with Gypsum. Workmanship of painting shall generally conform to IS : 2395.

2.16.3 White Wash

The prepared surfaces shall be wetted and the finish applied by brushing. The operation for each coat shall consist of a stroke of the brush first given horizontally from the right and the other from the left and similarly, the subsequent stroke from bottom upwards and the other from top downwards, before the first coat dries. Each coat shall be allowed to dry before the next coat is applied. Minimum of 2 coats shall be applied unless otherwise specified. The dry surface shall present a uniform finish without any brush marks.

2.16.4 Colour Wash

Colour wash shall be applied in the same way as for white wash. A minimum of 2 coats shall be applied unless otherwise specified. The surface shall present a smooth and uniform finish without any streaks. The finished dry surface shall not show any signs of peeling/ powdery and come off readily on the hand when rubbed.

2.16.5 Cement Paints

The prepared surfaces shall be wetted to control surface suction and to provide moisture to aid in proper curing of the paint. Cement paint shall be applied with a brush with stiff bristles. The primer coat shall be a thinned coat of cement paint. The quantity of thinner shall be as per manufacturer's instructions. The coats shall be vigorously scrubbed to work the paint into any voids for providing continuous paint film free from pinholes for effective water proofing in addition to decoration. Cement paint shall be brushed in uniform thickness and the covering capacity for two coats on plastered surfaces shall be 3 to 4 kg/sq.m. A minimum of 3 coats of the same colour shall be applied. At least 24 hours shall be left after the first coat to become sufficiently hard before the second coat is applied. The painted surfaces shall be thoroughly cured by sprinkling with water using a fog spray at least 2 to 3 times a day. Curing shall commence after about 12 hours when the paint hardens. Curing shall be continued for at least 2 days after the application of final coat. The operations for brushing each coat shall be as detailed above.

2.16.6 Oil Bound Distemper

The prepared surfaces shall be dry and provided with one coat of alkali resistant primer by brushing. The surface shall be finished uniformly without leaving any brush marks and allowed to dry for at least 48 hours. A minimum of two coats of oil bound distemper shall be applied, unless otherwise specified. The first coat shall be of a lighter tint. At least 24 hours shall be left after the first coat to become completely dry before the application of the second coat. Broad, stiff, double bristled distemper brushed shall be used for the work. The operations for brushing each coat shall be as detailed above. It shall be applied to interior surfaces only, unless instructed to apply outside.

2.16.7 Acid, Alkali Resistant Paints

A minimum of 2 coats of acid/ alkali resisting paint shall be applied over the prepared dry surfaces by brushing. Primer coat shall be as per manufacturer's instructions.

2.16.8 Acrylic Emulsion Paints

Acrylic emulsion paint shall be applied in the same way as for plastic emulsion paint. A minimum of 2 finishing coats over one coat of primer shall be provided unless otherwise specified.

2.17 Sanitary Appliances

Given in separate chapter

2.18 Construction Joints

As construction joints are weak in shear normally construction joints, if required, shall be provided in location where shear stress is minimum. However, construction joints should be avoided in the bottom slab of any water retaining structure. In the walls of the water

retaining structures vertical construction joints should be avoided to the maximum possible extent. In the event the Contractor solely for his convenience proposes construction joints in the bottom slab and or vertical construction joints in the wall of the water retaining structures, then the Contractor shall provide approved PVC water-stop of 230mm width and 8mm thick in all such joints. For the convenience of construction and to avoid segregation of concrete horizontal construction joints shall be provided in a planned way at a height not more than 2.0M in case of approved admixture, at his cost, is used by the contractor in the concrete to increasing the workability of the concrete without affecting the designed water cement ratio. In case such admixture is not used the height of such cast shall be restricted maximum up to 1.5M.

All such construction joints should be prepared properly like removing of all loose materials by wire brush and soaking with rich cement slurry mixed with approved water-proofing compound in prescribed ratio, before pouring next concrete. Next pour of concrete in any construction joints in water retaining structures should be within 24 hours of last pour.

2.19 Water Proofing

2.19.1 Water Proofing With Bitumen Felt

A four layer course treatment shall consist of the following layers

- Initial layer of bonding material applied hot at specified weight per unit area.
- Second layer of self finished bitumen felt of specified brand and manufacture conforming to the type and grade given in the description of the item.
- Third layer of bonding material
- Final layer of stone grit of pea sized gravel spread at specified volume of material per unit area.

Note: The primer or under lay where required to be provided shall not count against the number of courses specified.

Laying

Bitumen bonding material of required grade shall be heated to the working temperature specified for the particular grade by the bitumen manufactures and conveyed to the roof in buckets or pouring canes in weighed quantities.

Suitable working temperature for different grades of bitumen are as under :

- i) Blown type petroleum bitumen of IS grade 85/25 180 degree C.
- ii) Residual type petroleum bitumen of penetration 30/40 180 degree to 190 degree C (IS grade S-35).

Drain outlets shall be given a four or six course treatment as specified for the roof in the described of the item in the manner specified for the flat roof surface. Water proofing treatment shall be carried into the drainpipe or outlets by at least 10 cm. The water

proofing treatment laid on the roof surface shall overlap the upper edge of the water proofing treatment in the drain outlets by at least 10 cm.

The self-finished felt shall be cut to the required length, brushed clean of dusting material and laid out flat on the roof to eliminate curls and subsequent stretching. The felt shall normally be laid in length at right angles to the direction of the slope and laying shall be commenced at the lowest level and worked up to crest. The felt shall not be laid in single piece of very long lengths as they are likely to shrink, 6 to 8 m are suitable lengths. The roof surfaces shall be cleaned and dry before the felt treatment is begun. Each length of felt shall be laid in position and rolled up for a distance of half its length. The hot bonding material shall be poured on the roof across the full width of the rolled felt as the later is steadily rolled out and pressed down. The pouring shall be so regulated that the correct weight of bonding material per unit area is spread uniformly over the surface. Excess bonding material that gets squeezed out at the ends shall be leveled up as laying proceeds, When the first half of the strip of felt has been bonded to the roof, the other half shall be rolled up and then unrolled on the hot bonding material in the same way. Subsequently strips shall also be laid in the same manner. Each strips shall overlap the preceding one by at least 7.5 cm at the longitudinal edges and 10 cm at the ends. All overlaps shall be firmly bonded with hot bitumen. Streaks and tailings of bitumen near edges of laps shall be leveled by heating the overlap with a blowlamps and leveling down unevenness.

The third layer of bonding material in the four-course treatment shall be carried out in a similar manner after the flashing has been completed.

2.20 Roofing

As per Standard specification.

3. ROAD AND PAVEMENT WORKS

3.1 Granular Sub-Base

Scope

This work shall consist of laying and compacting well-graded material on prepared subgrade in accordance with the requirements of these Specifications. The material shall be laid in layers as sub-base as necessary according to lines, grades and cross-sections shown on the Drawings or as directed by the Engineer.

Materials

The material to be used for the work shall be natural sand, moorum, gravel, crushed stone, or combination thereof depending upon the grading required. Materials like crushed slag, crushed concrete, brick metal and kankar may be allowed only with the specific approval of the Engineer. The material shall be free from organic or other deleterious constituents and as per Standard Specifications (Civil Works).

Physical requirements

The material shall have a 10 percent fineness value of 50 kN or more (for sample in soaked condition) when tested in compliance with BS: 812 (Part III). The water absorption value of the coarse aggregate shall be determined as per IS: 2386 (Part 3): if this value is greater

than 2 percent, the soundness test shall be carried out on the material delivered to site as per IS: 383. For Grading II and III materials, the CBR shall be determined at the density and moisture content likely to be developed in equilibrium conditions which shall be taken as being the density relating to a uniform air voids content of 5 per cent.

Table: Grading for Coarse Graded Granular Sub-Base Materials

Grading No.	Size Range	Sieve Designation	Percent by Weight Passing the Sieve
1	90 mm to 45 mm	125 mm 90 mm 63 mm 45 mm 22.4 mm	100 90-100 25-60 0-15 0-5
2	63 mm to 45 mm	90 mm 63 mm 53 mm 45 mm 22.4 mm	100 90-100 25-75 0-15 0-5
3	53 mm to 22.4 mm	63 mm 53 mm 45 mm 22.4 mm 11.2 mm	100 95-100 65-90 0-10 0-5

Strength of Sub-base

It shall be ensured prior to actual execution that the material to be used in the sub-base satisfies the requirements of CBR and other physical requirements when compacted and finished.

When directed by the Engineer, this shall be verified by performing CBR tests in the laboratory as required on specimens remolded at field dry density and moisture content and any other tests for the “quality” of materials, as may be necessary.

Construction Operations

Preparation of subgrade

Immediately prior to the laying of sub-base, the subgrade already finished to applicable Clauses and shall be prepared by removing all vegetation and other extraneous matter,

lightly sprinkled with water if necessary and rolled with two passes of 80-100 kN smooth wheeled roller.

Spreading and compacting

The sub-base material of grading specified in the Contract shall be spread on the prepared subgrade with the help of mortar grade of adequate capacity, its blade having hydraulic controls suitable for initial adjustment and for maintaining the required slope and grade during the operation or other means as approved by the Engineer.

Moisture content of loose material shall be checked in accordance with IS: 2720 (Part 2) and suitably adjusted by sprinkling additional water from a truck mounted or trailer mounted water tank and suitable for applying water uniformly and at controlled quantities to variable widths of surface or other means approved by the Engineer so that, at the time of compaction, it is from 1 per cent above to 2 per cent below the optimum moisture content corresponding to IS: 2720 (Part 8). While adding water, due allowance shall be made for evaporation losses. After water has been added, the material shall be processed by mechanical or other approved means like disc harrows, rotators until the layer is uniformly wet.

Surface Finish and Quality Control of Work

The surface finish of construction shall conform to the requirements of Section 902 of MoST Specifications for Road and Bridge Works (Latest Revision). Control on the quality of materials and works shall be exercised by the Engineer in accordance with Section 900 of MoST Specifications for Road and Bridge Works (Latest Revision).

Measurements for Payment

Granular sub-base shall be measured as finished work in position in cubic metres as per Standard Specifications (Civil Works) and as approved by the Engineer.

Rate

The contract unit rate for granular sub-base shall be payment in full for carrying out the required operations including full compensation as per BOQ and as specified in Standard Specifications (Civil Works).

3.2 Wet Mix Macadam Sub-Base/Base

Scope

This work shall consist of laying and compacting clean, crushed, graded aggregate and granular material, premixed with water, to a dense mass on prepared subgrade/sub-base/base or existing pavement as the case may be in accordance with the requirements of these Specifications. The material shall be laid in one or more layers as necessary to lines, grades and cross-sections shown on the approved Drawings or as directed by the Engineer.

The thickness of a single compacted Wet Mix Macadam Layer shall not be less than 75 mm. When vibrating or other approved types of compacting equipment are used, the compacted depth of a single layer of the sub-base course may be increased to 200 mm upon approval of the Engineer.

Materials

Physical requirements-

Coarse aggregates shall be crushed stone. If crushed gravel/shingle is used, not less than 90 per cent by weight of the gravel/shingle pieces retained on 4.75 mm sieve shall have at least two fractured faces. The aggregates shall conform to the physical requirements set forth in Table 13-7 below.

Physical Requirements of Coarse Aggregates for Wet Mix Macadam for Sub- Base/Base Courses as per as specified in Standard Specifications (Civil Works).

If the water absorption value of the coarse aggregate is greater than 2 per cent, the soundness test shall be carried out on the material delivered to site as per IS: 2386 (Part-5).

Construction Operations

While constructing wet mix macadam, arrangement shall be made for the lateral confinement of wet mix. This shall be done by laying materials in adjoining shoulders along with that of wet mix macadam layer and following the sequence of operations described in Standard Specifications (Civil Works).

Preparation of mix

Wet mix macadam shall be prepared in an approved mixing plant of suitable capacity having provision for controlled addition of water and forced/positive mixing arrangement like pug mill or pan type mixer of concrete batching plant. For small quantity of wet mix work, the Engineer may permit the mixing to be done in concrete mixers.

Optimum moisture for mixing shall be determined in accordance with IS: 2720 (Part-8) after replacing the aggregate fraction retained on 22.4 mm sieve with material of 4.75 mm to 22.4 mm size while adding water, due allowance should be made for evaporation losses. However, at the time of compaction, water in the wet mix should not vary from the optimum value by more than agreed limits. The mixed material should be uniformly wet and no segregation should be permitted.

Spreading of mix

Immediately after mixing, the aggregates shall be spread uniformly and evenly upon the prepared subgrade/sub-base/base in required quantities. In no case should these be dumped in heaps directly on the area where these are to be laid nor shall their hauling over a partly completed stretch be permitted. The mix may be spread either by a paver finisher or motor grader. For portions where mechanical means cannot be used, manual means as approved by the Engineer shall be used. The motor grader shall be capable of spreading the material uniformly all over the surface. Its blade shall have hydraulic control suitable for initial adjustments and maintaining the same so as to achieve the specified slope and grade.

The paver finisher shall be self-propelled, having the following features:

1. Loading hoppers and suitable distribution mechanism
2. The screed shall have tamping and vibrating arrangement for initial compaction to the layer as it is spread without rutting or otherwise marring the surface profile.
3. The paver shall be equipped with necessary control mechanism so as to ensure that the finished surface is free from surface blemishes.

The surface of the aggregate shall be carefully checked with templates and all high or low spots remedied by removing or adding aggregate as may be required. The layer may be tested by depth blocks during construction. No segregation of larger and fine particles should be allowed. The aggregates as spread should be of uniform gradation with no pockets of fine materials.

Compaction

After the mix has been laid for the required thickness, grade and cross fall/camber the same shall be uniformly compacted, to the full depth with suitable roller. If the thickness of single compacted layer does not exceed 100 mm, a smooth wheel roller of 80 to 100 kN weight may be used. For a compacted single layer upto 200 mm, the compaction shall be done with the help of vibratory roller of minimum static weight of 80 to 100 kN or equivalent capacity roller. The speed of the roller shall not exceed 5 km/h. In portions having unidirectional cross fall/super elevation, rolling shall commence from the lower edge and progress gradually towards the upper edge. Thereafter, roller should progress parallel to the center line of the road, uniformly over-lapping each preceding track by at least one third width until the entire surface has been rolled. Alternate trips of the roller shall be terminated in stops at least 1 m away from any preceding stop.

In portions in camber, rolling should begin at the edge with the roller running forward and backward until the edges have been firmly compacted. The roller shall then progress gradually towards the center parallel to the center line of the road uniformly overlapping each of the preceding track by at least one-third width until the entire surface has been rolled. Any displacement occurring as a result of reversing of the direction of a roller or from any other cause shall be corrected at once as specified and/or removed and made good. Along forms, kerbs, walls or other places not accessible to the roller, the mixture shall be thoroughly compacted with mechanical tampers or a plate compactor. Skin patching of an area without scarifying the surface to permit proper bonding of the added material shall not be permitted.

Rolling should not be done when the subgrade is soft or yielding or when it causes a wave-like motion in the sub-base/base course or subgrade. If irregularities develop during rolling which exceed 12 mm when tested with a 3 m straight edge, the surface should be loosened and premixed material added or removed as required before rolling again so as to achieve a uniform surface conforming to the desired grade and cross fall. In no case should the use of unmixed material be permitted to make up the depressions. Rolling shall be continued till the density achieved is at least 98 per cent of the maximum dry density for the material as determined by the method outlined in IS: 2720 (Part-8). After completion, the surface of any finished layer shall be well-closed, free from movement under compaction equipment or any compaction planes, ridges, cracks and loose material. All loose segregated or otherwise defective areas shall be made good to the full thickness of the layer and re-compacted.

Setting and drying

After final compaction of wet mix macadam course, the road shall be allowed to dry for 24 hours.

Quality control

Control on the quality of materials and works shall be exercised by the Engineer in accordance with Section 900 of MoST Specifications for Road and Bridge Works (Latest Revision).

Rectification of Surface Irregularity

Where the surface irregularity of the wet mix macadam course exceeds the permissible tolerances or where the course is otherwise defective due to subgrade soil getting mixed with the aggregates, the full thickness of the layer shall be scarified over the affected area, reshaped with added premixed material or removed and replaced with fresh premixed material as applicable and re-compacted in accordance with Clause 13.3.3. The area treated in the aforesaid manner shall not be less than 5 m long and 2 m wide. In no case shall depressions be filled up with unmixed and ungraded material or fines.

Measurements for Payment

Wet mix macadam shall be measured as finished work in position in cubic metres.

Rates

The contract unit rate for granular sub-base shall be payment in full for carrying out the required operations including full compensation as specified in Standard Specifications (Civil Works) as per the BOQ.

3.3 Surface Base and Surface Courses (Bituminous prime coat)

Scope

This work shall consist of preparing an existing granular or black-topped surface bituminous course. The work shall be performed on such widths and lengths as shown on Drawings or as instructed by the Engineer. The existing surface shall be firm and clean and treated with Prime coat as shown on the drawings as otherwise stated in the contract.

Materials

For scarifying and re-laying the granular surface

The materials used shall be coarse aggregates salvaged from scarification of the existing granular base course supplemented by fresh coarse aggregates and screenings so that aggregates and screenings thus supplemented correspond to Water bound macadam or Wet mix macadam, as the case may be.

For patching potholes and sealing cracks

Where the existing surface to be overlaid is bituminous, any existing potholes and cracks shall be repaired and sealed in accordance with Clause 3004.2 and 3004.3 of MoST Specifications for Road and Bridge Works (IV Revision).

For profile corrective course

A profile corrective course for correcting the existing pavement profile shall be laid to varying thickness as shown on the drawings or as indicated in the contract documents. The profile corrective course shall be laid to tolerances and densities as specified for wearing course if a single layer, or base course, if it is to be covered with wearing course layer.

Profile corrective course and its application

The type of material for profile corrective course shall be as shown on the Drawing or as directed by the Engineer. Where it is to be laid as part of the overlay/strengthening course, the profile corrective course material shall be of the same Specification as that of the overlay/strengthening course. However, if provided as a separate layer, it shall be of the same Specifications and details given in the contract drawings.

(1) Any high spot in the existing surface shall be removed by a milling machine or other approved method, and all loose material shall be removed to the satisfaction of the Engineer.

(2) Where the maximum thickness of profile corrective course will be not more than 40 mm, the profile corrective course shall be constructed as an integral part of the over lay layer, adopting such construction procedures and using such equipment as approved by the Engineer, to lay the specified type of material, to thickness and tolerance as specified, for the course, to be provided.

Construction Operations

Preparing existing granular surface

Where the existing surface is granular, all loose and disintegrated materials shall be removed and the surface lightly watered if the profile corrective course to be provided as a separate layer is also granular. Where the profile corrective course of bituminous material is to be laid over the latter shall, after removal of all loose material, be primed. The surface finish of all granular layers on which bituminous work are to be placed, shall, unless otherwise specifically instructed by the Engineer, be free from dust. All such layers must be capable of being swept, after the removal of any non-integral loose material, by means of mechanical broom, without shedding significant quantities of material and dust removed by air jet, washing, or other means approved by the Engineer. After cleaning the surface shall be correct to line and level, with tolerances specified for base courses.

Scarifying existing bituminous surface

Where specified or shown on drawings, the existing bituminous layer in the specified width shall be removed with care without causing undue disturbance to the underlying layer by suitable method approved by the Engineer. After removal, all loose and disintegrated material, the underlying layer which might have been disturbed should be suitably reworked and compacted to line and level. After supplementing the base material

as necessary with suitable fresh stone, the compacted finished surface shall be primed on the process of removal shall, before laying of the overlay course, be reset properly by spreading/hand packing of aggregates and compacting with suitable roller/heavy hand rammers/approved mechanical temper so that the level of the top surface of such scarified area shall be even and properly graded with respect to adjoining surface. Where applicable, the granular surface, after removal of the existing bituminous layer, shall be primed. Reusable materials shall be stacked as directed by the Engineer with all lift and lead of 1000m of their origin.

Patching of potholes and sealing of cracks

Where the existing surface to be overlaid is bituminous, any existing pot-holes and cracks shall be repaired and sealed in accordance with Clauses 3004.2 and 3004.3 of MoST Specifications for Road and Bridge Works (IV Revision) or as directed by Engineer.

Covering the profile corrective course

Profile Corrective Course particularly shall be so planned that layer shall be covered by the designed base / wearing course at the earliest opportunity.

Surface Finish and Quality Control of work

The relevant provisions of Section 900 of MoST Specifications for Road and Bridge Works (IV Revision) shall apply.

Measurement

Prime Coat is to be measured and paid for on a square meter basis.

Rates

The contract unit rate as per BOQ for prime coat bituminous surfaces, including repairing/reworking disturbed underlying layers and stacking reusable / unusable material shall include for but not necessarily be limited to, the cost of all labour, supply of materials needed for repair / reworking, hire charges of tools and plants, and transportation of scarified materials with in 1000 m of their origin.

3.4 Dense Graded Bituminous Macadam

Scope

This clause specifies the construction of Dense Graded Bitumen Macadam, (DBM), for use mainly, but not exclusively, base, binder and profile corrective course. DBM is also intended for use as road base material. This work shall consist of construction in a single or multiple layers of DBM on a previously prepared base or sub base. The thickness of a single layer shall be 50mm to 100 mm shown in the construction drawing.

Materials

Bitumen

The bitumen shall be paving bitumen of Penetration Grade complying with Indian Standard Specification for “Paving Bitumen” IS 73, and of the penetration indicated in Table 13-11 for dense Bitumen or this Bitumen as modified by one of the methods specified in Clause 521 of MoST Specifications for Road and Bridge Works (IV Revision) or as otherwise specified in the Contract. Guidance on the selection of an appropriate grade of bitumen is given in the Manual for Construction and Supervision of Bituminous Works.

Coarse aggregates

The coarse aggregates shall consist of crushed rock, crushed gravel or other hard material retained on 2.36 mm sieve. They shall be clean, hard, and durable, of cubical shape, free from dust and soft or friable matter, organic or other deleterious substances. Where the contractor’s selected source of aggregates have poor affinity for bitumen, as a condition for the approval of that source, the bitumen shall be treated with an approved anti stripping agent, as per the manufacturer’s recommendations, without additional payment. Before approval of source, the aggregates shall be tested for stripping. The aggregates shall satisfy the physical requirements as specified in Standard Specifications (Civil Works) for dense bituminous macadam. Where the crushed gravel is proposed for use as aggregates, not less than 90 % by weight of the crushed material retained on 4.75 mm sieve shall have at least two fractured faces. The plasticity index of the fraction passing the 425 micron sieve shall not exceed 4.

Fine Aggregates

Fine aggregates shall consist of crushed or naturally occurring mineral material, or a combination of the two passing the 2.36 mm sieve and retained on the 75 micron sieve. They shall be clean, hard, durable, dry and free from dust, and soft or friable matter, organic or other deleterious matter. The fine aggregates shall have a sand equivalent value of not less than 50 when tested in accordance with the requirement of IS 2720 (Part 37). The plasticity index of the fraction passing the 0.425mm sieve shall not exceed 4 when tested in accordance with IS 2720 (Part 5)

Filler

Filler shall consist of finely divided mineral matter such as rock dust, hydrated lime or cement as approved by the Engineer as specified in Standard Specifications (Civil Works).

The filler shall be graded within the limits indicated in Standard Specifications (Civil Works).

Mixture Design

Requirement for the mixture

Apart from conformity with grading and quality requirements of individual ingredients, the mixture shall meet the requirements set out in Standard Specifications (Civil Works).

Construction Operations

Weather and Seasonal Limitations

The provisions of Clause 501.5.1 of MoST specification for Road & Bridge Works (IV Revision) shall apply.

Preparation of base

The base on which Dense Graded Bituminous Material is to be laid shall be prepared in accordance with Clauses 501 and 902 of MoST specification for Road & Bridge Works (IV Revision) as appropriate, or as directed by the Engineer. The surface shall be thoroughly swept clean by a mechanical broom, and the dust removed by compressed air. In locations where mechanical broom cannot access, other approved method shall be used as directed by the Engineer.

Geosynthetics

Where Geosynthetics are specified in the Contract this shall be in accordance with requirements stated in Clause 703 of MoST specification for Road & Bridge Works (IV Revision).

Stress absorbing layer

Where a stress absorbing layer is specified in the Contract, this shall be applied in accordance with the requirements of Clause 522 of MoST specification for Road & Bridge Works (IV Revision).

Prime coat

Where the material on which the dense bituminous macadam is to be laid is other than a bitumen bound layer, a prime coat shall be applied, as specified, in accordance with the provisions of Clause 13.19, in Standard Specifications (Civil Works) or as directed by the Engineer.

Spreading

The provisions of Clauses 501.5.3 and 501.5.4 of MoST specification for Road & Bridge Works (IV Revision) shall apply.

Rolling

The general provisions of Clauses 501.6 and 501.7 of MoST specification for Road & Bridge Works (IV Revision) shall apply, as modified by the approved laying trials. The compaction process shall be carried out by the same plant, and using the same method, as approved in the laying trials, which may be varied only with the express approval of the Engineer in writing.

Opening to Traffic

The newly laid surface shall not be open to traffic for at least 24 hrs after laying and completion of compaction, without the express approval of the Engineer in writing.

Surface Finish and Quality Control of Work

The surface finish of the completed construction shall conform to the requirements of Clause 902 of MoST Specifications for Road and Bridge Works (IV Revision). All materials and workmanship shall comply with the provisions set out in Section 900 of MoST specification for Road & Bridge Works (IV Revision).

Measurements for payment

Dense Graded Bituminous Materials shall be measured as finished work either in cubic metres, tons or by the square meter at a specified thickness as detailed on the Contract drawings, or documents, or as directed by the Engineer.

Rate

The contract unit rate for Dense Graded Bituminous Macadam shall be payment in full for carrying out the required operations as specified, and shall include, but not necessarily limited to all components listed in Clause 13.4.8.2 (i) to (xi). The rate shall include the provision of bitumen, at 4.25 per cent by weight of the total mixture and no extra cost shall be provided.

3.5 Bituminous Concrete

Scope

This clause specifies the construction Bituminous Concrete, for use in wearing and profile corrective courses. This work shall consist of construction in a single or multiple layers of bituminous concrete on a previously prepared bituminous bound surface. A single layers shall be 25mm to 100mm in thickness.

Materials

Bitumen

The bitumen shall be paving bitumen of Penetration grade complying with Indian Standard Specification for Paving Bitumen, IS: 73 and of the penetration indicated in Standard Specifications (Civil Works)., for bituminous concrete, or this bitumen as modified by one of the methods specified in Clause 521 of MoST specification for Road & Bridge Works (IV Revision), or as otherwise specified in the Contract. Guidance on the selection of an appropriate grade of bitumen is given in The Manual for Construction and Supervision of Bitumenous Works.

Coarse aggregates

The coarse aggregates shall be generally as specified in Clause 13.6.2.2 shall apply, except that the aggregates shall satisfy the physical requirements of Standard Specifications (Civil Works).

Fine aggregates

The fine aggregates shall be all as specified in Standard Specifications (Civil Works).

Filler

Filler shall be generally as specified in Standard Specifications (Civil Works). Where the aggregates fail to meet the requirements of the water sensitivity test in Standard Specifications (Civil Works). then 2 percent by total weight of aggregate, of hydrate lime shall be added without additional cost.

Aggregates grading and binder content

When tested in accordance with IS: 2386 Part 1 (Wet grading method), the combined grading of the coarse and fine aggregates and added filler shall fall within the limits shown in Standard Specifications (Civil Works) for grading 1 or 2 as specified in the Contract.

Mixture Design

Requirement for the mixture

Apart from conformity with the grading and quality requirements of individual ingredients, the mixture shall meet the requirements set out in Standard Specifications (Civil Works).

The requirements for minimum per cent voids in mineral aggregate (VMA) are set out in Standard Specifications (Civil Works).

Binder content

The binder content shall be optimized to achieve the requirements of the mix set out in Standard Specifications (Civil Works) and the traffic volume as specified in the Contract. The Marshall method for determining the optimum binder content shall be adopted as described in the Asphalt Institute Manual MS-2, replacing the aggregates retained on the 26.5mm sieve and retained on the 22.4mm sieve, where approved by the Engineer.

Job mix formula

The procedure for formulating the job mix formula shall be generally as specified in Clause 13.6.3.3 and the results of the tests enumerated in Standard Specifications (Civil Works).

Construction Operations

Weather and seasonal limitations

The provisions of Clause 501.5.1 of MoST Specifications for Road and Bridge Works (IV Revision) shall apply.

Preparation of base

The surface on which the bituminous concrete is to be laid shall be prepared in accordance with Clause 501 and 902 of MoST Specifications for Road and Bridge Works (IV Revision) as appropriate, or as directed by the Engineer. The surface shall be thoroughly swept clean by mechanical broom and dust removed by compressed air. In location where mechanical broom cannot access, other approved method shall be used as directed by Engineer.

Geosynthetics

Where Geosynthetics are specified in the contract this shall be in accordance with the requirements stated in Clause 703 of MoST Specifications for Road and Bridge Works (IV Revision).

Stress absorbing layer

Where a stress absorbing layer is specified in the Contract, this shall be applied in accordance with the requirements stated in Clause 522 of MoST Specifications for Road and Bridge Works (IV Revision).

Mixing and transportation of the mixture

The provisions as specified in Clause 501.3 and 501.4 of MoST Specifications for Road and Bridge Works (IV Revision) shall apply.

Spreading

The general provisions of Clause 501.5.3 and 501.5.4 of MoST Specifications for Road and Bridge Works (IV Revision) shall apply.

Rolling

The general provisions of Clause 501.6 and 501.7 of MoST Specifications for Road and Bridge Works (IV Revision) shall apply, as modified by the approved laying trials.

Opening to Traffic

The newly laid surface shall not be open to traffic for at least 24 hours after laying and the completion of compaction, without the express approval of the Engineer in writing.

Surface Finish and Quality Control of Work

The surface finish of the completed construction shall conform to the requirements of Clause 902 of MoST Specifications for Road and Bridge Works (IV Revision). All materials and workmanship shall comply with the provisions set out in Section 9000 of this Specification.

Arrangements for Traffic

During the period of construction, arrangement of traffic shall be made in accordance with the provisions of Standard Specifications (Civil Works)..

Measurements for Payment

The measurement shall be all as specified in Clause 507.8 of MoST Specifications for Road and Bridge Works (IV Revision).

Rate

The contract unit rate shall be all as specified in Standard Specifications (Civil Works). except that the rate shall include the provision of bitumen at 5.0 per cent, by weight of total mixture.

4. PIPES AND PIPE LAYING

4.1 HDPE Pipes:

4.1.1 Applicable Codes

The manufacturing, testing, supplying and testing at work sites of HDPE pipes shall comply with all currently applicable statutes, regulations, standards and Codes. In particular, the following standards, unless otherwise specified herein, shall be referred. In all cases the latest revision of the Codes shall be referred to. If requirements of this Specification conflict with the requirements of the standards / Codes, this Specification shall govern:

Code No.	Title/Specification
IS 2530-1963	Methods of test for polyethylene moulding materials and polyethylene compounds
IS 4905-1968	Methods for random sampling
IS 14333: 2001	High Density Polyethylene Pipes for Sewerage-Specification
IS 7328-1992	High density polyethylene materials for moulding and extrusion- Specification
IS 7634-Part 2-1975	Laying & Jointing of Polyethylene (PE) Pipes
IS 8008: Part 2-2003	Part 2: Specific Requirements for 90 degree Bend.
IS 8008: Part 3- 2003	Part 3: Specific Requirements for 90 degree Tee.
IS 8008: Part 4-2003	Part 4: Specific Requirements for Reducers.
IS 8008: Part 6-2003	Part 6: Specific Requirements for Pipe ends.
IS 8008: Part 9-2003	Part 9: Specific Requirements for End Caps.
IS 8360 Part 1: 1977	Specification for fabricated high density polyethylene (HDPE) fittings for potable water supplies – Part 1 : General requirements.
IS 8360 Part 2: 1977	Part 2 Specific requirements for 90 0Tees.
IS 8360 Part 3: 1977	Part 3 Specific requirements for 90 0 bends.

Others Codes not specifically mentioned here but pertaining to the use of HDPE pipes form part of these Specifications.

4.1.2 Marking

All pipes shall be marked at maximum interval of 1 m.

The marking shall indicate at least the following information.

- Manufacturer's name & / or trade mark.
- The dimensions (nominal outside diameter X nominal wall thickness)
- The designation of pipes material (PE 80)
- The nominal pressure (PN 2.5)
- The production period (date or code)

4.1.3 Handling, Transportation, Storage and Lowering of Pipes

During handling, transportation, storage and lowering, all sections shall be handled by such means and in such a manner that no distortion or damage is done to the section or to the pipes as a whole.

The following procedures should be followed so as to eliminate potential damage to pipes and fittings and to maintain

- a) Maximum safety during unloading, lifting and lowering.
- b) Pipes must not be stored or transported where they are exposed to heat sources likely to exceed 60 degree C.
- c) Pipes shall be stored such that they are not in contact with direct sunlight, lubricating or hydraulic oils, petrol, solvents and other aggressive materials
- d) Scores or scratches to a depth of greater than 10% or more of wall thickness are not permissible; any pipes having such defects should be strictly rejected.
- e) PE pipes should not be subjected to rough handling during loading and unloading operations. Rollers shall be used to move, drag the pipes across any surface.
- f) Only polyester webbing slings should be used to lift heavy PE (>315mm) pipes by crane. Under no circumstances, chains, wire ropes and hooks be used on PE pipes.
- g) Pipes shall not be dropped to avoid impact or bump. If any time during handling or during installation, any damage, such as gouge, crack or fracture occurs, the pipe shall be repaired if so permitted by the competent authority before installation.
- h) Straight lengths should be stored on horizontal racks giving continuous support to prevent the pipe taking on a permanent set
- i) The truck used for transportation of the PE pipes shall be exclusively used of PE pipes only with no other material loaded – especially no metallic, glass and wooden items. The truck shall not have sharp edges that can damage the Pipe.
- j) Pipes manufactured at factory are to be carried to the site of work directly or stacked suitably and neatly along the alignment/road side/elsewhere near by the work site or as directed by the Project Manager.
- k) Damages during transit, handling, storage will be to the Contractor's account and replacement for such pipes has to be made by the Contractor without any extra cost as directed by the Project Manager.

4.1.4 Workmanship / Appearance

Pipes shall be free from all defect including indentations, delaminating, bubbles, pinholes, cracks, pits, blisters, foreign inclusions that due to their nature degree or extent detrimentally affect the strength and serviceability of the pipe. The pipe shall be as uniform as commercially practicable in colour opacity, density and other physical properties as per relevant IS Code or equivalent International Code. The inside surface of each pipe shall be free of scouring, cavities, bulges, dents, ridges and other defects that result in a variation of inside diameter from that obtained on adjacent unaffected portions of the surface. The pipe ends shall be cut clearly and square to the axis of the pipe.

4.1.5 Measurement

The net length of pipes as laid or fixed shall be measured in running meters correct to a cm. Specials shall be excluded and measured and paid separately under the relevant item. The portion of the pipe at the joints (inside the joints) shall not be included in the length of pipe work. Excavation, refilling, masonry and concrete work wherever required shall be measured and paid for separately under relevant items of work.

4.1.6 Colour

The colour of the pipe shall be black in general. In case employer has other choice on standard colour, then this shall be applied.

4.1.7 Anti-Oxidant

The percentage of anti-oxidant used shall not be more than 0.3 percent by mass of finished resin.

4.1.8 Reworked Material

No addition of Reworked/ Recycled Material from the manufacturer's own rework material resulting from the manufacture of pipes is permissible and the vendor is required to use only 100% virgin resin compound.

4.1.9 Maximum Ovality of Pipe

The outside diameter of pipes, tolerance on the same and ovality of pipe shall be as given in table 2 of IS 14333. Ovality shall be measured as the difference between maximum outside diameter and minimum outside diameter measured at the same cross section of the pipe, at 300 mm away from the cut end. For pipes to be coiled the ovality shall be measured prior to coiling. For coiled pipes, however, re-rounding of pipes shall be carried out prior to the measurement of ovality.

4.1.10 Wall Thickness

The minimum & maximum wall thickness of pipe for the PE80 shall be as given in table 4 in IS: 14333.

4.1.11 Length of Straight Pipe

The length of straight pipe used shall be 5 m to 20 m as agreed by Project Manager. Short lengths of 3 meter (minimum) up to a maximum of 10% of the total supply may be permitted.

4.1.12 Coiling

The pipes supplied in coils shall be coiled on drums of minimum diameter of 25 times the nominal diameter of the pipe ensuring that kinking of pipe is prevented.

4.1.13 Fittings and Specials

All HDPE fittings / specials shall be Injection moulded fittings as per IS: 8008 (Part I to IX). The fittings shall be supplied only by the manufacturer of the pipes. Nominal pressure rating of flanges will be PN10.

4.1.14 Inspection and Testing

The material will be inspected and tested by the Inspectors to be nominated by the Employer. The following tests shall be conducted

- a) Physical Dimensions and visual inspection: The Manufacturers test reports shall be provided for review.
- b) Density: The density will be tested as per the provisions of Annex-A of IS 7328. It should match to the density claimed by the raw material supplier for compounded material / specifications.

- c) MFR test as per clause 9.2.4 of IS 14333. MFR shall also be within 30% of the MFR of the material used in manufacturing pipes.
- d) Carbon black content / dispersion test shall be as per clause 9.2.4 of IS 14333.
- e) Hydraulic Characteristics shall be as per Clause 8.1 of IS 14333
- f) Reversion Test shall be as per Clause 8.2 of IS 14333

4.1.15 Method of Fusion

Method of jointing between the pipes to pipes and pipes to specials shall be with fusion welding using automatic or semi automatic, hydraulically operated, superior quality heat fusion machines which will ensure good quality heat fusion welding of HDPE pipes. The most widely used method for joining individual lengths of large diameter polyethylene pipe (>75mm) is by heat fusion of the pipe ends. This technique produces a permanent, economical and flow-efficient joint. Field-site heat-welding may be made readily by trained operators using specially developed heat fusion machines. The Fusion Jointing between HDPE pipes and specials shall be done as per the latest IS: 7634 part- II

4.1.16 General Guidelines for Fusion Welding

The welding area has to be protected from unfavorable welding conditions such as moisture, wind, dirt, excessive surface temperature and low temperatures < 5 degree C and intensive UV radiation. If the pipe is exposed to such UV radiation, the pipe ends are to be thoroughly scrapped (by planning tool) before the welding procedure is adopted.

Heating Pressure 0.15 N/sq. mm

Welding Temperature 200-220 deg. C

The seven steps involved in making a heat fusion joint are:

- a) Securely fasten the components to be joined
- b) Square cut the surface of the pipe end
- c) Face the pipe ends
- d) Align the pipe profile
- e) Melt the pipe interfaces
- f) Join the two profiles together
- g) Hold under pressure and release

Heat fusion cycle and parameters are given in Annex A in ISO 11414 – the contractors are requested to follow this guideline for a good weld.

Caution: An additional 10 to 60 minutes cooling time may be required (depending on pipe size) after removing the pipe from the fusion equipment before subjecting the pipe for bending, burying, pressure testing or similar handling.

4.1.17 Bead Removal

In some pipe system usage, the bead from the heat fusion process may be undesirable. Inside beads may create minor flow turbulence of liquids or may become an obstacle on which solids in the fluids may become lodged. Furthermore, outside beads may be a hindrance to relining operations. Equipments are available to remove the bead. The bead removal shall not affect the performance of the pipe and the weld

However, it must be noted that the friction factor ('c' value; 'k' value) as given elsewhere in the manual takes cognizance of the inside bead. Hence the bead does not effect the design parameters for flow rates in PE pipes.

4.1.18 Fusion Equipment

The Contractor should have automatic superior quality fusion welding machines with hydraulic jacks, surface cleaning planner, and digitally controlled heating mirror and hydraulic power pack for doing the installation.

The contractor is cautioned for the proper procurement of the welding equipment and the Inspection agencies shall necessarily be assured that the welding contracting company has the proper machine for a good field weld.

The heat fusion equipment shall incorporate a facility for supporting the heating plate and planning tool (necessary to square cut the pipe end) when in use. The machine shall be robust enough to stand normal field use.

The design of the heat fusion machine shall allow the heating plate to be removed and the pipe ends closed after heating, without damaging the heating surfaces, within a time frame of maximum of 6 secs upto $d < 250\text{mm}$ and 12 secs for $d > 250\text{mm}$.

The clamp alignment system shall be such that there shall be perfect axial alignment of the pipe surface – during heating and during pressurizing the pipe ends after heating, is assured.

The guide elements of the machine shall be such that the gap between the pipe ends shall not exceed 0.25mm for $d < 250\text{mm}$ and 0.5mm $d > 250\text{mm}$

Heat-welding machines shall have a locking system to hold the fusion force is to be ensured in all the systems.

All the systems shall be protected against over pressure. It shall be capable of maintaining the required interface force on the pipe or fittings end as long as necessary

There shall be a display of the pressure applied.

4.1.19 Trained Manpower for Fusion Welding

Only trained and technically qualified for the welding method are to be employed for the welding operation

It is necessary that the manufacturer certified person need only be authorized for heat-welding. These persons shall carry at all the time in the field during site work, a valid and authentic certificate that the person performing welding has been so trained.

4.1.20 Testing After Laying

The sewer line laid will be tested in the following manner including the house connection pipes

Leak Testing

This low-pressure air testing practice detects damaged piping or improper jointing by measuring the rate at which air under pressure escapes from an isolated section of sewer.

The rate of air loss indicates the presence or absence of damaged piping or leaking joints. This practice is not intended to show total system water leakage limits and shall not be used as a quantitative measure of leakage under service conditions for infiltration or ex-filtration.

This practice provides assurance of initial condition and quality of workmanship of properly-installed sewer pipe.

This practice provides procedures for testing non-pressure plastic pipe sewer lines, using low-pressure air to prove the integrity of the installed material and the construction procedures.

This practice is performed on lines after all connections and service laterals have been plugged and braced adequately to withstand the test pressure. The time between completion of the backfill operation and low-pressure air testing may be specified by the approving authority. This practice is used as a preliminary test, which enables the installer to show the condition of a buried line prior to final backfill, paving, and other construction activities.

This standard does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

Air Test Method-Gravity sewer

All sanitary sewer lines, including service connections, shall be substantially watertight and shall be tested for excessive leakage upon completion and before connections are made to the service by others.

For gravity flow sewers, the sewer shall be subjected to ex-filtration testing, by the ASTM F1417 (low pressure air) test method regardless of pipe material. The requirements set forth for maximum leakage shall be met as a condition for acceptance of the sewer section represented by the test. All testing shall be performed by the Contractor without any direct compensation being made therefore, and the Contractor shall furnish all necessary equipment and materials, including plugs as required.

The Table below contains the values of pressure rating and allowable minimum time required to drop the pressure from 0.36 kg/cm² to 0.26 kg/cm² (Gravity Sewer Lines):

HDPE Pipe PE - 80

Nominal Pipe Diameter	Inside Pipe Diameter	Shortest time allowed for the air pressure drop to 1 PSI	Max. Length of Stretch to be tested
90	3.48	3 min 21 Sec	up to 120 m
110	4.26	4 min 6 Sec	up to 120 m
125	4.84	4 min 40 Sec	up to 120 m

140	5.42	5 min 13 Sec	up to 120 m
160	6.2	5 min 58 Sec	up to 100 m
180	6.97	6 min 43 Sec	up to 100 m
200	7.75	7 min 27 Sec	up to 80 m
225	8.72	8 min 23 sec	up to 80 m
250	9.69	9 min 19 sec	up to 60 m
		10 min 08 sec	60 to 80 m
280	10.85	10 min 27 sec	up to 60 m
		12 min 42 sec	60 to 80 m
315	12.21	11 min 45 sec	up to 40 m
		12 min 03 sec	40 to 60 m
		16 min 05 sec	60 to 80 m

Source: ASTM F1417.- 11a. "Standard practice for installation acceptance of plastic. Non - pressure sewer lines using low - pressure Air Note: 1 PSI = 0.0703 kg/cm²

In the event of test failure on any test section, testing shall be continued until all leakage has been detected and corrected to meet the requirements. All repair work shall be subject to approval of the Engineer. Introduction of sealant substances by means of the test water will not be permitted.

Unsatisfactory repairs or test results may result in an order to remove and replace pipe as the Engineer considers necessary for test conformance. All repair and replacement work shall be at the Contractor's expense.

Deflection Test

Deflection tests shall be performed on all flexible gravity sewer pipes. The test shall be conducted after the sewer trench has been backfilled to the desired finished grade for a minimum of 30 days.

The deflection test shall be performed by pulling a rigid ball or pointed mandrel through the pipe without the aid of mechanical pulling devices. The ball or mandrel shall have a minimum diameter equal to 92.5 % of the actual inside diameter of the pipe. The maximum allowable deflection shall not exceed 5 % of the pipe's internal diameter. The line will be considered acceptable if the mandrel can progress through the line without binding. The time of the test, method of testing, and the equipment to be used for the test shall be subject to the approval of the City.

All testing shall be performed by the Contractor at its expense without any direct compensation being made therefore, and he shall furnish all necessary equipment and materials required

In the event of test failure on any test section, the section shall be replaced, with all repair work subject to approval of the City. The replaced section shall be re-tested for leakage and deflection in conformance with the specifications contained herein. All repairs, replacement, and re-testing shall be at the Contractor's expense

Flow Test

After completion of entire network of the sewer line, flow test shall be carried out.

4.2 Unplasticized Polyvinyl Chloride (U-PVC) Pipes

4.2.1 Applicable Codes

The manufacturing, testing, supplying and testing at work sites of PVC-U pipes shall comply with IS 15328:2003 and all currently applicable statutes, regulations, standards and Codes. In particular, the following standards, unless otherwise specified herein, shall be referred. In all cases the latest revision of the Codes shall be referred to. If requirements of this Specification conflict with the requirements of the standards / Codes, this Specification shall govern:

Code No.	Title/Specification
IS 4905:1968	Methods for random sampling.
IS 4985:2000	Unplasticized PVC pipes for potable water supplies — Specification (third revision).
IS 5382:1985	Specification for rubber sealing rings for gas mains, water mains and sewers (first revision).
IS 12235	Methods of test for unplasticized PVC pipes for potable water supplies:
(Part 1): 1986	Method of measurement of outside diameter.
(Part 5):1986	Reversion test
(Part 8):1986	Internal hydrostatic pressure test
IS 14182:1994	Solvent cement for use with unplasticized polyvinyl chloride pipe and fittings — Specification
IS 15328:2003	Unplasticized non-pressure polyvinyl chloride (PVC-U) pipes for use in underground drainage and sewerage systems— Specification

Others Codes not specifically mentioned here but pertaining to the use of PVC-U pipes form part of these Specifications.

4.2.2 Marking

Each pipe shall be clearly and indelibly marked in ink/ paint or hot embossed on white base at intervals of not more than 3 m, but at least once per pipe, in the colour differs from the basic colour of the pipe. The marking shall be legible without magnification. The marking shall not initiate cracks or other types of defects which adversely influence the performance of the pipe. Marking by indentation reducing the wall thickness not more than 0.15 mm shall be deemed to conform to this clause without infringing the requirements for the wall thickness given in 6.1.2. of IS 15328. The markings shall include the following:

- 26.3. Identification of the source of manufacture or trade-mark,
- 26.4. The nominal pipe diameter,
- 26.5. Stiffness class of pipe,
- 26.6. Insertion depth of end for joint to be marked on perimeter of pipe on both the ends by 10 mm thick red colour.
- 26.7. Batch No. /Lot No. or date of manufacture.

4.2.3 Inspection and Testing

The material will be inspected and tested by the third party Inspectors to be nominated by the Employer. The sampling procedure to be adopted and the criteria for conformity shall be as given in Annex F of IS: 15328.

- 26.8. Physical Dimensions and visual inspection: The Manufacturers test reports shall be provided for review.
- 26.9. Vicat Softening temperature shall be carried out as per Annex A of IS 15328.
- 26.10. Ring Stiffness shall be as per IS 15328.
- 26.11. Resistance to Internal Hydrostatic pressure shall meet the requirements of IS 15328.

4.2.4 Joints

Elastomeric sealing rings shall be free from substances (for example, plasticizers) that can have a detrimental effect on the polyvinyl chloride of the pipes or fittings used in conjunction with the pipes.

The design of the profile and dimensions of the sealing ring is left to the manufacturer, as long as the pipe with the sealing ring meets the requirements of this standard. Where the design of the socket is such that the sealing ring is not firmly fixed in position, the housing for the ring shall be so designed as to minimize the possibility of the ring being dislodged during insertion of the pipe

Elastomeric sealing rings shall be in accordance with one of the types (Type 1 to Type 6) of IS 5382. The manufacturer has to, however, specify the type of sealing ring (namely Type 1, 2, 3, 4, 5 or 6) that is being offered.

4.3 Laying and Jointing of Waste Pipes

All the waste pipes/sewer lines are to be laid perfectly true both in alignment and to gradient specified. In case of spigot and socket pipe, the socket end of the pipe shall face upstream.

The waste pipe/sewer lines shall be laid such that the marking on pipes appears at the top of the pipes.

Properly fitted temporary wooden stoppers shall be provided to close the ends of all incomplete sewer line. The stoppers are only to be removed when pipes are being laid and jointed. Opening of sewer at end of day's work shall be capped and sealed.

Waste pipes/Sewer pipe laying and jointing shall be started and completed only section wise as per the instruction of the Project Engineer. The sections shall be chosen manhole to manhole. However in unavoidable circumstances the section of sewer line shall be changed as per site condition & as directed by Project Engineer. The work of sewer line laying, manhole construction and house sewer connections shall be done simultaneously so that all the necessary testing can be done efficiently.

After laying of pipe line the trench shall be filled up to top of pipe with moist soil. The trench can be filled up to the top of the pipe level with moist soil to ensure curing of concrete and then after testing of sewer line, trench should be filled. In the duration before filling the trench, soil should be kept moist to ensure adequate curing.

The waste pipe/sewer lines shall be secured in place with approved backfill material tamped under it and proper care shall be taken during tamping at the socket end of the pipe to check that it is not damaged. The watering shall be done on the refilled material in the trench before compaction based on the OMC of the soil to achieve 90 % MDD of the refilled material.

Special arrangements such as cranes, tripods with chain pulley block for lowering the pipes and fittings shall be made by Contractor at his own cost. In no case pipes and fittings shall be dropped.

The posts and rails shall in no case be removed until the trench is excavated, the pipes are laid and Engineer gives permission to proceed with the backfilling.

The pipes fittings and other construction material shall be placed along the alignment in advance with utmost care during transit so that they are not damaged. Any damage due to these reasons shall be Contractor's liability.

4.4 Bedding of Waste Pipe Lines

The bedding below the pipe line and backfilling shall be provided as per the standard / approved drawing / as per direction of the Project Engineer. After the work of laying and jointing of pipes is completed, the pipes line shall be subjected to hydraulic test at work site. The pipes line should be tested immediately after laying of pipe line. The water required for testing and for any other purpose shall be arranged by the Contractor at his own cost.

4.5 Precast RCC Chambers/Manholes

Structure

It is proposed to provide circular or rectangular chambers or manholes. The general manhole construction may be RCC Precast manholes as per drawings. The contractor will be responsible to ensure procurement and placement of the precast elements in position without any damage. The jointing of the various elements will be made so as to achieve the required water tightness. RCC pre-cast and RCC cast in situ elements shall be tested in accordance with the provisions of IS 456:2000.

RCC works shall generally conform to IS.456-2000. The location of manhole shall be as per the approved drawing or layout given by the Project Manager or as directed by the Project Manager. The Manhole dimensions and other details shall be as per the approved drawings. The Contractor, while constructing the manholes, shall suitably provide HDPE/PVC-U pipe connection lines for the sewer connection to prevent the undue breaking of man hole or road in future, as directed by the Project Manager. The location of manholes shall be as per the approved drawing or layout given by the Project Manager. The vent shaft connection shall be as per the approved drawing.

Pre-cast RCC M25 to M40 manhole & sewer chambers shall be procured / constructed simultaneously with the laying of sewers as per approved drawing and detailed specification.

RCC precast manholes shall be constructed as per approved drawings.

In case of Pre-cast RCC manholes, design mix concrete of grade M25 to M40 shall only be used for the pre-cast manhole elements as per approved drawings.

The Contractor shall provide steel reinforcement as per design requirement in each Pre-Cast Circular Rings including Starter Base Wall at the bottom of the manhole chamber, subject to a minimum of nominal reinforcement as per Code of "Practice of

Plain and Reinforced Concrete” IS:456 2000. No extra payment shall be made to the contractor on this part. The Contractor should therefore take provisions accordingly.

Contractor may study the design, drawings and specifications carefully and if felt necessary, may increase the sectional thickness, reinforcement or the grade of concrete suitably. No extra payment shall be made to the contractor over the rates quoted by the contractor for any modifications / changes proposed by him. The contractor shall be fully responsible for the structural safety of the pre-cast manhole elements /components.

Any data or information received by the Contractor, from the department or otherwise, shall not relieve the Contractor from his responsibility for the design and execution and structural stability of the pre-cast elements.

Top Conical Piece

- c) Providing and fixing of Pre-cast RCC concrete eccentric conical piece for manhole manufactured using Weigh Batching Plant.
- d) Only Design Mix Concrete of Grade M25 to M40 shall be used.
- e) Shape: - Eccentric frustum of cone of designated diameter and thickness as per the enclosed drawings and specifications
- f) Testing: Apart from the usual strength test on of the concrete mix non-destructive test for strength of the concrete is to be carried out on sample piece of pre-cast manhole elements as per the instruction of Project Manager.

Circular Rings

- a) Providing and fixing of Pre-cast M-40 grade cement concrete circular rings for manhole chambers manufactured by using Weight Batching Plant.
 - b) Only Design Mix Concrete of Grade M-40 shall be used.
 - c) Shape: - Circular in shape with end keys at top and bottom of designated diameter, height and thickness as per the enclosed drawings and specifications. The height of rings can be increased in the multiples of 30cms after inspection and approval of
 - d) Testing: Apart from the usual strength test on of the concrete mix non-destructive test for strength of the concrete is to be carried out on sample piece of pre-cast manhole elements lot as per the instruction of Project Manager.
30. The contractor shall be responsible for the quality of the works during the executions of works with good Engineering practices. He shall, therefore, have his own independent and adequate setup for ensuring the same.

4.6 Polyethylene Manholes

4.6.1 Reference Specification

PE manholes shall be as per EN 13598-2:2009 and ISO 9001:2008. This specification references the standard American Society of Testing and Materials (ASTM) standard specifications, which are made a part hereof by such reference and shall be the latest edition and revision thereof.

ASTM D3261 Standard Specification for Butt Heat Fusion Polyethylene(PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing

ASTM D3350 Standard Specification for Polyethylene Plastic Pipes and Fittings Materials.

ASTM F714 Standard Specification for Polyethylene (PE) Plastic Pipe(SDR-PR) Based on Outside Diameter.

ASTM F894 Standard Specification for Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe.

ASTM F1759 Standard Practice for Design of High Density Polyethylene Manholes in Subsurface Applications.

4.6.2 Definitions

Base: The bottom surface of the MH either flat or shaped (benched).

Chimney: A reduced diameter portion of the MH extending from the riser to the underside of the MH top (usually a cast iron frame and grate).

DVS certified: Deutscher Verband für Schweißen (German Welding Standards).

Fabricator: The firm responsible for creation of shop drawings, and the accumulation of all components and the execution of the works to create the manhole produced in accordance with this specification and the shop drawings.

Inspector: The authorized representative of the purchaser entrusted with the duty of inspecting the manhole or components used in the fabrication of the manhole, and witnessing tests performed under this specification.

Inspection: Inspection of the components or the complete fabrication, by the inspector.

Manufacturer: The firm producing the riser pipe and stub out pipes.

Purchaser: The person, firm, corporation or government agency engaging in a contract or agreement to purchase a PE fabrication according to this specification.

Riser: The vertical body of the manhole.

Stub out: Short sections of PE pipe that are part of the manhole fabrication that are to be attached to the sewer connections to the manhole in the field. Stub outs may start inside the riser ID or they may be continuous extending through the MH.

4.6.3 Design Requirements

The manhole riser's performance limits are based on ring deflection, ring (hoop) and axial stress (or strain), and ring and axial buckling. Evaluation of suitability for service is to be performed in accordance with ASTM F1759 - Standard Practice for Design of High

Density PE Manholes in Subsurface applications. Suitability for service is affected by the ground water level, and the characteristics and uniformity of the embedment materials. Confirmation of the 'suitability for service' and the 'as constructed' embedment is the responsibility of the owner or his representative.

When the MH is to be installed in a location that is exposed to live loads, a live-load cap shall be designed to support these vehicular (or other loads); the cap foundation

ring must be placed on well compacted embedment materials surrounding the manhole riser. The cap itself must be physically separated by several inches, as specified on the project drawings, from the PE manhole riser.

4.6.4 Delivery Storage and Handling

Delivery: Manholes shall be prepared for standard commercial shipment unless otherwise specified. Delivery vehicles should be provided with a clean, flat bed, free of sharp objects. Care must be taken to prevent slippage or excessive bowing of the manholes. The load shall be well secured to prevent rubbing. Nylon straps, not chains or ropes, shall be used to secure the load. Do not rest manholes on the socket. Avoid contamination from chemicals such as diesel oil.

Storage: All Materials should be carefully inspected at the time of receipt of delivery and any defects should be noted and reported immediately. Manholes should be placed on firm, flat ground to support the weight of the manhole and the lifting equipment. For safety it is recommended that manholes be stored away from heat sources. Protect all materials and equipment from theft, vandalism, accidental damage and contamination.

Handling: Manholes can be unloaded from the truck by using a boom and sling arrangement that places lifting loads on the riser and not on the stub-outs. Chains or hooks should not be used.

4.6.5 Fabrication Requirements

Joints & Connections: All joints and connections between PE components shall be made by means of extrusion welding or fusion (heat, or socket) welding.

Where heat or socket fusion is used, it shall meet the requirements of ASTM F2620-Standard Specification for Heat Heat Fusion of Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.

Where extrusion welding is used, it shall be undertaken by joining technicians under the direction of DVS certified extrusion-welding trainers.

The manhole fabrication shall be factory leak tested with air or water to assess the integrity of all joints /connections. The factory test shall be completed in accordance with a documented testing procedure unless otherwise agreed to by the Manufacturer and the Purchaser.

The testing may be witnessed by the Purchaser's Inspector when the Purchaser so specifies on the purchase order. The inspector shall have free access to the inspection area of the manufacturer's plant. The fabricator shall furnish a certificate of compliance to these specifications upon request to do so in the purchase order.

4.6.6 Marking Requirements

Pipe used in the fabrication of a PE MH shall be marked in accordance with the requirements of the applicable pipe specification. The orientation of the riser shall be selected to maintain as much of the pipe marking string as possible.

The MH shall have an affixed label adjacent to any locations where pressure gauges were located used to pressure test the fitting, indicating that the fabrication met the pressure testing requirements.

Each extrusion weld made during fabrication of the MH assembly shall be identified using either an indenting tool or with a stamp (with initial(s) particular for each operator) applied on the extrusion weld seam. Root weld shall be identified in the same way, the only difference being the mark placement on the side of the weld. The identification shall consist of the operator's initials; the maximum depth of indent/stamp shall be 1/16" (approx 1.5 mm).

The MH shall be legibly marked in such a way as to not lower its quality and shall remain legible after installation and inspection.

4.6.7 Joining Methods

PE Pipe shall be extrusion welded to PE manhole(s) by manual extrusion welding techniques on both the interior and exterior of the manhole. When the PE mainline pipe is a closed profile pipe, several extrusion jointing details are possible. One of the following joint types shall be used for joining pipes.

Interior (or exterior) v-welded joint. This joint is suitable for direct burial of gravity flow pipes subject to long term positive head up to 5 psi.

Interior and exterior v-welded joint. This joint is suitable for direct burial of pipe subject to long term positive head exceeding 5 psi.

Full wall welded joint. This joint is suitable for direct burial of pipe subject to long-term positive head exceeding 5 psi.

4.6.8 Interior and Exterior V-Welded Joints

External band clamps may be used to assist with pipe alignment. The external clamp shall be placed by the contractor under the direction of the pipe manufacturer's Field Service Technicians. Temporary internal braces or jacks may also be used to assist with pipe wall alignment. Pipe ends shall be positioned to align the "Profile cut" notches and to provide the maximum amount of surface contact between adjacent pipe faces while minimizing or eliminating the space between pipe ends. Welding is completed using the manual extrusion welding procedure recommended by the pipe manufacturer on the wall of the pipe profile. In most cases the internal v-weld will be completed and then the external alignment band clamp will be removed to complete the exterior v-weld. It will be necessary to provide access to the weld 'work area' by removing temporarily the bedding material under the joint. Once all the extrusion welding work is completed at the joint, the bedding material must be replaced and compacted in accordance with the contract requirements.

4.6.9 Full Wall Welded Joint

External band clamps may be used to assist with pipe alignment. The external clamp shall be placed by the contractor under the direction of the pipe manufacturer's Field Service Technician(s) or other approved persons. Temporary internal jacks may be placed to assist with pipe alignment. Pipe ends shall be positioned to align the 'Profile

cut' notches and to provide a suitable equally spaced gap between pipe ends. Extrusion welding is completed by the pipe manufacturer's Field Service Technician(s) or other approved party(s) using semi-automated extrusion welding equipment and procedure.

4.6.10 Testing of Joints for Water Tightness

The inlet/ outlet connections of the manhole will be tested for water tightness along with the testing of manholes.

4.7 Chamber/Manhole Frame and Cover

4.7.1 Steel Fibre Reinforced Concrete (SFRC)

The selection of samples per lot for testing, failure percentage, no. of test, Concrete mix curing, etc shall be as per IS 12592 (part-I) for Pre-Cast Concrete Manhole Cover. The load of class AA shall be as per IRC guidelines.

The Manhole cover shall be heavy duty whereas for Road Side Chamber Cover and frame shall be medium duty in Steel Fibre Reinforced Concrete (SFRC) and shall confirm to IS 12592 (Part I & II) except for the scraper manhole. The inspection and testing for these shall be done by Third Party agency also in the presence of Project Manager or his representative. The load test shall be done in accordance with Table 1 of IS 12592 (Part – I).The cover & frame shall be manufactured as per approved drawing. The frame and cover of manhole shall be in SFRC as per approved drawing.

4.7.2 Cast Iron Manhole Cover

Cast iron manhole cover with frame shall be of medium duty. It shall comply to IS specification. The weight of the cover to be not less than 58 kg. The frame of manhole cover shall be fixed firmly by plain concrete on the top of the RCC slab

4.7.3 Precast RCC

Pre-cast RCC M – 40 manhole & sewer chambers shall be procured / constructed simultaneously with the laying of sewers as per approved drawing and detailed specification. The Contractor shall provide steel reinforcement as per design requirement in each Pre-Cast M-40 Grade Circular slab, subject to a minimum of nominal reinforcement as per Code of “Practice of Plain and Reinforced Concrete” IS:456 2000. No extra payment shall be made to the contractor on this part. The Contractor should therefore take provisions accordingly.

4.8 Fibre Reinforced Plastic

The matrix must also meet certain requirements in order to first be suitable for FRPs and ensure a successful reinforcement of itself. The matrix must be able to properly saturate, and bond with the fibres within a suitable curing period. The matrix should preferably bond chemically with the fibre reinforcement for maximum adhesion. The matrix must also completely envelop the fibres to protect them from cuts and notches that would reduce their strength, and to transfer forces to the fibres. The fibres must also be kept separate from each other so that if failure occurs it is localized as much as possible, and if failure occurs the matrix must also debond from the fibre for similar reasons. Finally the matrix should be of a plastic that remains chemically and physically stable during and after the reinforcement and moulding processes. To be

suitable as reinforcement material, fibre additives must increase the tensile strength and modulus of elasticity of the matrix and meet the following conditions; fibres must exceed critical fibre content; the strength and rigidity of fibres itself must exceed the strength and rigidity of the matrix alone; and there must be optimum bonding between fibres and matrix. It shall be chemical resistant.

5. TUBEWELL/BOREWELL CONSTRUCTION

The Contractor shall conduct Hydrogeological investigation to determine the most probably spot for bore hole to obtain water. The scientific investigation is to be carried in the presence and in the directions of the engineer and using specialised resistivity measuring instruments.

Construction of Tube-well upto 100 Meter depth and above in all type of soil/rocks by DTH system and over burden to accommodate casing pipe of following sizes in all types of soils and over burden including lowering of casing pipes, excluding the cost of casing pipes as per IS : 2800 (Part I & II) 1979 specifications. The work would be completed after obtaining sand free water and as per direction of the engineer. The tube well should have a throughout bore as per nominal dia of casing pipe:150 mm dia nominal bore.

Supply and installation of ERW M.S black casing pipe ISI marked (IS: 4270/1992) of grade Fe410 of following nominal bore sizes at site of work - 150 mm diameter

Supply and installation of strainer pipes made of ERW M.S. black pipe ISI mark of following sizes at the site of work including required size of slotting as per IS: 8110 - 1985 of following nominal bore sizes at site of work. Nominal bore dia: 150 mm

Testing verticality of tube well by plumbing system and yeild test and draw down test by pumping system as per IS: 2800 (part II) 1979

Supply and fixing of tube well cover of M.S sheet(6 mm thick) with nuts and bolts complete for casing size of 150 mm dia

Supply and fixing of MS clamp set of 50 x 6 mm flat iron with nuts and bolts etc for holding the riser pipe assembly of submersible pump set

Installation of submersible motor pump set in tube well complete (labour charges only) including transportation of tripod, pulley block, and any other material required for lowering purpose

Providing and lowering of GI flange pipe B class including rubber washer and nuts of 8 mm dis complete in all respect - 50 mm.

6. SANITARY APPLIANCES

6.1 General

All works under this contract shall be carried out in accordance with the technical specifications and the latest issue of the Indian Standard Specifications applicable to the particular class of work. If Indian Standards are not formulated for any particular material of work, the relevant equivalent International Standards shall apply. Relevant issues of I.S. Specifications applicable to the particular work have been described along with the specification for the respective works. In case of any confusion or dispute regarding the meaning & interpretation of any specification for the respective works, the decision of the Engineer shall be final and binding on the contractor.

All water supply, sanitary installations, sewerage & drainage works shall be carried out by skilled and licensed plumbers/ technicians in a workman like manner complying in all respects with the relevant by-laws of the local municipal corporation.

On completion of all works under this contract, the contractor shall prepare and submit (at his own cost), 1 set hard copy and 1 soft copy of completion drawings showing the entire system of unit including water piping, sanitary installations, drainage & sewerage disposal incorporating upto date changes (if any) at site in all works mentioned above and permanent structures, roads, pathways, boundary lines etc.

All sanitary appliances shall be of Indian Manufacture and of first quality glazed porcelain, white or coloured. Water closets shall be with 'P' or 'S' traps and with left hand/right hand vent or no vent as per requirements. Wall hung type water closets shall be used where specifically mentioned. Coloured appliances shall be adopted where specifically mentioned.

6.2 Sanitary Installation

6.2.1 Plastic Overhead Tank

Plastic overhead storage tanks shall be of polyethylene (PE) of external black colour and internal PE lining in white. The tank material shall be non-toxic suitable for potable water. The materials must be as per Bureau of Indian Standards. The capacities of the tanks shall 200-300 lit for individual toilet.

6.2.2 India Type Water Closet (WC) Pan

Indian Type W.C. Pan (IWC): The WC pan shall be of 1st quality white vitreous china of specified size and pattern. It shall be of back flush inlet type. The pan shall be of approved best quality and shall bear the mark of the manufacturer. The pan shall be provided with a 100 mm 'P' or 'S' trap as per requirement and suitability at site with a min. 50 mm seal.

Fixing: The WC pan shall be sunk or raised from the general floor as shown in drawing, but its surrounding floor shall be sloped towards the pan. Care shall be taken so that the pan is not damaged in the process of fixing; if damaged in any way, it shall be replaced immediately. It shall be fixed in a proper cement concrete base of 1:3:6 proportion (with a wire netting where required) taking care that the cushion is uniform and even without having any hollows between the concrete base and pan.

The joint between the pan and the trap shall be made with epoxy putty (M-seal or equivalent) and shall be leak proof.

'Orissa' pattern water closets where required shall be 580mm size generally fitted with low level PVC flushing cisterns on the back wall, be fittings with flush valve.

Flush pipe (except for coupled closets) shall be (1 1/4") 32 mm. dia 90 deg. brass chromium plated long arm bend straight from cistern outlet to floor, in case of 'Orissa' closets

6.2.3 *European Type WC Pan*

European type W.C. Pan (EWC) : Shall be of wash down type, shall bear the mark of an approved firm and shall be of best quality. The closet shall be of 1st quality vitreous china ware having integrated trap 'P' or 'S' type with or without vent outlet,

Seat : The seat with lid shall be of PVC/Thermoplastic (black) and shall be fixed in position by using aluminium or plastic hinges supplied by manufacturer.

In case of low level cisterns supply, connections shall be brass chromium plated, C.P. plumbers union and tube bend as required shall be used. C.P. concealed type or angle type stop cock shall be adopted to isolate each cistern. Flush pipe (except for coupled closets) shall be (1 1/4") 32 mm. dia 90 deg. short bend in case of floor mounted type European closets.

6.2.4 *Urinal*

Lipped Front Urinal

The urinal shall be of flat back lipped front basin of required dimensions in first quality white vitreous china ware of an approved make. It shall be fixed in position by using rawl plugs embedded in the wall with SS. screws 75 mm long. Each urinal shall be connected to a 40 dia flexible PVC waste pipe which shall discharge into a 100 mm half round white porcelain channel & CI floor trap.

Wall Type Urinal

This shall be a standing urinal with 300 x 300 wall glazed tiles set on the vertical wall at an inclination of 1:30. Height of tiles shall be 1200 mm and inside width of urinal shall be 700 mm. Division plates shall be 25 mm thick gray kota stone or black stone 470 mm wide x 750 mm high. The stone shall be embedded in wall by 25-35 mm. The balance will protrude from the vertical wall edge. A half-round white porcelain channel will be embedded at the bottom of the wall tiles in a PCC (1:3:6) platform 125 mm thick. The platform will protrude 600 mm from the wall. The platform flooring will be with 300 x 300 mm non-skid ceramic tiles set in cement/sand mortar (1:4) – 12 mm thick. The bed will slope towards the channel. All details are shown in drawings.

6.2.5 *Wash Basin*

Lavatory Basin : The basins shall be 1st class of white vitreous china of approved pattern. The size of the basin shall be standard not more than 0.75m. The basins shall be of approved quality and make.

Fittings: Each WHB shall be provided with a PTMT (Polytetra Methylene Terephthalate) pillar tap (15 mm) and fitted with 32 mm dia PTMT waste complete in all respect of approved quality.

Fixing: The basin shall be supported on a pair of C.I., painted concealed type brackets embedded in wall with PCC (1:3:6) blocks. These brackets shall be painted to the standard shade.

A 32 mm dia flexible PVC waste pipe with brass coupling nut shall discharge into the floor trap inlet below the WHB.

6.2.6 Toilet Requisites

Water connection: Water connection to flushing cistern, lavatory basins shall be by means of white PVC 15 mm dia connector with PTMT coupling nuts. The length of connector shall be 375 mm.

Shelf : This shall be of PTMT approx. 500 mm. Long. Shelf shall be fixed to with SS screw and PVC hold fasts.

6.2.7 Fittings

All fittings shall be of standard manufacture and shall in all respect comply with the Indian Standard Specifications. The brass fittings shall be fixed in pipe line in a workman like manner. Care must be taken to see that joints between fittings are made leak proof. The fittings and joints shall be tested to a pressure of 7 Kg per sq.cm. unless otherwise specified. The defective fittings and the joints shall be repaired, redone or replaced at the contractors expense. PTMT with hardness 75 on Rockwell scale, dimensionally stable upto 1200C. These fittings should conform to BIS recommendation or equivalent IS code.

6.2.8 Cock

Bib Cock

The bib cock shall be of brass CP/PTMT specified quality with flat seat opening of screw down pattern of the size as specified.

Stop Cock

The stop cock shall be of brass CT/PTMT specified quality with flat seat opening of screw down pattern of the size as specified.

6.2.9 Shower Rose

The shower rose (fixed mounted or telephone) shall be of brass CT/PTMT specified quality 100 mm □ with uniform perforation. The inlet size shall be 20 mm or 15 mm as specified.

6.2.10 uPVC/HDPE Pipes and Fittings

Pipes and fittings: The pipes and fittings shall be of HDPE or UPVC of approved quality. It should be black in colour. It shall be used for Soil pipe, waste pipe and vent pipe.

The pipes and fittings shall be fixed to walls /ceilings by using proper clamps integrated with the pipes. The pipes shall be fixed perfectly vertical or in a line as directed. Where pipes are laid along walls, the pipes are to be fixed 10 mm away from the wall surface.

The access door fittings shall be of proper design so as not to form any cavities in which filth may accumulate. Doors shall be provided with SS bolts and synthetic rubber gaskets. The doors shall be secured to make it leak proof.

Connections between main pipe and the branch pipes shall be made by using required types of fittings with/without access doors for cleaning.

6.2.11 GI Pipe Fittings

The pipes shall be of galvanised (as per IS 4736), screwed and socketed and shall conform to I.S. 1239 (Part- I) with ISI mark. The fittings shall be of malleable cast iron (galvanised) (IS: 1879) with ISI mark.

Nominal Bore	Weight of Pipe in kg/mtr		
	Light	Medium	Heavy
15 mm (1/2")	0.96	1.23	1.46
20 mm (3/4")	1.42	1.59	1.91
25 mm (1")	2.03	2.46	2.99
32 mm (1 1/4")	2.61	3.17	3.87
40 mm (1 1/2")	3.29	3.65	4.47
50 mm (2")	4.18	5.17	6.24
65 mm (2 1/2")	5.92	6.63	8.02
80 mm (3")	6.98	8.64	10.30
100 MM (4")	10.20	12.40	14.70

Laying & Fixing: Where pipes have to be cut or re-threaded, ends shall be carefully reamed and filed so that no obstruction to bore is visible.

Jointing shall be done by applying a layer of white zinc paste and fine jute threads on the threaded part (external & internal) and the socket or fitting is to be screwed tight to a torque of approximately 4 kg-m During pressure testing the joint shall show no sign of leakage.

All cutting holes, chases, trenches etc. at any place necessary in connection with the work as per items of this tender and subsequent mending damages are to be included in the rates.

Internal works: Internal G.I. pipes and fittings inside the duct walls shall be fixed exposed by means of M.S. galvanised holder bat clamps keeping the pipe 25 mm clear off the wall everywhere or concealed as directed. It shall be by chasing floors and walls as directed. The holder bat clamps shall be fixed at suitable distances.

All pipes and fittings shall be fixed truly vertical or horizontal or as directed by the Engineer.

For internal works in toilets etc. pipes may be concealed within wall chases. The depth of chase shall be at least the outer dia of pipes and fittings. The pipes shall be anchored by means of galvanised hooks.

External Works: For external work G.I. pipes and fittings shall be laid in trenches. The width of the trench shall be as shown in drawing. The pipes laid underground shall be at 900 mm (average) below ground level. The work of excavation and refilling shall be done in accordance with the general specification for earthwork. All buried pipes shall be painted with 2 coats of coal tar epoxy paint to a DFT of maximum 100 microns.

Painting: All internal G.I. pipes and fittings shall be painted with 2 coats of enamel paint of approved quality over a coat of epoxy primer. The cost of such painting shall be included in the contractor's rate. All pipes and fittings in external work shall be painted with 2 coats of enamel paint over a coat of epoxy primer.

Testing: All G.I. pipes and fittings shall be tested by hydraulic pressure machine to a pressure of 7 kg per sq.cm. All leaky joints must be made leak proof by tightening or re-doing at contractor's expense. Water for testing shall be at contractor's own cost.

6.2.12 Water Meters

Water Meter shall conform to IS-779 and have ISI marking on it. The meter type, body & nominal size shall be as specified in the bill of quantities.

33. Type: Dry Dial, Wet-Dial, Inferential or Semipositive type.

34. Body : Made out of bronze conforming to Grade 2 of IS-318 Or Brass conforming to Grade 3 of IS 292

6.2.13 Valves

Ball Cocks: It shall be of approved quality and manufacture in brass with copper, ball float or polythene ball float (as mentioned in schedule of quantities) and shall operate freely & efficiently in water.

Gun Metal Gate, Globe & Check Valve: These shall conform to I.S 778/1971 and shall have ISI marking on it. The type, class, nature of ends (screwed or flanged, male and female) and nominal size of the valve shall be as specified in the schedule of quantities.

The valves shall be minimum of PN10 pressure rating.

The component materials specifications shall be as under:

- Body & Bonnet as per IS 318/1962 Grade 2.
- Gland, Gland nut, Disc spindle nut Disc retaining nut etc. of non-ferrous alloy having ultimate tensile stress not less than 30 kgf/sq.cm and elongation not less than 20% on a 50 mm gauge length.
- Spindles of nonferrous materials with minimum ultimate tensile stress for Class 1 valves: 30 kgf/sq.mm. Ultimate tensile stress for Class II valves: 40 kgf/sq.mm minimum elongation on 50 mm gauge length: 20% minimum hardness

number for the material specified shall be 80, when tested with 10 mm dia ball and a load of 1000 kg applied for 15 seconds.

- Trim : Includes body slats, discs, gates, balls, pistons hinge pins and swing discs of check valves may be made of materials similar to body for bonnet or other materials as specified for the required service conditions.
- Hand wheels of ferrous or nonferrous material. Its bolts shall have an ultimate tensile stress of not less than 44 kg/sq.mm and an elongation of not less than 20% on a 50 mm gauge length when tested per I.S. 1608/1960.

6.2.14 Ball Valve

Ball valves of material UPVC and pressure rating of 6kg/cm² with long handles for operation. The ball valves must be fixed in place along with the process piping by means of o-rings, sealants, couplers and sleeves as per design requirement or direction of the site engineer. Ball valves to be procured from reputed brands such as astral, supreme, prince etc.

6.2.15 Sluice Valve

It shall conform to IS 780/1969 and shall bear ISI mark on it. The class, material, nominal size etc. shall be as specified in the schedule of quantities.

7 ELECTRO-MECHANICAL WORKS

7.1 Wastewater Pump

Non-self-priming, single-stage, centrifugal pump designed for handling wastewater, process water and unscreened raw sewage. The pump is designed for intermittent and continuous operations in submerged installation. The impeller provides free spherical passage of solids up to 80 mm and is suitable for wastewater with a dry matter content of up to 3 %. A stainless-steel clamp assembling system enables quick and easy disassembly of the pump from the motor unit for service and inspection. Pipework connection is via a DIN flange.

General	Required head of the pump: 6 m Required flow rate: 3 m ³ /hour
Controls	Moisture sensor: with moisture sensors Water-in-oil sensor: with water-in-oil sensor
Materials	Pump housing: Cast iron (EN-GJL-250) Impeller: Cast iron (EN-GJL-250) Motor: EN-GJL-250 Primary shaft seal: SIC/SIC Secondary shaft seal: CARBON/CERAMICS
Installation	Maximum ambient temperature: 40 °C Flange standard: DIN Pump inlet: 100 Pump outlet: 100 Pressure stage: PN 10 Maximum installation depth: 10 m
Electrical Data	Power input - P1: 1.9 kW Rated power - P2: 1.5 kW

	Mains frequency: 50 Hz Rated voltage: 3 x 380-415 V Voltage tolerance: +10/-10 % Max starts per. hour: 20 Rated current: 4.1-4.2 A Number of poles: 4 Start. method: direct-on-line Enclosure class (IEC 34-5): IP68 Insulation class (IEC 85): H Explosion proof: yes Length of cable: 10 m
Weight	Not exceeding 50 kgs

7.2 Tubewell Pump

3" multi-stage, submersible pump designed for domestic water supply, liquid transfer in tanks, irrigation and environmental applications. The pump to have soft starting and protection against dry-running, upthrust, overvoltage, under voltage, overload and over temperature. The motor is a single-phase motor of the permanent magnet rotor type, fitted with a replaceable end cover with socket. The pump is designed for intermittent and continuous operations in submerged installation.

General	Required head: 50 meters Required flow rate: 5 m ³ /hour
Liquid	Pumped liquid: Water Maximum liquid temperature: 35 °C Max liquid t at 0.15 m/sec: 35 °C Liquid temperature during operation: 20 °C Density: 998.2 kg/m ³ Kinematic viscosity: 1 mm ² /s
Material of construction	Pump: Polyamide / Stainless steel DIN W.-Nr. 1.4401; AISI 316 Impeller: Polyamide Motor: Stainless steel DIN W.-Nr. 1.4401, AISI 316
Installation	Pump outlet: Rp 1 1/2 Minimum borehole diameter: 76 mm
Electrical data	Motor type: MS3-N Power input - P1: 2.32 kW Rated power - P2: 1.68 kW Mains frequency: 50 Hz Rated voltage: 1 x 200-240 V Rated current: 11.2 A

	Power factor: 1,00 Start. method: direct-on-line Enclosure class (IEC 34-5): IP68 Insulation class (IEC 85): F Length of cable: 1.5 m
--	---

8 FAECAL SLUDGE TREATMENT PLANT (FSTP)

The following sections cover a detailed outline of the design process of the faecal sludge treatment system starting with criteria and considerations for the design, followed by the concept and implementation proposal.

8.1 TREATMENT OBJECTIVE

The treatment objective is the treatment of the faecal sludge for safe disposal, decrease the pollution load, reduce in solids content, and create water and sludge reuse opportunities. The purpose of the safe disposal and treatment of the faecal sludge and water also contributes to a general improved health condition related to water bodies. The treated wastewater should meet current disposal standards while the sludge used for fertilization should be helminth and pathogen free and not health threatening when used for farming purposes. The targets to meet are the following: BOD less than 30 mg/L and a COD less than 50 mg/L.

Besides the before mentioned objective, the FSTP is designed in a manner to ensure user friendly operation and maintenance such as low energy consumption. Low maintenance includes a large robustness towards external factors and fluctuating inflow characteristics and quantity.

Under this project, it is proposed to consider population method for taking faecal sludge quantity to treat in a day. The volume of containment unit method doesn't hold good since the desludging frequency will vary from house to house and cannot be assumed properly. The Collection based method also ignored since there is no proper collection is happening at this moment and it is impossible to project it for future years. With proper guidance and regulation it is estimated that maximum of 13.20 KLD of faecal sludge every day will be generated based on population method. Further considering a modular plant design aspect and also of population growth discrepancy it was decided to design a Faecal Sludge Treatment Plant of 12 cum capacity per day.

The desludging truck carrying faecal sludge will be directed to a receiving point inside the treatment facility. The faecal sludge received at the treatment facility will be discharged into the screen and grit chamber by means of gravity where it undergoes pre-treatment without any exposure to the desludging operator. Large and inorganic solids are trapped in this using a vertical screen and grit chamber.

The solids collected in this chamber are removed regularly and dumped along with municipal solid waste arrangement made by Municipality. The sludge in the form of slurry from screen and grit chambers are transferred to sludge drying beds by gravity and a pipe. The sludge drying beds are structures with sloped base for holding graded filter media. The sludge undergoes solid-liquid separation and drying. The percolate from the sludge drying bed is collected and conveyed to the Integrated Settler and AF for further treatment. The dried sludge from the drying beds are removed periodically and transferred to the sludge storage shed located within the premises.

The percolate from the sludge drying bed is subjected to anaerobic treatment in the settler integrated with an Anaerobic Filter. It is proposed to provide a settler before the anaerobic treatment to trap solids. Anaerobic Filter is used for removal of organic

matter in the percolate. As a tertiary treatment module a sand and carbon filter is planned for post treatment of water coming out of the AF, however use of sand and carbon filter depends on the desired quality of treated wastewater. For BOD of 30mg/l there is no necessity to use the sand and carbon filter, settler integrated with an anaerobic filter alone can treat it but for quality of BOD less than 10mg/l use of sand and carbon filter unit becomes necessary. Proper arrangement is made in concept preparation for use and non-use of sand and carbon filter.

8.2 CONCEPT - PDB METHOD

This faecal sludge treatment unit is designed for 12 cum capacity. The area proposed is calculated based on Total Solids content and Loading Rate of the sludge. The septage shall first be made to pass through the screen and the grit chamber for the retention of coarse materials/ solid waste present in the septage. Then the septage would be conveyed to Planted Drying Bed (PDB).

The PDBs are loaded with layers of sludge that are dewatered and stabilised through multiple physical and biological processes. When the sludge is deposited on the Planted Drying Bed the solids (which form about 50% of the septage) are retained on the bed and the rest of the part which is the liquid percolate or effluent wastewater is conveyed to the registers by gravity. The final registers collect effluents from all the drying beds and the wastewater is conveyed to integrated settler with anaerobic filters by gravity.

Here 12 Planted Drying beds are provided in treatment plant in two set (6 beds for each set) however only one set of planted drying beds will be actively in operation for a year period, this means per day 12cum of Septage is provided to a single bed, the next day's load of septage application should be on the second bed and then the third and so on. Considering Sunday as rest day (no desludging happens) the 6 drying beds for remaining days are made consecutively, so one drying bed gets a load after a gap of six days. The other 6 drying beds (second set) will not be in operation for a period of one year, however the plants can be grown in these drying beds and kept alive by feeding treated wastewater coming from in-operation 6 drying beds (first set).

After a period of one year the second set of drying beds is used for feeding septage and first set of drying beds is kept as it is for complete drying and treatment of septage already fed. After 8 months the sludge from this set will be removed and stored in sludge storage room. Considering two months period is needed for replacement of filter media and two months period for complete growth of plants, this set should be ready for septage feeding after a gap of a year. Once the feeding for this set of beds begins, other set is kept as it is for 8months and after the sludge from this set will be removed and stored in sludge storage room. Again 4 months can be taken for repairing the beds for next feed. This process will be continued year after year, thus giving two years as a desludging period for each set.

The effluent wastewater is then treated in two stages (primary and secondary stage) in integrated settler with anaerobic filter module. The primary stages i.e. Settler is mainly meant for Sedimentation of any solids that have entered the modules along with the percolate. The secondary stage i.e. Anaerobic Filter is for the anaerobic degradation of any dissolved and suspended organic matter. The partially treated wastewater from the

secondary treatment unit would be conveyed into the tertiary treatment unit Planted Gravel Filter in order to remove the odor and color and to enrich the wastewater with oxygen. Then for the post treatment the wastewater is conveyed to collection tank with Sand and Carbon filter as explained in earlier sections the use of this unit depends on desired quality of treated wastewater.

Proper arrangement is made for use and non-use of sand and carbon filter. The treated wastewater from the Planted Gravel Filter will flow to Collection Tank via gravity. The collection tank is divided in two parts by having a baffle wall in between. During non-usage years of sand and carbon filter the wastewater stored in collection tank can be diverted to polishing pond directly through control of valve which is provided for a pipe connecting first part of collection tank and polishing pond. If sand and carbon filter is used then the valve will be closed thus disconnecting the first part of collection tank and polishing pond. The wastewater is pumped to sand and carbon filter from first part of collection tank and then outlet of sand and carbon filter will be connected to second part of collection tank. The treated wastewater stored in second part of collection tank will flow to polishing pond by gravity through arrangements made.

The final water from polishing pond can be reused for agriculture or feeding to plants for inactive set of draying beds or gardening purpose in treatment plant itself.

8.3 DESIGN DESCRIPTION FOR THE PROPOSED TREATMENT MODULES-CONCEPT

8.3.1 Screen and Grit chamber

It is a physical method for separation of solid waste and inorganic solids like plastic, cloth, sand, slit etc. from the faecal sludge to prevent clogging of subsequent treatment modules and also enhancing the value of treated end products. Screen chamber uses a series of vertical screens made from stainless steel and coated with anti-corrosive elements for this purpose. In the screen chamber proposed for this treatment facility there is one vertical screen with a 2.5 cm opening between vertical bars. The trash is collected in a tray by manually scrapping the screen with a rake or similar arrangement. The collected trash will be kept on perforated manhole cover to dry the liquid back to screening chamber for 5 to 10 min. Then dried solids stored and disposed along with municipal solid waste collection facility of the municipality.

Grit chambers are like sedimentation tanks, designed to separate the intended heavier inorganic materials and to allow the lighter organic materials to pass through to the next treatment unit. Hence, the flow velocity is a decisive design consideration. The velocity should neither be too low as to cause the settling of lighter organic matter, nor should it be too high as to preclude the settlement of the silt and grit present in the sludge. A horizontal flow velocity of 15 to 30 cm /sec is used at peak flows. The detention time proposed in the grit chamber varies between 30 to 60 seconds.

Here the grit removal is provided in screening chamber only, the grit coming out of grit removal pipe from screening chamber can be collected in small bucket and disposed safely. One screen and grit chamber is provided for each drying bed so in total there will be 12 screen and grit chambers.

Design parameters for Screen chamber

Design parameter	Value
Inlet flow [m ³ /s]	0.01
Velocity in the chamber [m/s]	0.3

With the design parameters mentioned above, the following specifications were obtained for the screen and grit chamber.

Specifications for Screen and Grit chamber

Parameters	Values
Area required [m ²]	1.11m ² for each screen and grit chamber
Retention time [min]	30 sec
Number of screen and grit chambers [-]	1 for each drying bed

8.3.2 Planted Drying Bed

The screened faecal sludge is applied on to Planted drying beds (PDBs), also sometimes referred to as planted dewatering beds, vertical-flow constructed wetlands and sludge drying reed beds, are beds of porous media (e.g. sand and gravel) that are planted with emergent macrophytes. PDBs are loaded with layers of sludge that are subsequently dewatered and stabilized through multiple physical and biological mechanisms. FS is repeatedly loaded onto PDBs, with up to 10 cm of FS per loading where it accumulates for several years depending on the loading rate (1 year and 8 months in this treatment plant), the capacity of the system and mineralization rates and meanwhile the percolated water is treated separately in DEWATS modules.

The volume of sludge on the PDB reduces continuously (through moisture loss and degradation), and the plants maintain porosity in the sludge layer thereby significantly reducing the need for sludge removal compared to unplanted drying beds (which require sludge removal every two to three weeks).

PDB specifications

Parameters	Unit	Values
Total number of beds		12
Treatment volume of each bed	cum	12
Sludge retention time	Years	2
Area required.	Sqm	80 m ² per bed
Sludge feeding frequency	days	6 days a week
Sludge loading rate	KgTS/m ² /ye	150

8.3.3 Integrated Settler and Anaerobic Filter

The percolate from the Sludge Drying Bed is further subjected to treatment in Settler and Anaerobic Filter (AF). The incoming faecal sludge load has moderately high solids content, therefore it is proposed to provide a settler for sedimentation before it enters into the AF. As wastewater flows through the filter, particles are trapped and organic matter is decomposed by the biomass that is attached to the filter material.

Design parameters for the integrated settler and AF

	Design parameter	Value
Settler	Daily waste water inflow per stream [m ³]	8
	Time of most waste water flow [h]	4
	HRT inside tank [h]	2
	Depth / Length / Width [m]	1.7 / 2.1 / 2.5
	COD in [mg/L]	1200
	BOD in [mg/L]	600
Anaerobic Filter	Number of tank [-] 3	3
	Depth / Length / Width of each filter tank	1.6 / 3.0 / 2.5
	COD in [mg/L]	840
	BOD in [mg/L]	409

Expected output going from the settler and anaerobic filter ²	
BOD outlet [mg/L]	59
COD outlet [mg/L]	182

² Values based on literature study and experience at other FSTP

8.3.4 Planted Gravel Filter

Organic load entering into the PGF is already within the required effluent (BOD < 30mg/L) requirement. In order to remove the odor and color and to enrich the wastewater with oxygen it is necessary to allow the wastewater to pass through aerobic treatment. PGF is made of planted filter materials consisting of graded gravel. The bottom slope is 1% and the flow direction is horizontal. The main plants used in this filter bed are *Canna indica*, *Reed juncus*, *Papyrus* and *Phragmites*. The plant selection is mainly based on their ability to grow in wastewater and have their roots spread wide. PGF also aids in reducing the nutrients such as Nitrogen, Phosphorous and potassium present in wastewater.

Planted Gravel Filter



Planted Gravel Filter Specifications

Parameters	Units	Value
Percolate treatment quantity	cum	08
Total number of PGF	-	1
Hydraulic Retention Time per PGF	hrs	36
Area required per PGF .	Sqm	60
BOD outlet	mg / l	<30
COD outlet	mg / l	<50

8.3.5 Filter Media

All filter media such as sand, gravel and other coarse aggregates to be used in the treatment module such as sludge drying beds, anaerobic filter and planted gravel filter to be washed thoroughly to remove silt and flaks before installing. Further details are as follows:

Sizes	Fineness modulus
6-8 mm aggregates	< 6
10-12 mm aggregates	< 7.2

50-70 mm aggregates	8.5-9
16-20 mm aggregates	<6.8
90-120 mm aggregates	>8

Coarse aggregates to be sourced from a single mine after inspection and sieve test carried out as per instruction of the engineer. The below would be the range of recommended fineness modulus for various aggregates used.

The aggregates have to be cleaned and sampled for analysis of fineness modulus, only after the results are as per the requirement, would the aggregates be used for the desired purpose as per design.

Sand is to be sourced from natural sources such as river bed or ravines. The fineness modulus of sand to be used for sludge drying bed is to be between 3 - 4, with a majority of particles passing through sieve opening of 2.36 mm but straining on a 0.6 mm sieve. The sand has to be free from silt, this is to be ensured by washing of sand thoroughly and conducting onsite inspection as per directions of the engineer. Only sieved and washed sand with no clay content is to be used in the drying beds.

Cinder is the preferred filter material to be used in anaerobic filter, any other material can also be preferred which is economical, easily available, inert in sewage and does not disintegrate under continuous submerged conditions. The filter media must have a specific surface area of at least 100 m² per m³ with a void ratio of at least 45%.

8.3.6 Sand and Carbon Filter

After the aerobic treatment the treatment the treated wastewater will be conveyed into pressurized sand and carbon filter for further treatment to reduce BOD levels < 10mg/l. The use of this unit depends on the desired quality of final treated wastewater. Pressurized Sand Filter is recommended for the removal of suspended & visible impurities like sand, silt, heavy metals etc. It reduces Turbidity and TSS of water. It contains Graded Sand media inside Pressure Vessel. Activated Carbon Filter removes Colour, Odour, organic matter, VOC, Chlorine and hundreds of manmade chemicals through Adsorption. It contains Activated Carbon (Higher the Iodine Value of Activated Carbon, better the quality) supported by Gravels & Pebbles inside Pressure Vessel.

Sand and Carbon Filter



8.4 AREA REQUIREMENTS OF MODULES

Module-wise area requirement

Sl. No.	Module Name	No. of units	Area of each unit, Sqm	Total area, Sqm
1	Screening chamber	12	2.26	27.12
2	Planted drying beds	12	90.00	1080.00
3	Integrated settler and anaerobic filter	1	21.40	21.40
4	Planted gravel filter	1	72.21	72.21
5	Sand Carbon Filter	1	20.00	20.00

8.5 INTEGRATED FSTP AND TRUCK OPERATIONS

The idea here is to combine the Operation and maintenance of the FSTP and Desludging Vehicles which will then be operated as a single business unit. Integrated FSTP, Truck Operations and Scheduled Desludging services will also be carried out by the parties for 6 years. The scope of work beyond the construction of the FSTP is as below:

- a) Setting up a project office
- b) Reporting to the Nagar Parishad
- c) Operating and Maintaining the FSTP
- d) Operating and Managing the Desludging Operations

Following is detailed description of the scope of work:

8.5.1 SETTING UP A PROJECT OFFICE:

The 3rd Party will operate the desludging trucks in Chirkunda and setup a project office that plans and manages all activities, and provides a convenient interface for the municipality and citizens. It will keep citizens updated with latest news and

developments, maintain records, inform citizens of the schedule of cleaning, provide information to the urban local body as needed, support with compliance of regulations and disseminate other sanitation related information.

- a) The project office will be staffed from 9am to 6pm on weekdays and Saturday, except Government holidays and days when the municipal office is closed.
- b) A daily log with appropriate details will be generated and maintained in hard copy, with signature of the operator(s). These forms may be digitized after 180 days, and will be maintained until the end of the contract period.
- c) In the beginning of every month, generate a list of septic tanks to be desludged.
- d) The project office will set up an IVR system to manage all on-demand service requests and grievance redressal.

8.5.2 INFORMATION AND REPORTING TO THE CHIRKUNDA NAGAR PANCHAYAT:

The 3rd party will create and maintain a Geographic Information System Map (GIS Map) and log of the service delivery area, and provide periodic reporting to the municipal authorities. The following reports will be generated for each month and submitted to the local authorities before the 5th of the following month:

- I. A list of all septic tanks cleaned by the truck with customer name.
- II. The Desludging vehicle will be installed with a GPS (Global Positioning System) and will require the preparation of periodic reports.
- III. An MIS statement containing the key operational and financial metrics, to be mutually agreed between the service provider and the municipality including number of cleanings done by the trucks, amount of faecal sludge disposed at the disposal site to be maintained.
- IV. A monthly Control Centre summary including (a) number of calls received, (b) purpose of calls, (c) time taken to fulfil service requests and (d) time taken to solve complaints including corrective actions taken to prevent recurrence of complaints.
- V. Copies of the “Service Provided Notice” of all the desludgings done in that particular month.

8.5.3 OPERATING AND MAINTAINING THE FSTP:

The 3rd Party will also be responsible for the regular operation and maintenance of the FSTP which includes the following:

- e) Coordinating with the desludging operator before feeding of FS at the FSTP.
- a) Collection and maintenance of all data points and FS samples
- b) Cleaning/replacement of all the modules of the FSTP as and when required.
- c) Ensuring that all safety parameters are adhered to within the premises of the FSTP.
- d) All purchases relating to meeting the safety requirements will have to be made by the 3rd Party.
- e) Conduct quality tests for the treated wastewater and faecal sludge from an accredited lab at the end of each quarter.

8.5.4 OPERATING AND MANAGING DESLUDGING TRUCKS:

The existing 3500 L desludging vehicle owned by the Chirkunda Nagar Panchayat will be given for operational purposes to the 3rd Party.

- a) All equipment and machines will be new and manufactured by a reputed manufacturer such as Tata motors, Kam-Avida, Maniar etc.
- b) Each truck will have a driver (with proper driving license and permits) and an operator properly trained to conduct their roles. They will be dressed in uniforms as per norms of the municipality, will use appropriate safety gears and carry identification at all times.
- c) Truck will arrive at the customer location within 30 minutes of the scheduled appointment.
- d) The Truck operator will hand over the customer copy of the “Service Provided Notice” to the customer, and get a signature on the Customer copy, ULB copy and Control Center copy and return these copies at the respective places.
- e) The trucks will be maintained and serviced every month to ensure compliance with all road and pollution norms.
- f) All purchases relating to meeting the safety requirements will have to be made by the 3rd Party.

8.5.5 REUSE OF TREATED WASTEWATER AND FAECAL SLUDGE

The technology proposed for the treatment of FS, is via planted drying beds. The O&M of such a system is low coupled with complete treatment of FS into a compost after the completion of 3years. This end product does not require any further treatment and thus can be directly used on the fields.

Since the source of the bio solid is FS, there may be resistance to its usage by the farmers in the adjacent areas. In such a case, the 3rd Party will get the treated FS and wastewater verified from an accredited lab and obtain the necessary certificates and ensure that it is completely pathogen free. This certification will then be verified by the Chirkunda Nagar Panchayat after which the bio solid can be sold in the market.

The 3rd party will have to organize necessary awareness campaigns with the farmers to inform them about the usage of the compost and eliminate the stigma associated with the use of the same. Sale of the compost is crucial for 2 primary reasons, firstly storing the huge quantity of compost will become a burden on the 3rd party and the Nagar Panchayat, secondly the sale of compost can jumpstart the revenue generation of the ULB, where the money collected can be channelized into the O&M post the termination of the 5 year contract.

8.5.6 CAPACITY BUILDING DEVELOPMENT PLAN

An important component for successfully implementing the above FSSM Plan would be augmenting existing capacities of various stakeholders. This would include workshops, trainings, live on-site demonstrations, interactive focus group discussions, continuous handholding assistance, education and awareness programs along with distribution of operative manuals and guidelines customized for target audience.

Following is the breakup of the target audience and the subject on which the capacities are supposed to be developed:

Capacity building requirements of different stakeholders

S. No.	Stakeholder	Subject	Modality	Metric/No
1.	ULB Officials	Concept and need of FSSM, FSSM Process across the sanitation value chain, Issues and Challenges, Statutory Provisions, Roles and Responsibilities, State level Operative Manuals and Guidelines, City FSSM Plan and regulations, scheduled desludging approach, post cleaning inspection, management of finances-revenue and expenditure, redressal of grievances, monitoring and evaluation of the work, maintaining records and database.	Interactive Workshop	2 Workshops
2.	Survey Team	HH level Containment system data collection and database preparation	On-on-one training	1 workshop,
3.	Households	Awareness regarding containment systems, scheduled desludging, health and safety hazards of open discharge, adverse impacts of open defecation, proper usage of public toilets and urinals, proper desludging services, incentives and penalties, payment of user charge, applying for emergency desludging request, registering complaints and grievances, filling up the records in the manifest forms with the desludging operators.	Focus group discussions, public announcements, activities and pamphlets	Outreach to at least 25000 residents of Chirkunda
4.	Masons and plumbers	Proper containment size, specifications and designs, Proper techniques to construct a septic tank, pit latrine, soak pit, toilet superstructure, various construction materials to be used	On-site demonstrations	15 masons and plumbers trained

		and its sources		
5.	Desludging Operator	Safe procedure of desludging, importance of wearing safety gear, equipment maintenance, filling up the job card, penalties in case of non-compliance	On-site demonstration	Targeted at all ULB employed operators + 50% privately employed desludging operators
6	Treatment Plant Supervisor and operator	Treatment technology, detailed procedure of operations and maintenance, keeping records and manifests, storage and sale of compost generated from the plant	Training	Outreach to all plant staff
7	Public and Community toilet operators	Regular cleaning and maintenance of public toilets/urinals, keeping log of users, collection of user charges	On-site demonstrations	Outreach to all publicly employed staff
8	Farmers	Adverse impacts of disposal of untreated sludge on farmlands, benefits of the compost generated from the treatment plant along with the ways to procure it.	Public announcements and pamphlets distribution	Outreach to 50% farming households
9	Ward Councilors	Concept and need of FSSM, FSSM Process across the sanitation value chain, Issues and Challenges, Statutory Provisions, Roles and Responsibilities, scheduled desludging approach, passing of town level resolutions for effective implementation of FSM.	Interactive Workshop	2 workshops with a minimum attendance of 80% elected representatives, policy resolution created to be signed by the end of the process

8.5.7 FAILURE TO ACHIEVE EFFLUENT QUALITY STANDARD

In case of failure to attaining the required quality of treated wastewater effluent and non-attending to comply with the O&M activities as stipulated in the document, liquidated damages shall be imposed for such failure to meet the performance criteria. The Employer will be entitled to recover any such non-compliance from the monthly progress payments to be made to the Contractor in the month in which the failure occurred, or at any time thereafter from the subsequent monthly progress payments.

If the Contractor does not meet the quality as directed by the Employer due to his operational limitations, liquidated damages (LD) (designated as LD in this chapter) shall be imposed on a daily basis or withheld from performance guarantee. The limit of LD shall not exceed the percentage/amount as given in the relevant section elsewhere in the bid document.

In case the permissible effluent quality limits for any of the parameters, as listed below, is not achieved it would be deemed to be non-conformance to qualitative guarantee. The effluent sampling and monitoring shall be done as per the monitoring schedule provided below:

Parameters	Frequency	Testing Lab
Treated water – BOD	Once in a month	From laboratory outside
Treated water – COD	Once in a month	From laboratory outside
Treated water – E-coli	Once in a month	From laboratory outside
Treated water – pH	Everyday	Inside the Office (Contractor to establish facility for testing)
Treated water TSS	Once in a month	From laboratory outside

Penalties (or LD) for non-conformance to qualitative guarantee is given in Particular Condition of Contract or elsewhere in the relevant section of the document.

9. DRAWINGS

All the drawings are attached in Part 1 – Volume 2

10 Personnel Requirement

10.1 Personal Requirement of Contractor during Construction

The Employer places great importance on the quality and authority delegated to the Contractor's key staff deployed in the field to execute and supervise the works in construction phase. The Contractor is required to ensure deployment of qualified and experienced staff in sufficient numbers on site at his own cost to ensure quality and adhere to the schedule. The general requirements of key staff are given below.

Position	Responsibilities	Minimum Qualification
Construction Manager - 1 no.	He/she shall be a person deployed by the Contractor as the overall In-charge for the Contract and shall be posted in the respective project town.	B.E. in Civil Engineering Minimum 3 years of general field supervision of Contracts OR Diploma Civil with Minimum 5 years of general field

		supervision of Contracts
--	--	--------------------------

Manpower personal requirement for Operation and Maintenance stage, as applicable, is given in relevant section of the document.

10.2 Personal Requirement of Contractor during O&M Period

For all operations and maintenance work, the Contractor shall provide skilled staffs relevant to the scope of work. They should have adequate qualifications and sufficient experience of in performing similar work.

The Table below outlines the minimum levels (number) of staffing, and their minimum qualifications and experience on similar projects, that the Contractor shall be required deploy for carrying out the O&M functions. Contractor shall deploy more personnel and workers when required for proper functioning of the system.

SL. No.	Designation	Qualification	Nature of Input
1	Operator	12th Pass	Full time
2	Helper cum gardener cum security guard	-	Full time

In case the effluent fails to give desired quality, the services of Micro-biologist may require. Contractor shall keep provision of small input for this expert.

11. EQUIPMENT REQUIREMENT

11.1 Equipment Requirements

The Contractor is required to assign at least a minimum amount of equipment on site for ensuring quality and timely progress of works. The minimum equipment, including but not limited to the equipment described in Table below shall be mobilized by the Contractor to the Project Site in working condition.

The list in Table below may be reviewed by the Employer's Representative on justifications for any change that may be submitted by the Contractor in the Bid or later in the design stage. It may however be noted that the equipment requirement is keeping in view the period in which it is required to complete and also taking into account the avoidance of any delays resulting from equipment breakdowns.

The Contractor should submit the equipment mobilization program in reference to the list of equipment given below.

Sl. No	Description of Equipment	Minimum No.
1	Concrete mixer	1
2	vibrator	1
3	Total station	1
4	Hand cart trolley	1
5	H&S equipment	1
6	Tractor	1

7	Dewatering pump	1
8	Slurry pump	1
10	Electric generator	1
11	Electric lighting equipment	1

11.2 Tools & Tackles for O&M

Detail of tools and tackles required for operation and maintenance activities is given below.

Items	Minimum Numbers
Gum boots	4
Plastic Drums	2
Rakes	3
Items	Minimum Numbers
Tarpaulin sheet (3mx3m)	6
Boom	4
Mask	5
Snapper	1
Gloves	4
Hose pipe (total 80m)	1
Shovel	2
Wheel barrow	2
Plant Trimmer	1
Tiller	1
Safety Arrangement	
First Aid Box (with all necessary medical arrangement)	1
Sign Board (1 for each unit in English and Hindi in each)	1
Safety arrangement	1
Laboratory Equipment	
pH Meter	1

During O&M phase, the Contractor shall arrange for additional 50% standby, but not less than 1no., arrangement.

Draft Format for Memorandum of Understanding for JOINT VENTURE

This Memorandum of Understanding (hereinafter referred to as "MOU") is made and entered into this ----- ("Effective Date").

BETWEEN

M/s. _____, a company incorporated, and having its registered office at _____ (Hereinafter referred to as the "**First Party**"/"**One Partner**");

M/s. _____) a company incorporated, and having Registered office at _____. (Hereinafter referred to as the "**Second Party**"/ "**Each Partner**");

M/s. _____) a company incorporated, and having Registered office at _____. (Hereinafter referred to as the "**Third Party**"/ "**Each Partner**");

Hereinafter jointly referred to as the "Parties" and individually as "Each Party" or "a Party" as the case may be.

WHEREAS,

A) The **Government of Jharkhand, Jharkhand Urban Infrastructure Development Company Limited, Jharkhand** (hereinafter referred to as the **JUIDCO** or "**Employer**") invited bid for

(B) The **Parties** hereto formed a Joint Venture or will form a **joint venture** (hereinafter referred to as the "**JV**") to jointly execute the above project in all respect

NOW THEREFORE IT IS HEREBY AGREED as follows

ARTICLE 1: JOINT VENTURE:

1.1. The Parties hereto agree to form the Joint Venture with _____ designated as the **One Partner and First Partner**.

1.2. _____ shall be the **Second Member – or Second Partner**

1.3. _____ shall be the **Third Member – or Third Partner** (insert more lines if more partners)

ARTICLE 2: JOINT VENTURE NAME:

2. The JV shall do business in the name of “ _____ **Joint Venture**”.

ARTICLE 3: JOINT AND SEVERAL LIABILITY:

3.1 The Parties hereto shall, for the above-referred Projects, be jointly and severally liable to the Employer for the execution of the Projects in accordance with the Contract till the actual completion of Contract including defect liability period and operation & maintenance as per bid conditions.

ARTICLE 4: PROPORTIONATE SHARE:

4.1 Each member of the Joint Venture agrees to place at the disposal of the Joint Venture, the benefit of all its experience, technical knowledge and skill, and shall in all respects bear its share of responsibility and burden of completing the contract. The parties herein shall be responsible for physical and financial distribution of work as under.

Lead Partner : Financial responsibility : -----

Physical responsibility :-----

Other Partners: Financial responsibility : -----(not less than 25%)-

Physical responsibility :----- (not less than equal to 20%)

4.2 All rights, interests, liabilities, obligations, risks, costs, expenses and pecuniary obligations and all net profits or net losses arising out of the Contract shall be shared or borne by the Parties in the above Proportions.

4.3 The members in the proportion as mention in article 4.1, shall contribute sufficient Initial fixed capital for timely execution of the project including commissioning & operating period as per the contract.

ARTICLE 5: JOINT EFFORT AND MANAGEMENT:

5.1 The Parties shall participate as a JV in the submission of bids and further negotiations with the Employer and shall co-operate and contribute their respective expertise and resources to secure and execute the Projects.

5.2 On award of Projects, the First Partner in consultation with the other members of JV will decide on the final management structure for the successful execution of the Projects as per the terms of Contract.

5.3 All the Parties hereby agree to pool in their financial, administrative, managerial, technical and material resources for execution of the Projects, including commissioning & operation for the period as stipulated in the contract. The share of interest of the JV shall be as per the mutual understanding for the successful completion of the project.

ARTICLE 6: EXCLUSIVITY:

6.1 The co-operation between the Parties hereto shall be mutually exclusive i.e. none of them shall without the other Party's consent & prior approval of RUIDP, approach or cooperate with any other parties in respect of the Project.

6.2 In the course of working as associates, the parties to the JV will be sharing information with each other which may be proprietary /confidential information /knowledge acquired by each other. It is hereby agreed that the parties will maintain complete secrecy regarding such information / knowledge and will not divulge to any party for any other purpose except for the success of the joint execution of the contract. All parties will also indemnify each other against any claim that may arise out of using information, which are being claimed proprietary.

ARTICLE 7: Memorandum of Understanding:

7.1 This Memorandum of Understanding shall be terminated:-

- a. if the Parties mutually confirm that the JV's bid proposal has not been finally accepted by Employer and all rights and obligations of the Parties under or in connection with this Memorandum of Understanding have ceased, or
- b. after successful completion of the project including commissioning & operation and defect liability period from the date of this Memorandum of Understanding unless extended for a further period on demand of RUIDP& mutual consent of the Parties, or

7.2 The Memorandum of Understanding can be modified by mutual consent of the Parties to suit the efficient and expeditious execution of Projects including commissioning & operation of Plant or to make this agreement more meaningful to suit the requirements of Employer after the consent of the Employer.

ARTICLE 8: ARBITRATION:

8.1 Any dispute resulting from this Agreement shall be settled amicably by mutual Consultation by the Managing Directors/Chairman of _____&_____. In the event that an amicable settlement is not reached within 60 days in any particular case, the dispute shall be referred to arbitration and shall be resolved in accordance with and subject to the provisions of the _____ and any statutory modifications and enactment hereof for the time being in force. The decision of the arbitrators shall be final and binding upon both parties. The venue of arbitration will be _____.

ARTICLE 9: GOVERNING LAWS:

9.1 This Agreement shall in all respects be governed by and interpreted in accordance with the _____ Laws.

ARTICLE 10: CONFIDENTIALITY:

10.1 No Party hereto shall disclose to any other party any information of a confidential nature including but not limited to trade secrets, know-how acquired from any Party in connection with the subject matter of this Agreement.

ARTICLE 11: ADDRESS OF CONSORTIUM:

Any and all correspondence from the Employer to the **JV** shall be addressed to **(name of JV)** at the address stated herein below—(any one of the partners). The address of the Consortium office of the partner companies will be deemed to be the address for the purpose of communication.

The notice, if any required to be served on the party by the other party, will be deemed to be served, if the said notice / communication is delivered by Registered Post at the respective address

(name of JV)

ARTICLE 12: Authorized Representative:

the JV shall nominate a Representative who shall have the authority to conduct all business for and on behalf of any and all the parties of the JV during the bidding process and, in the event the JV is awarded the Contract, during contract execution.

Authorized Representative of JV : _____

ARTICLE 13: ASSIGN ABILITY:

13.1 The interests and rights of a Party in the Contract and as a Party of the Joint Venture shall not be transferable or assignable without the written consent of the Employer & other party.

ARTICLE 14: INTERPRETATION OF HEADINGS:

14. The headings of each of the Articles herein contained are inserted merely for convenience of reference and shall be ignored in the interpretation and construction of any of the provisions herein contained.

ARTICLE 15: OTHERS

15.1 Any other matters not contained in this Agreement shall be discussed and amicably agreed upon by the Parties in the spirit of mutual trust and cooperation for timely completion of project including commissioning & operation of project. Notwithstanding anything above all the Parties are severally and jointly responsible to the Employer for execution of the Contract:

IN WITNESS WHEREOF the Parties hereto have caused this Agreement to be executed by each of the duly authorized representatives as appearing below:-

Signed by) For and on behalf of _____)	_____
in the presence of:) _____ Name: Designation:	Name: Designation:
Signed by) For and on behalf of) _____ _____.	_____ _____

in the presence of:) _____) Name: Designation:	Name: Designation:
---	-----------------------

TRIPARTITE MAINTENANCE AGREEMENT

JUIDCO

THIS AGREEMENT made at Ranchi on this day of _____

BETWEEN

JUIDCO, Jharkhand having its principal place of business or head office at Ranchi hereinafter referred to as “the Employer” of the **FIRST PART**.

AND

M/s _____ a company / firm having its registered office at _____, hereinafter referred to as "CONTRACTOR" (which expression shall unless repugnant to the subject or context be deemed to mean and include its successors, representatives and assigns) of the **SECOND PART**.

AND

ULB (hereinafter referred to as "the ULB") of the **THIRD PART**.

WHEREAS the ULB is obliged to pay proportionate charges for maintenance of the said O & M and for provision of various services in the said O&M to the Contractor.

NOW, THEREFORE, THIS AGREEMENT WITNESSETH AND IT IS HEREBY AGREED AND DECLARED BY AND BETWEEN THE PARTIES HERETO AS FOLLOWS:

WHEREAS:

A. The JUIDCO has appointed the Contractor to operate and maintain the Septage Management Services specified in the First Schedule (the Service Area);

B. Following a process of competitive tender the JUIDCO has requested the Contractor to undertake the operation and maintenance of Septage Management services within the Service Area in accordance with this *Operation and Maintenance Services Agreement (OMSA)*;

C. The Contractor, having represented to the ULB that it has the required managerial, technical, scientific, engineering and operational skills and competencies in respect of the design, construction, operation and maintenance of the Septage Management, has agreed to be responsible for the operation and maintenance of the Septage Management system as described in this Agreement and based on existing standards in the sector and reflecting service delivery reliability and quality.

THE PARTIES AGREE AS FOLLOWS:

1. INTERPRETATIONS

1.1. In this OMSA, unless the context otherwise requires:

a) ULB means the Urban Local Body

b) Septage Management Services include: (i) Procurement of equipment and provision of services for collection and transportation of septage from households; (ii) Supply, construction, installation, testing and commissioning of septage treatment plant at Chirkunda Town; and (iii) Operation and maintenance of the above system for 6 years including public outreach activities and collection of user charges from consumers.

c) Commencement Date means the date as specified by the ULB after successful completion and commissioning of the system and components including service connections existing at the time of commissioning.

d) Operation and Maintenance Contract means the clauses and provisions contained in the agreement that relate to Operation and Maintenance of Septage Management Services.

e) Generally Accepted Accounting Principle” means the Generally accepted accounting principles prescribed by the Institute of Chartered Accounted of India.

f) Service Area means the Municipal limits of Municipal Council.

g) Project Manager shall be the Project Manager of JUIDCO.

2. COMMENCEMENT OF THIS OMSA

This OMSA shall come into effect on the Commencement Date

3. DURATION OF THIS OMSA

This OMSA shall continue in force for a period of 6 years ending on the [sixth] anniversary of the Commencement Date.

4. NOTICE UNDER THIS OMSA

Any notice, instruction, direction, requestor permission to be given or made under this OMSA shall be in writing and signed by:

For the ULB:_____

For the Contractor:_____

The Contractor or any person authorized by and acting on behalf of the Contractor. Such authorizations shall become OMSA Documents

Such notice, instruction, request or permission under sub-clause 4.1 shall be deemed to be duly given or made when it shall have been delivered by hand or mail at the address of the party concerned as specified below:

For the ULB:

.....
.....
.....

For the Contractor:

.....
.....

5. APPOINTMENT AND RESPONSIBILITY OF THE CONTRACTOR

5.1. The ULB hereby appoints the Contractor to be the sole and exclusive manager of the Septage Management Services in the Service Area for the duration of this OMSA.

5.2. The Contractor shall, in such manner and at such times as it shall in its absolute discretion see fit, use all its skills and knowledge to manage, administer, conduct, maintain and develop the Septage Management Services in the Service Area in an efficient and professional manner, in the best interests of the ULB, and in accordance with Good Industry Practice and Applicable Law. In particular but without prejudice to the generality of the foregoing, Contractor shall carry out the duties and obligations set out in this Agreement to ensure that the performance of the Septage Management Services is in compliance with the terms and conditions of this Agreement and meets the Performance Standards specified.

5.3. The qualification and experience of the key staff as identified in the Bid for the Operations and Maintenance Period is attached to this OMSA. The Contractor shall confirm the key staff being available and ready to start work in the Service Area at least 3 months prior to the commencement of the operation and maintenance Period. In case the Contractor is required to change any of the identified key staff due to unavoidable circumstances, such change will be subject to approval from the ULB in justification provided by the Contractor. The proposed replacement shall have to be of equivalent or higher qualification and experience specified in the above referred schedule for the respective key staff.

5.4. All other personnel deployed by the Contractor for the provision of services under this Agreement shall hold relevant qualifications and appropriate training and shall have sufficient relevant experience to ensure the operation and maintenance of the Septage Management Services is in compliance with the terms and conditions of this Agreement.

5.5. Notwithstanding Clause 5.1, the Contractor may sub-contract the day to day management of the Septage Management Services and Assets in the Service Area, or sections of the Service Area or any part of the system or Assets to any person or entity subject to compliance with the following requirements:

- a. the Contractor shall not sub-contract the performance of any of its obligations under this OMSA without first informing the ULB in writing, providing such information about the sub-Contractor as the ULB may require, and obtaining the ULB's written consent(not to be unreasonably withheld);
- b. the Contractor shall remain liable under this OMSA for the performance of any obligations subcontracted by it under this Clause; and
- c. failure by the Contractor to inform the ULB and to obtain the ULB's written consent to any purported assignment of any of its obligations under this OMSA

shall invalidate the sub - contract as well as constitute a ground for termination of the OMSA by the ULB under Clause 21 of this OMSA. The contractor shall sub-contract the OMSA only if the sub-contractor satisfactorily completed as a prime contractor at least one similar O&M work of value not less than 35% of O&M contract value in any one year.

6. SAFEGUARD, USE, MANAGEMENT AND CONTROL OF ASSETS

6.1. The ULB reserves the rights in the assets comprising the system in sub- clause 5.1 asset out in the Third Schedule to this OMSA at all times.

6.2. The Contractor shall have access to, the right to use, and the duty to safeguard, manage and control the assets referred to in sub-clause 6.1, for the purpose of discharging its duties and obligations or exercising its rights under this Agreement, for the term of this Contract.

6.3. The Contractor shall maintain in good working condition, throughout the term of this OMSA, the assets referred to in sub-clause 6.1 and shall ensure that adequate control is maintained over assets owned by, or in the custody of the Contractor.

6.4. The Contractor shall not dispose of or create any lien, charge or proprietary interest of any nature whatsoever in favor of the Contractor or a third party in the assets referred to in subclause 6.1, except on the express written instruction of the ULB.

6.5. The Contractor shall comply with any directions of the ULB to use or dispose of any asset or any money or other consideration to which the ULB becomes entitled as a result of disposing of any asset referred to in sub-clause 6.1.

7. OBLIGATIONS OF THE CONTRACTOR

7.1. During the term of this Agreement, the Contractor shall be responsible for operation and maintenance of all components, including and without limitation components built new and existing, of the septage management system, and including ancillary equipment, in compliance with the terms and conditions of this Agreement to meet the Performance Standards specified in Schedule 4. This will include all systems supporting the provision of services including septage collection system, septage treatment system, customer grievance redressal system, billing systems and any other works included under the contract.

7.2. The Contractor shall procure grants, licenses and renewals of, and keep up to date, all Applicable Permits to enable the Contractor to perform the Services throughout the term of the Agreement other than those Applicable Permits that are to be applied for by the JUIDCO

7.3. If and as required, the Contractor shall provide assistance to the ULB or agencies/advisors nominated by it to liaise with other Governmental agencies in any interface in the operation of the septage management system;

7.4. The Contractor shall collect septage from individual households as per the schedule fixed for the service area, transport the same to the septage treatment plant, treat the

septage to prescribed effluent quality, dispose the treated effluent and sludge as per requirements of the bid document, and collect the user charges as applicable.

7.5. The Contractors shall fully operationalise the Customer Grievance Redress System through establishing and maintaining two(2) Customer Service Centers in identified locations of the Service Area (made available by ULB) for customer grievances and recording and keep them open between 0800 hours and 1900 hours, for a minimum 5 days a week. At each such office, make arrangements for recording of complaints (through web site or register) from Customers/citizens. Additionally, operationalize and maintain atleast one centralized call centre, online web based system complaint registration systems which shall be accessible on24X7basis.

7.6. In discharging the duties and obligations referred to in sub-clauses above, the Contractor shall:

a) exercise due diligence, efficiency and economy in accordance with generally accepted professional conduct and practice, and shall employ sound management practices and appropriate technology in the best interests of the ULB;

b) comply with:

1) Codes of workmanship prescribed by the legislation of India and Jharkhand

2) the service standards specified or referred to in the Fourth Schedule to this Operations and Maintenance Agreement

3) provisions of all relevant laws relating to the duties and obligations referred to including as relating to occupational health safety of employees, to the environment, to the collection and payment of taxes and to any other matter whatsoever.

4) the terms of any water or waste discharge permit granted to the ULB.

5) any notice, instruction or direction issued in accordance with clause 4

c) familiarize himself and be in confirmation with the terms of the Indian legislation for Septage Management and any statutory clearances for the Septage Management Services and shall perform the Service in conformity with all of the conditions of these consents.

d) pay all taxes, rates, charges, fees, and penalties and provide all returns, files and documents required of it under applicable tax laws or other laws and discharge all obligations imposed on it by such laws Failure by the Contractor to comply with the foregoing provisions shall amount to a breach of this OMSA, subject to clause 21 at the discretion of the ULB.

8. SYSTEM MAINTENANCE AND IMPROVEMENT

8.1. One month prior to the commencement of the operations period, the Contractor shall prepare and provide JUIDCO a plan containing its proposed operating strategy and

programme of preventive and other scheduled maintenance for the first year of operations (Draft Operations and Maintenance Plan). Subject to approval by the JUIDCO, the plan shall comply with the operation and maintenance manual and safety requirements. The Draft O&M Plan shall include:

- a) Implementation plan for effective operations and maintenance, leakage control, asset management and customer services and emergency repairs.
- b) required and proposed extensions or additions to the septage management systems, along
with the justification and the cost implications
- c) other information that the Contractor may consider appropriate or that may be specified by the ULB

Upon approval by JUIDCO, or expiry of 30 days from submission, the Draft O&M Plan shall be the approved O&M Plan to be implemented by the Contractor.

8.2. The Plan shall be prepared and submitted for approval every two years before the start of next cycle of operations.

8.3. The Contractor shall be responsible, at its own cost, for managing all preventive maintenance and normal repairs, major maintenance or replacements (if any required) to the system as per the O&M Plan, including rectifying damage to the system due to any act of negligence in performance of its functions, deemed necessary to maintain the value of the assets included in the document and ensure operations in compliance with the Performance Standards.

8.4. If the Contractor is of the opinion that matters have arisen that may prevent, or significantly affect the implementation of the O&M Plan, the Contractor shall immediately notify the ULB of its opinion and there as on thereof.

8.5. In case of occurrence of an insurable event, the Contractor shall be responsible for informing the insurance agency about the event, complete any survey, follow-up with the insurance agency for insurance claim settlement and repair/replacement of assets affected by the insurable event. The expenditure on repair/replacement shall be certified by the Project Manager. In the event the expenditure on repair/replacement of assets due to insurable event is more than the insurance claim settlement, the difference would be borne by the Owner.

9. BILL GENERATION, DISTRIBUTION AND COLLECTION

9.1. During the Operation and Maintenance Period, the Contractor shall be responsible for generation of bills to customers as per user charges; delivery of bills to customers and collection of the same from the users.

9.2. The Contractor shall under take generation of bills in the name of ULB and distribution of bills on behalf of ULB

9.3. The Contractor shall follow good industry practices including use of modern technology including but not limited to mobile hand-held devices for billing and distribution

9.4. The responsibility for collections also remains with the Contractor. All the collections shall be deposited in the Escrow Account (as referred to in the main bid document). In case of defaulters who are not paying the user charges as per requirements, the Contractor may submit the list of same to ULBs for their assistance. The ULBs shall assist the Contractor in the collections part by issuing warning letters to such users.

9.5. The records for billing and collections of water charges shall be updated in real time in the financial management system and customer data base developed by the Contractor, and accessible to the ULB. Viewing access for collection records for each and all customers in the Service Area shall be provided by the ULB to the Contractor.

10. CONTRACTOR FEE

10.1. Subject to the provisions of this Contract and in consideration of the Contractor accepting the rights under this Contract, and undertaking to perform and discharge its obligations in accordance with the provisions of this Contract, the JUIDCO agrees and undertakes to pay to the Contractor Fees in accordance with Schedule 4.

10.2. The payment of Contractor Fee for services shall be on basis of quarterly invoices specified in Schedule to this Agreement.

10.3. The Contractor Fee payable shall be subject to meeting Performance Standards and adjusted in the manner provided .

10.4. The Contractor should raise invoice within 15 days of completion of a quarter for services relating to the previous quarter and submit the same to ULB. The ULB shall certify and approve the payment of the invoice within 45 days of submission of the invoice.

10.5. The ULB shall be responsible for making quarterly payment to the Contractor for services provided.

10.6. During the Operations Period, all requests for new users will be submitted to the Contractor, but require to be authorized and approved by the ULB.

11. TO MAINTAIN AND KEEP RECORDS

11.1. The Contractor shall keep proper and adequate accounts and records of the transactions and affairs of the septage management and shall keep records that are necessary to explain the financial operations and financial position of the system.

11.2. During the O&M Period the Contractor shall keep a computerized data base of customer's records including billing and collection. Collection information would be updated based on actual collection information for each customer as available with the accounting system of ULB. The contractor shall be given access to the water charge

collection accounts of ULB. The Contractor shall keep a record in an electronic format using simple office management software. There should be suitable controls to prevent unauthorized access to these records.

The Contractor shall be required to allow inspections of these records to the ULB or his authorized representatives.

11.3. The Contractor shall develop and maintain an adequate budgeting and accounting system. The Contractor shall develop and maintain an adequate internal accounting control system.

11.4. The accounting period of the Contractor shall coincide with the accounting period of the ULB.

11.5. Without detracting from sub-clause 11.1, the Contractor shall keep the records referred to in the Fifth Schedule of this Operations and Maintenance Agreement and shall retain those records for the period prescribed in the Schedule..

11.6. Except as provided below and specified otherwise in any other clause, all records are confidential to the Contractor and the ULB.

a) Any customer or former customer of the Contractor may apply to the Contractor for a copy of all records held by the Contractor concerning that customer, in such a form as may be prescribed by the ULB.

b) The Contractor shall provide a customer or former customer under sub-clause 11.6(a) with a copy of the relevant records, but may impose a reasonable charge to cover the costs to the Contractor of making the copy available in accordance with clause 11.6(a).

12. REPORTING REQUIREMENTS

12.1. The Contractor shall, in respect of each quarter of a financial year and no later than 15 calendar days after the end of such quarter, prepare a report to the ULB containing:

a) information about, and an analysis of, its operations for the quarter and cumulatively for the year to date; and

b) Financial statements in accordance with Generally Accepted Accounting Principles for the quarter and cumulatively for the year to date.

12.2. The report referred to under sub-clause 12.1 shall:

a) be prepared in a form acceptable to the ULB;

b) contain the information specified in the Fifth Schedule of this Operations and Maintenance Agreement and any other information determined by the Contractor to be appropriate; and

c) Contain any other information reasonably required by the ULB.

12.3. The financial statements referred to under sub-clause 12.1(b) shall:

a) contain information determined by the ULB to be appropriate;

b) include an assessment of the cost of carrying out any other obligation that is imposed on

the Contractor under this OMSA and that requires the Contractor to act otherwise than in accordance with normal commercial practice;

c) be prepared in a manner and form approved by the ULB; and

d) Present fairly the results of the financial transactions of the Contractor during the financial period to which they relate and the financial position of the Contractor as at the end of that period.

12.4. The Contractor shall, in respect of each calendar month, and no later than 5 days after the end of such month, prepare a report to the ULB containing:

a) the billings for the month showing distinctly the net billings, and gross billings;

b) collections for the month showing distinctly the net billings, and gross billings collected;

12.5. The ULB may require and the Contractor, when notified, is obliged to appear in meetings of the ULB convened to discuss the affairs of the ULB. The ULB may request the Contractor to make such presentations, reports, demonstrations or take such actions as the ULB may deem necessary with reasonable prior notice.

12.6. Failure of the Contractor to comply with the provisions of this clause shall amount to a breach this OMSA, subject to clause 21 at the discretion of the ULB.

13. INSPECTION BY THE ULB

The Contractor shall allow the ULB and/or any person representing the ULB, access at anytime to:

(a) any land owned or occupied by the ULB;

(b) any assets renewed, acquired or constructed by the ULB;

(c) any assets under the contract owned by the Contractor;

(d) inspect any land, works, buildings or any other assets;

(e) make any tests, take any measurements or take any samples;

(f) take any photographs or make any plans or drawings; and (g) inspect and, if necessary, make any copies of any records or documents referred to in clause 10 in order to ascertain whether the Contractor is complying in every respect with this OMSA.

14. INDEMNIFICATION

Provided that the Contractor, their servants and employees shall use diligence and care in carrying out their duties here under, neither they nor any of their servants and employees shall be liable for any damage to persons or property arising out of any information, advice or service supplied to the ULB or act performed for the ULB or otherwise in the course of their duties here under. The ULB shall indemnify the Contractor and every such person against all claims, demands, losses, liabilities, actions, lawsuits, costs and expenses arising directly or indirectly out of or in consequence here of or in the implementation of this OMSA.

DUTIES, RIGHTS AND OBLIGATIONS OF THE AUTHORITY

Without detracting from any duties, obligations and rights imposed on or conferred upon (whether expressly or by implication) the ULB by this Operation and Maintenance Agreement, or implied by law or commercial custom on persons similar to the ULB, the ULB shall have duties obligations or rights in the following:

15. ADJUSTMENT OF TARIFFS, FEES, RATES AND CHARGES

15.1. The Owner shall have the right and obligation to set and adjust the tariffs, fees, rates and charges to be charged under clause 9, subject to the provisions of the Second Schedule.

15.2. At the Commencement Date the water tariff is set at the level given in the Sixth Schedule to this Operation and Maintenance Agreement.

15.3. In exercising its rights under sub-clause 15.1, the ULB shall, from time to time and whenever tariff adjustments have taken place, publish a schedule of approved tariffs, fees, rates and charges and related instructions and shall furnish the Contractor with such schedule.

16. RECOGNITION OF THE CONTRACTORS RIGHTS TO CHARGE TARIFFS AND CONNECTION FEES

16.1. The Contractor has no right to charge individual beneficiary/user connected to the septic tanks in accordance with Clause 9. This does not seem to be valid in our case. Can be deleted??

17. AUDITING OF ACCOUNTS

17.1. The ULB shall have the right to appoint an audit or to examine the accounts, books and records of the Contractor.

17.2. The ULB shall pay the costs of any audit or engaged under sub-clause 17.1.

18. NON-INTERFERENCE WITH OPERATIONS

The provisions in this OMSA notwithstanding, the ULB shall not interfere with the day to day operations of the Contractor. In particular, the ULB shall not:

- a) issue instructions to the Contractor regarding operational decisions or actions except by way of the ULB's approved business plan or amended business plan or as required by the law;
- b) Withhold payments due to the Contractor on account of the Contractor refusing or failing to comply with instructions issued in contravention of this clause;
- c) Contravention of this clause by the ULB shall constitute a breach of this OMSA subject to termination of the OMSA under clause 21.

19. POLICY RESOLUTION PASSED BY TOWN COUNCILLORS

19.1. The Town Municipal Council Representatives pass a resolution which supports FSM in the town and ensures sustainability in the future. It may contain the following resolutions subject to discussion with councillors:

1. With the knowledge of the absence of adequate funding and water supply for a traditional sewage treatment system, in the near future, we resolve to implement innovative sanitation systems such as Decentralised Wastewater Management and Faecal Sludge Management systems.
2. As a part of the Faecal Sludge Management System, we resolve to undertake the following:
 - 2.1. Declare the town open defecation free by _____
 - 2.2. Ensure every toilet has a containment system designed according to standard designs mentioned in the SBM guidelines.
 - 2.3. Ensure every containment system is desludged at least once in every five years.
 - 2.4. Ensure no desludging vehicle disposes raw or untreated faecal sludge outside, exposed in the environment.
 - 2.5. We will establish a faecal sludge treatment system for the town
 - 2.6. We will ensure the sustainability of the treatment system, by creating provisions for user fee collection and appropriate allocations in each annual budget.
3. For the purpose of setting up a Faecal Sludge Treatment Plant, we earmark ___Acre of land with Survey No _____ in Ward no _____. The treatment plant will be low in operation and maintenance, odour-free and aesthetically appealing.
4. We will undertake all processes needed to provide data for preparation of the Detailed Project Report and support the PMC for its preparation.
5. We resolve to carry out IEC campaigns to spread awareness amongst the community about faecal sludge and wastewater management.

The above resolution is taken in the presence of all ward councillors, Vice Chairman, Chairman and Executive Officer of TMC, Chirkunda and shall be ratified with immediate effect.

MISCELLANEOUS PROVISIONS

20. WAIVER

20.1. A failure, delay or indulgence on the part of either party in exercising any power or right under this OMSA does not waive that power or right.

20.2. Any single exercise of a power or right under this OMSA does not preclude any other or further exercise of it or the exercise of any other power or right under this OMSA.

21. AMENDMENT OR VARIATION

This OMSA may be amended or supplemented, at anytime, in writing signed by both parties.

22. SUSPENSION AND TERMINATION

As per provisions in Article 73 of the General Conditions.

23. TRANSFER

23.1. The Contractor shall be responsible for transfer of all assets, equipment, customer records and other material created or maintained by the Contractor for the smooth operation and maintenance of the Septage management System.

23.2. Atleast three months before expiry of the O&M Agreement, the Project Manager shall assess, with assistance from IVT and/or PMC, if required, the useful life of the assets pertaining to the ULB which are part of service area. If the remaining useful life of assets is substantially less than what it should be if these were operated as per prescribed methodology, the Contractor shall be responsible for undertaking any refurbishment or replacement as required before hand over of the system at the end of O&M Period. If the Contractor fails to undertake such refurbishment or replacement, such reasonable amount as may be recommended by the value or otherwise can be deducted from any payments due to the Contractor including termination payment or Performance Security.

CLIENT: JUIDCO JHARKHAND

PROJECT NAME: IMPLEMENTATION OF FSTP AT CHIRKUNDA

LOCATION: CHIRKUNDA, JHARKHAND



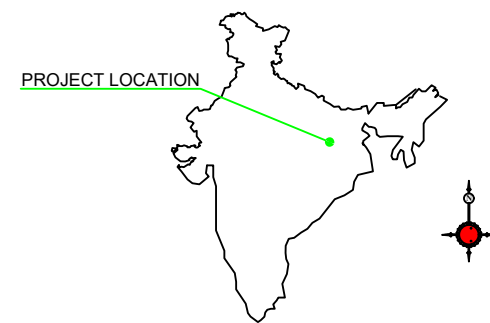
Consortium for
DEWATS
Dissemination
Society

Survey No.205,
Opp. Beedi Workers Colony,
Kommaghatta Road, Bandemath
BANGALORE - 560 060
KARNATAKA.

INDEX TO DRAWINGS:

SHT NO.	DWG NO.	DESCRIPTION
01	D-01/CHIRKUNDA/FSTP/MP-01	MASTER PLAN DRAWING
02	D-02/CHIRKUNDA/FSTP/HP-01	HYDRAULIC PROFILE
03	D-03/CHIRKUNDA/FSTP/SC-01	SCREENING CHAMBER DETAILS
04	D-04/CHIRKUNDA/FSTP/PDB-01	PLANTED DRYING BED DETAILS
05	D-05/CHIRKUNDA/FSTP/ISAF-01	INTEGRATED ST AND AF DETAILS
06	D-06/CHIRKUNDA/FSTP/ISAF-02	PERFORATED SLAB DETAILS
07	D-07/CHIRKUNDA/FSTP/PGF-01	PLANTED GRAVEL FILTER DETAILS
08	D-08/CHIRKUNDA/FSTP/PGF-02	PLANTED GRAVEL FILTER FM DETAILS
09	D-09/CHIRKUNDA/FSTP/CT-01	COLLECTION TANK DETAILS
10	D-10/CHIRKUNDA/FSTP/PP-01	POLISHING POND DETAILS
11	D-14/CHIRKUNDA/FSTP/R-01	REGISTER DETAILS
12	D-16/CHIRKUNDA/FSTP/CD-01	COMPOUND AND DRAIN DETAILS
13	D-11/CHIRKUNDA/FSTP/RD-01	BITUMINOUS ROAD DEATILS
14	D-13/CHIRKUNDA/FSTP/SSR-01	SLUDGE STORAGE ROOM DEATILS
15	D-12/CHIRKUNDA/FSTP/OR-01	OPERATOR ROOM DETAILS
16	D-15/CHIRKUNDA/FSTP/SS-01	SEPTIC TANK AND SOAK PIT DEATILS

VICINITY MAP



LOCATION MAP



LEGENDS/SYMBOLS

	GATE VALVE		SUPPORT WALL
	MAN HOLE		SECTION OF A-A
	PIPE		V-NOTCH
	GAS VENT OPENING		WATER LEVEL
	RCC WALL		EXISTING GROUND LEVEL
	BRICK WALL		GAS VENT PIPE WITH VENT COWL
	CINDERS		S.S OPEN CHANNEL GATE
	SOLING		OPENING IN WALL
	CEMENT CONCRETE FILLING		LANDSCAPE

CLIENTS CONSULTANT:



Survey No.205,
Opp. Beedi Workers Colony,
Kommaghatta Road, Bandemath
BANGALORE - 560 060
KARNATAKA.

DRAWN BY	CHECKED BY	APPROVED BY
SHRINIVAS	PRAVEEN	PRAVEEN
DATE	DATE	DATE
29/11/2017	29/11/2017	29/11/2017
SCALE: NTS	TOTAL SHEETS: 17	

Faecal Sludge Treatment Plant

NOTES

1. ALL DIMENSIONS ARE IN MM UNLESS MENTIONED OTHERWISE.
2. ALL DIMENSIONS ARE CHECKED AND CO-RELATED WITH THE ARCHITECTURAL DRAWINGS AND ANY DISCREPANCY OR OMISSION SHALL BE BROUGHT TO THE NOTICE.
3. THIS IS THE PROPERTY OF CDD SOCIETY & IS NOT TO BE COPIED OR PRODUCED ANYWHERE WITHOUT THEIR PERMISSION
4. ALL INTERNAL DIMENSIONS SHOWN ARE CLEAR (EXCLUDING PLASTERING THK).
5. E G L = EXISTING GROUND LEVEL
6. F G L = FINISHED GROUND LEVEL
7. I L = INVERTED LEVEL
8. B.M : REF B.M 10.00M ON EXISTING ROAD
9. 20MM THK PLASTERING 1:4 C.M ON BOTH SIDES (WATER PROOF)
10. DIMENSIONS ARE INDICATED TO BE CHECKED AT SITE
11. PIPE INVERT IN WALL TO BE EMBEDDED IN P.C.C. 1:3:6

REV NO.	DATE	REMARKS	SIGNATURE
---------	------	---------	-----------

REVISIONS

TITLE
MASTER PLAN CONCEPT-01

DRG. No.
D-01/CHIRKUNDA/FSTP/MP-01

PROJECT NAME
IMPLEMENTATION OF FSTP AT CHIRKUNDA

FOR TENDER

CONSULTANTS: Wastewater Treatment System



OPP. BEEDI WORKERS COLONY
 KENGERI SATILLITE TOWN
 BANGALORE - 560 060
 KARNATAKA.

DRAWN BY

SHRINIVAS

DATE

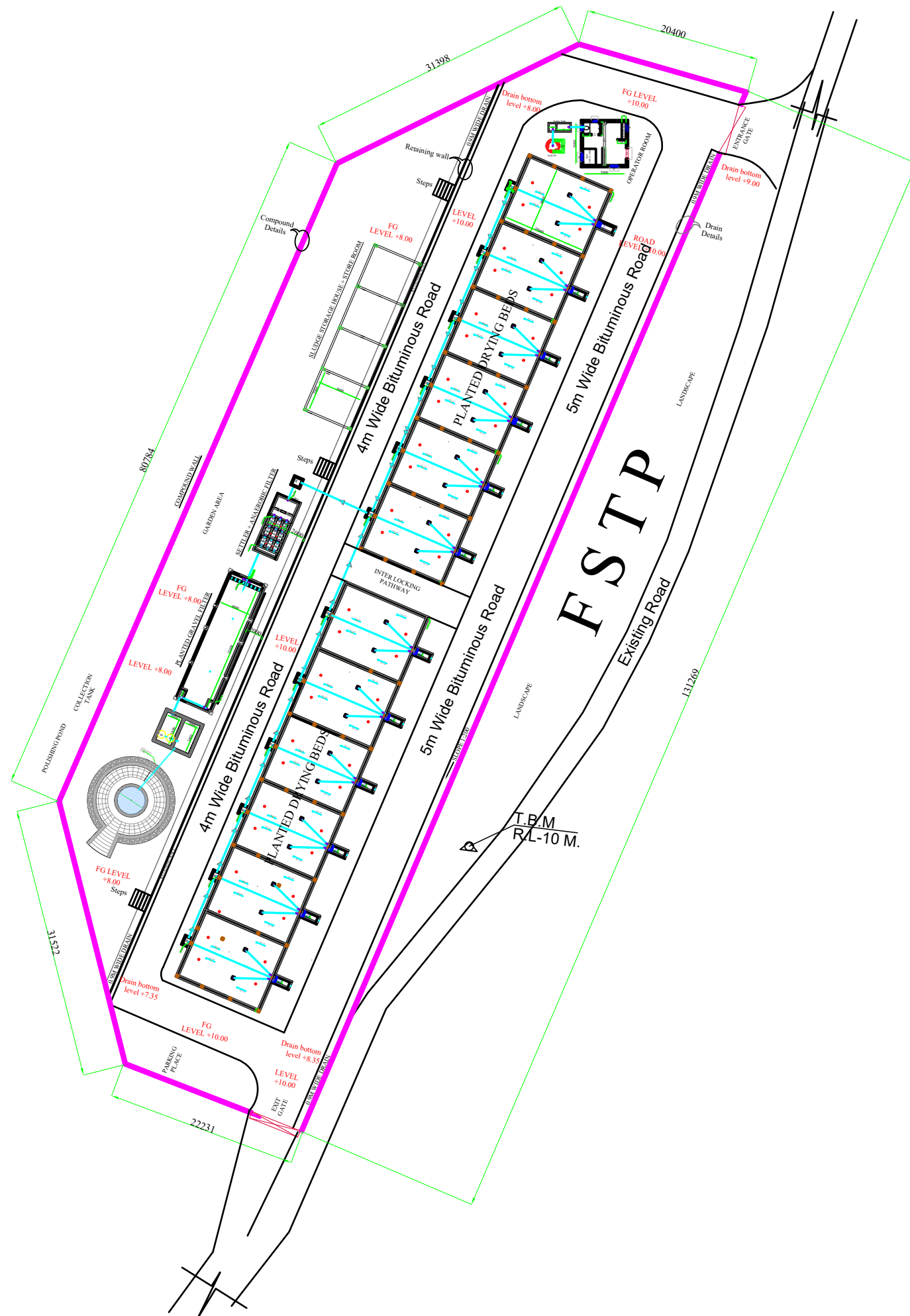
22-11-2017

CHECKED BY

PRAVEEN

DATE

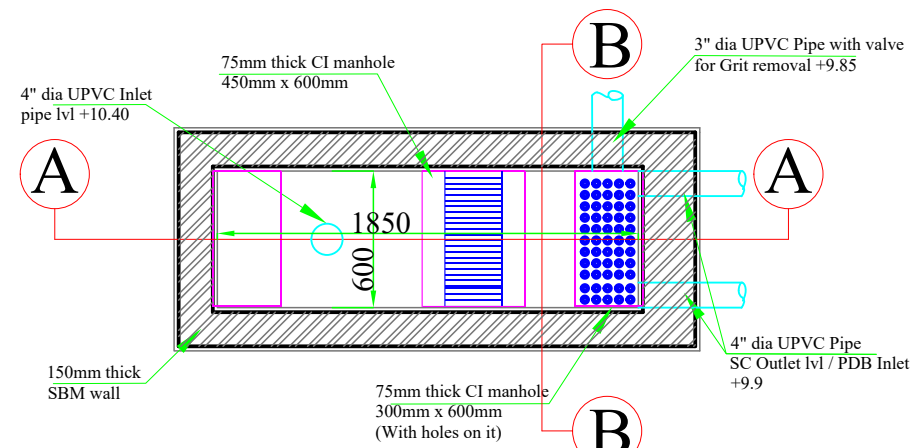
22-11-2017



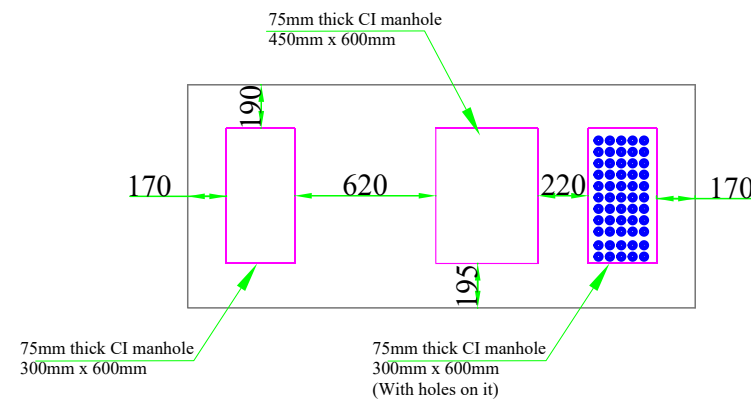
Faecal Sludge Treatment Plant

NOTES

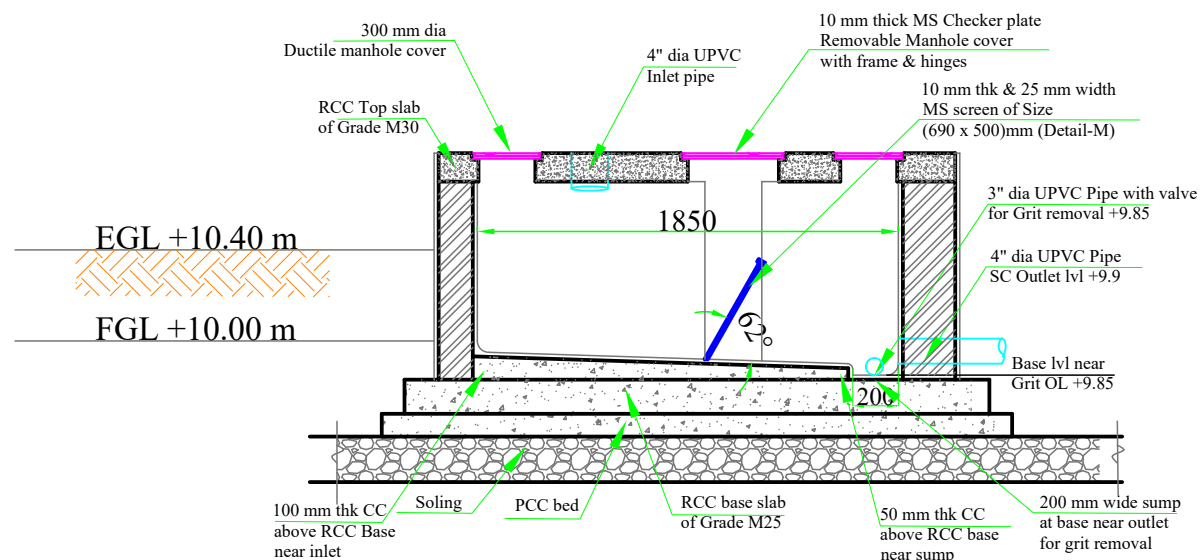
1. ALL DIMENSIONS ARE IN MM UNLESS MENTIONED OTHERWISE.
2. ALL DIMENSIONS ARE CHECKED AND CO-RELATED WITH THE ARCHITECTURAL DRAWINGS AND ANY DISCREPANCY OR OMISSION SHALL BE BROUGHT TO THE NOTICE.
3. THIS IS THE PROPERTY OF CDD SOCIETY & IS NOT TO BE COPIED OR PRODUCED ANYWHERE WITHOUT THEIR PERMISSION
4. ALL INTERNAL DIMENSIONS SHOWN ARE CLEAR (EXCLUDING PLASTERING THK).
5. E G L = EXISTING GROUND LEVEL
6. F G L = FINISHED GROUND LEVEL
7. I L = INVERTED LEVEL
8. B.M : REF B.M is 10.00M ON EXISTING ROAD
9. 20MM THK PLASTERING 1:4 C.M ON BOTH SIDES (WATER PROOF)
10. DIMENSIONS ARE INDICATED TO BE CHECKED AT SITE
11. PIPE INVERT IN WALL TO BE EMBEDDED IN P.C.C. 1:3:6
12. SC INDICATES SCREENING CHAMBER, FSTP INDICATES FAECAL SLUDGE TREATMENT PLANT



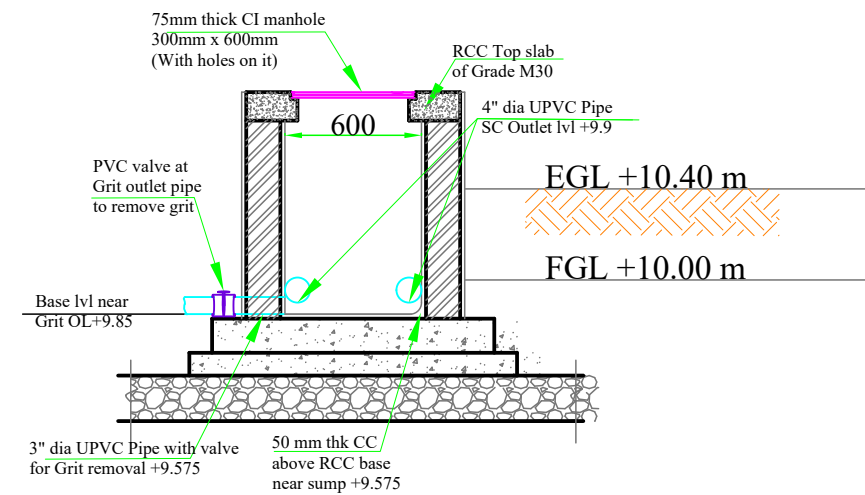
Plan of Screening Chamber



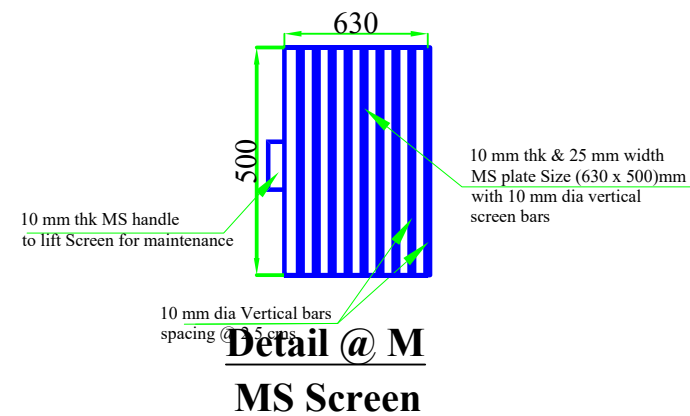
Manhole Drawing (SC)



L-SECTION @ A-A



C-SECTION @ B-B



**Detail @ M
MS Screen**

REV NO.	DATE	REMARKS	SIGNATURE

REVISIONS

TITLE
SCREENING CHAMBER: PLAN WITH SECTIONAL AND SCREEN DETAILS

DRG. No.
D-03/CHIRKUNDA/FSTP/SC-01

PROJECT NAME
IMPLEMENTATION OF FSTP AT CHIRKUNDA

FOR TENDER

CONSULTANTS: Wastewater Treatment System



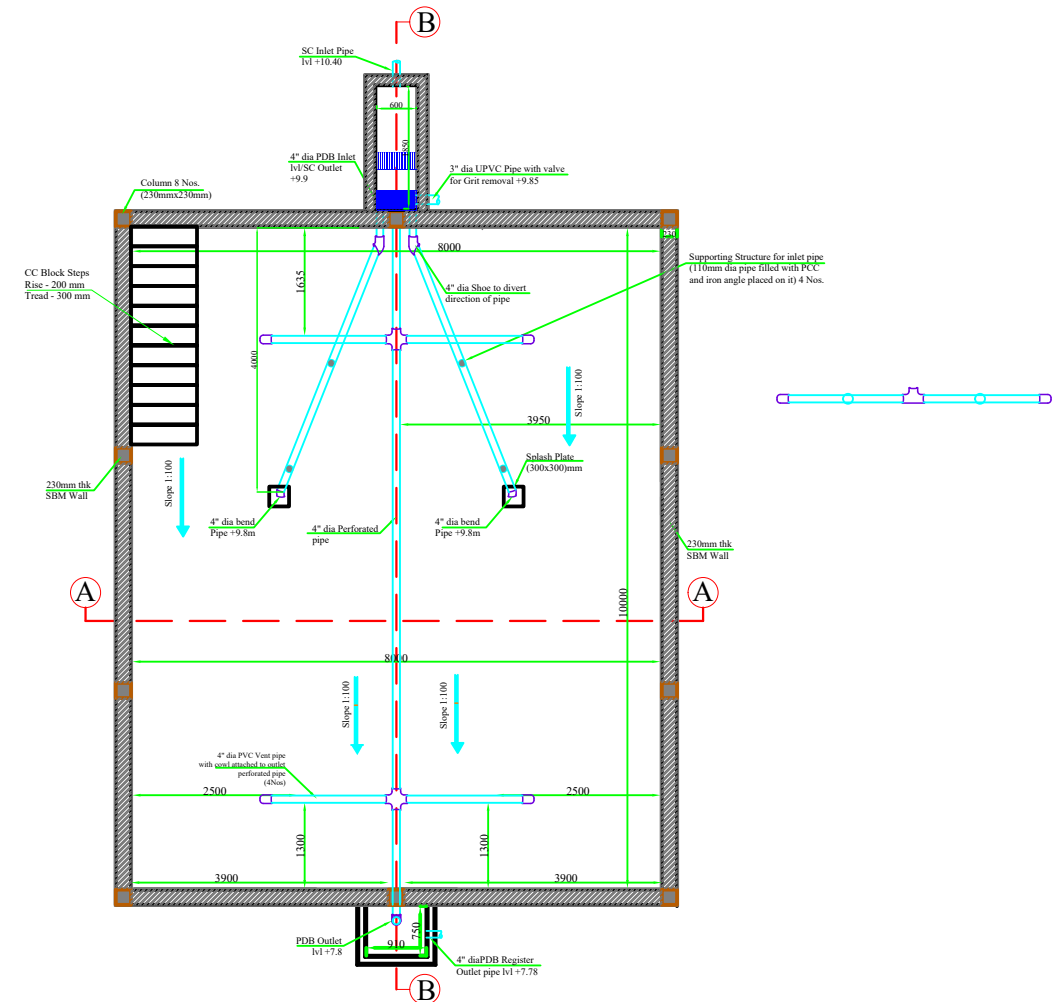
OPP. BEEDI WORKERS COLONY
KENGARI SATILLITE TOWN
BANGALORE - 560 060
KARNATAKA.

DRAWN BY	CHECKED BY
SHRINIVAS	PRAVEEN
DATE	DATE
22-11-2017	22-11-2017





Faecal Sludge Treatment Plant

NOTES

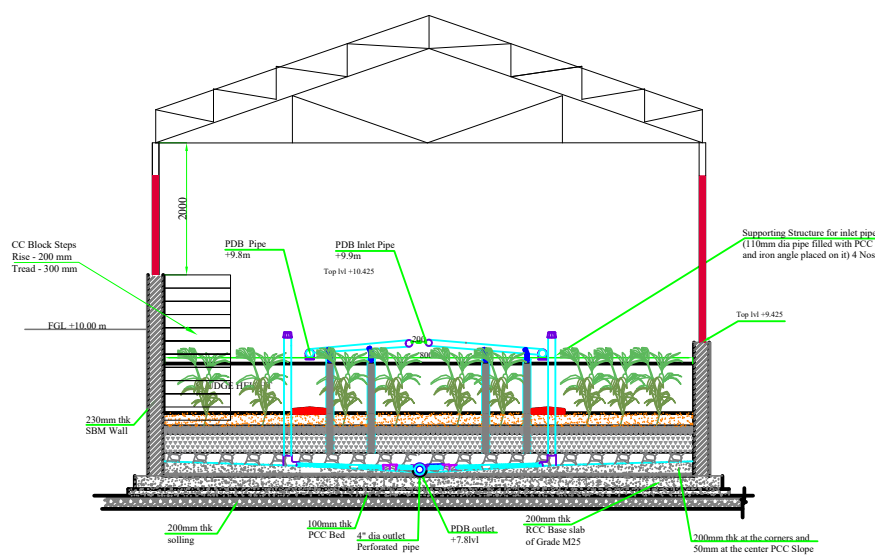
1. ALL DIMENSIONS ARE IN MM UNLESS MENTIONED OTHERWISE.
2. ALL DIMENSIONS ARE CHECKED AND CO-RELATED WITH THE ARCHITECTURAL DRAWINGS AND ANY DISCREPANCY OR OMISSION SHALL BE BROUGHT TO THE NOTICE.
3. THIS IS THE PROPERTY OF CDD SOCIETY & IS NOT TO BE COPIED OR PRODUCED ANYWHERE WITHOUT THEIR PERMISSION
4. ALL INTERNAL DIMENSIONS SHOWN ARE CLEAR (EXCLUDING PLASTERING THK).
5. E G L = EXISTING GROUND LEVEL
6. F G L = FINISHED GROUND LEVEL
7. I L = INVERTED LEVEL
8. B.M : REF B.M 10.00M ON EXISTING ROAD
9. 20MM THK PLASTERING 1:4 C.M ON BOTH SIDES (WATER PROOF)
10. DIMENSIONS ARE INDICATED TO BE CHECKED AT SITE
11. PIPE INVERT IN WALL TO BE EMBEDDED IN P.C.C. 1:3:6
12. PDB INDICATES PLANTED DRYING BED , FSTP INDICATES FAECAL SLUDGE TREATMENT PLANT AND DC INDICATES DISTRIBUTION CHAMBER



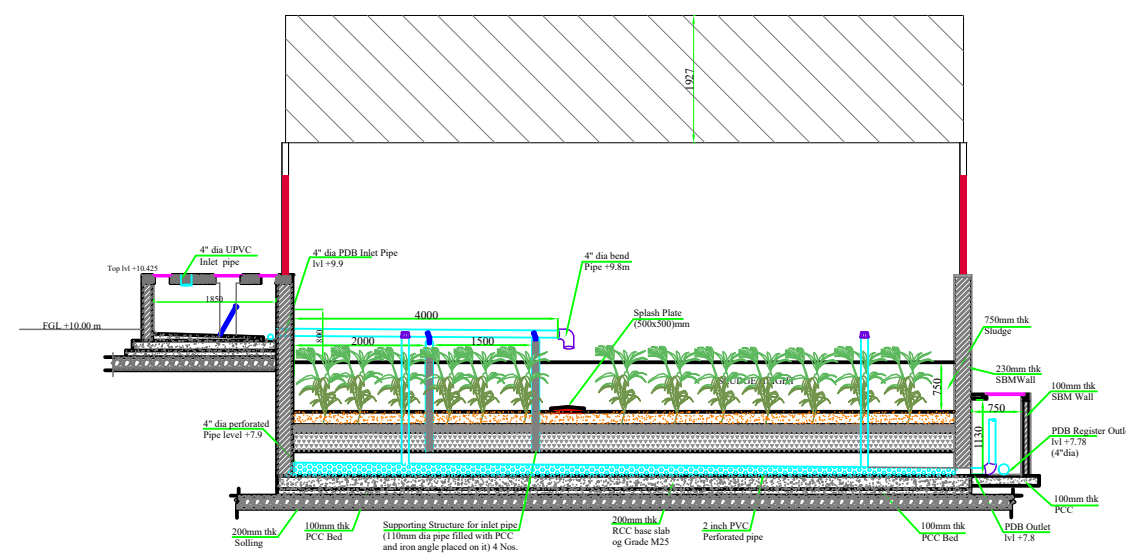
Filter Material Size (Gravel)

-  Sand 1mm to 2mm - 200mm height
-  Passing through sieve size 7 mm and retained on sieve size 5 mm - 100mm height
-  Passing through sieve size 20 mm and retained on sieve size 10 mm - 300mm height
-  Passing through sieve size 40mm and retained on sieve size 20mm - 150mm height

PLAN OF PLANTED DRYING BED



CROSS SECTION A-A



CROSS SECTION B-B

FOR TENDER

REV NO.	DATE	REMARKS	SIGNATURE

REVISIONS

TITLE
PLANTED DRYING BED: PLAN AND SECTION

DRG. No.
D-04/CHIRKUNDA/FSTP/PDB-01

PROJECT NAME
IMPLEMENTATION OF FSTP AT CHIRKUNDA

CONSULTANTS: Wastewater Treatment System



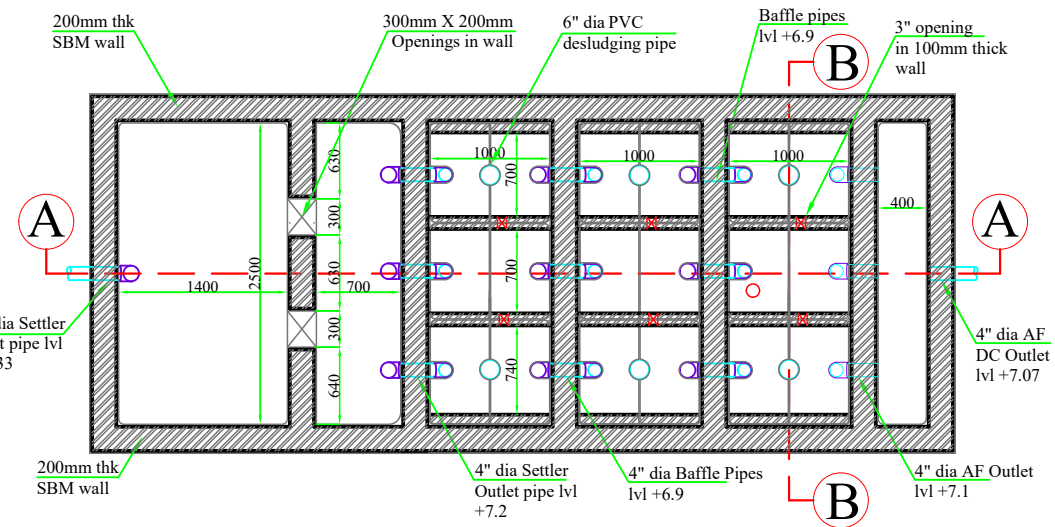
OPP. BEEDI WORKERS COLONY
 KENGERI SATILLITE TOWN
 BANGALORE - 560 060
 KARNATAKA.

DRAWN BY	CHECKED BY
SHRINIVAS	PRAVEEN
DATE	DATE
22-11-2017	22-11-2017

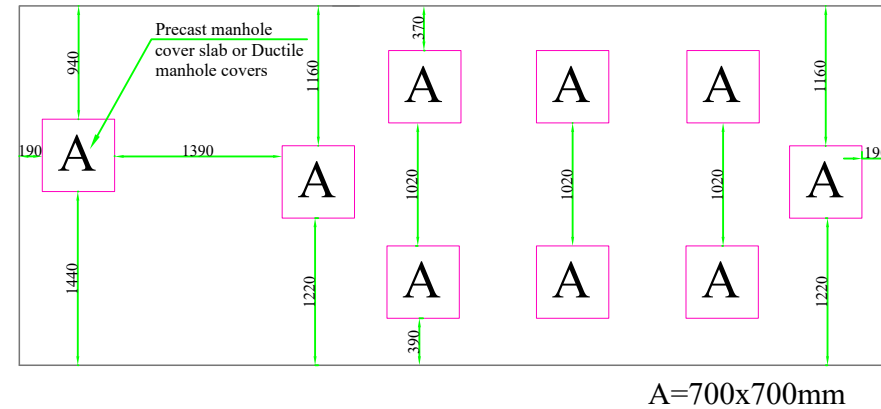
Faecal Sludge Treatment Plant

NOTES

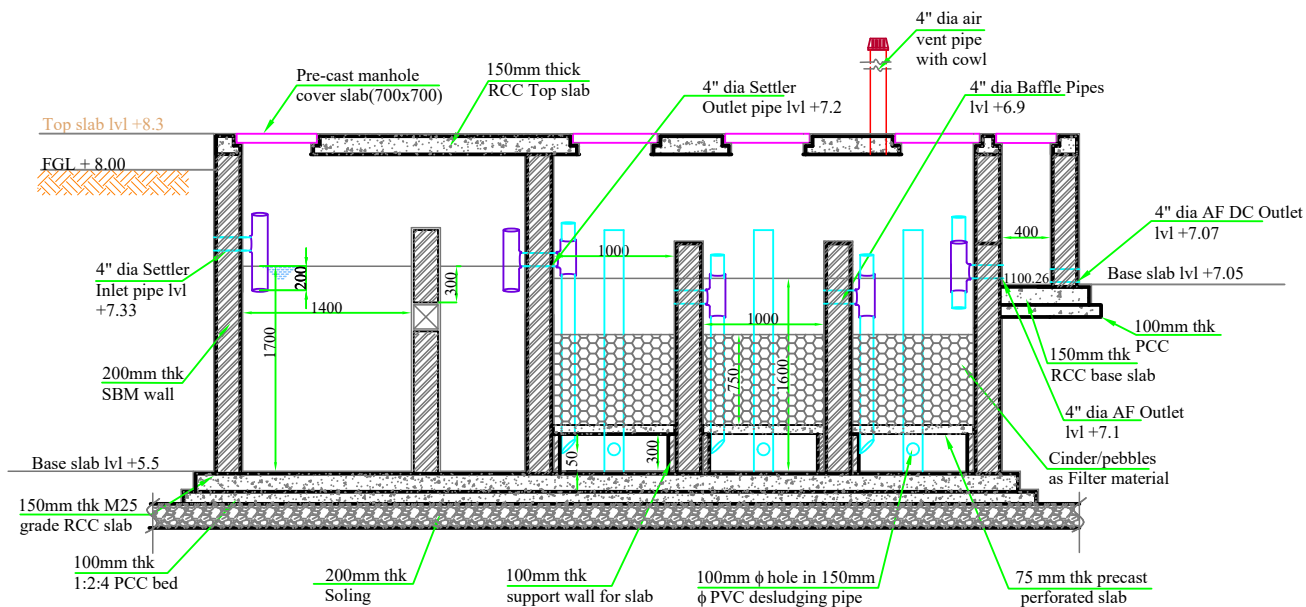
1. ALL DIMENSIONS ARE IN MM UNLESS MENTIONED OTHERWISE.
2. ALL DIMENSIONS ARE CHECKED AND CO-RELATED WITH THE ARCHITECTURAL DRAWINGS AND ANY DISCREPANCY OR OMISSION SHALL BE BROUGHT TO THE NOTICE.
3. THIS IS THE PROPERTY OF CDD SOCIETY & IS NOT TO BE COPIED OR PRODUCED ANYWHERE WITHOUT THEIR PERMISSION
4. ALL INTERNAL DIMENSIONS SHOWN ARE CLEAR (EXCLUDING PLASTERING THK).
5. E G L = EXISTING GROUND LEVEL
6. F G L = FINISHED GROUND LEVEL
7. I L = INVERTED LEVEL
8. B.M : REF B.M 10.00M ON EXISTING ROAD
9. 20MM THK PLASTERING 1:4 C.M ON BOTH SIDES.
10. DIMENSIONS ARE INDICATED TO BE CHECKED AT SITE
11. PIPE INVERT IN WALL TO BE EMBEDDED IN P.C.C. 1:3:6
12. ABR INDICATES ANEROBIC BAFFLE REACTOR, AF INDICATES ANEROBIC FILTER AND DC INDICATES DISTRIBUTION CHAMBER FSTP INDICATES FAECAL SLUDGE TREATMENT PLANT



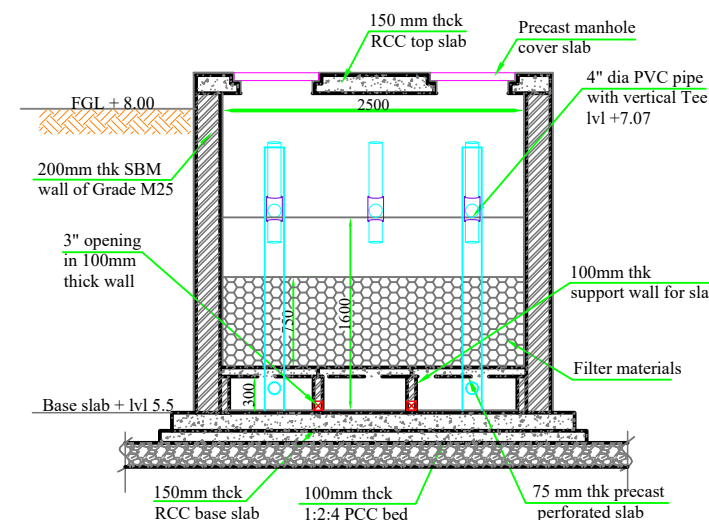
Integrated Settler and Anaerobic Filter Plan



Manhole Layout



Cross section @ A-A



CROSS SECTION @ B-B

REV NO.	DATE	REMARKS	SIGNATURE

REVISIONS

TITLE
INTEGRATED SETTLER WITH ANAEROBIC FILTERS: PLAN, SECTION AND MANHOLE DETAILS

DRG. No.
D-05/CHIRKUNDA/FSTP/ISAF-01

PROJECT NAME
IMPLEMENTATION OF FSTP AT CHIRKUNDA

FOR TENDER

CONSULTANTS: Wastewater Treatment System



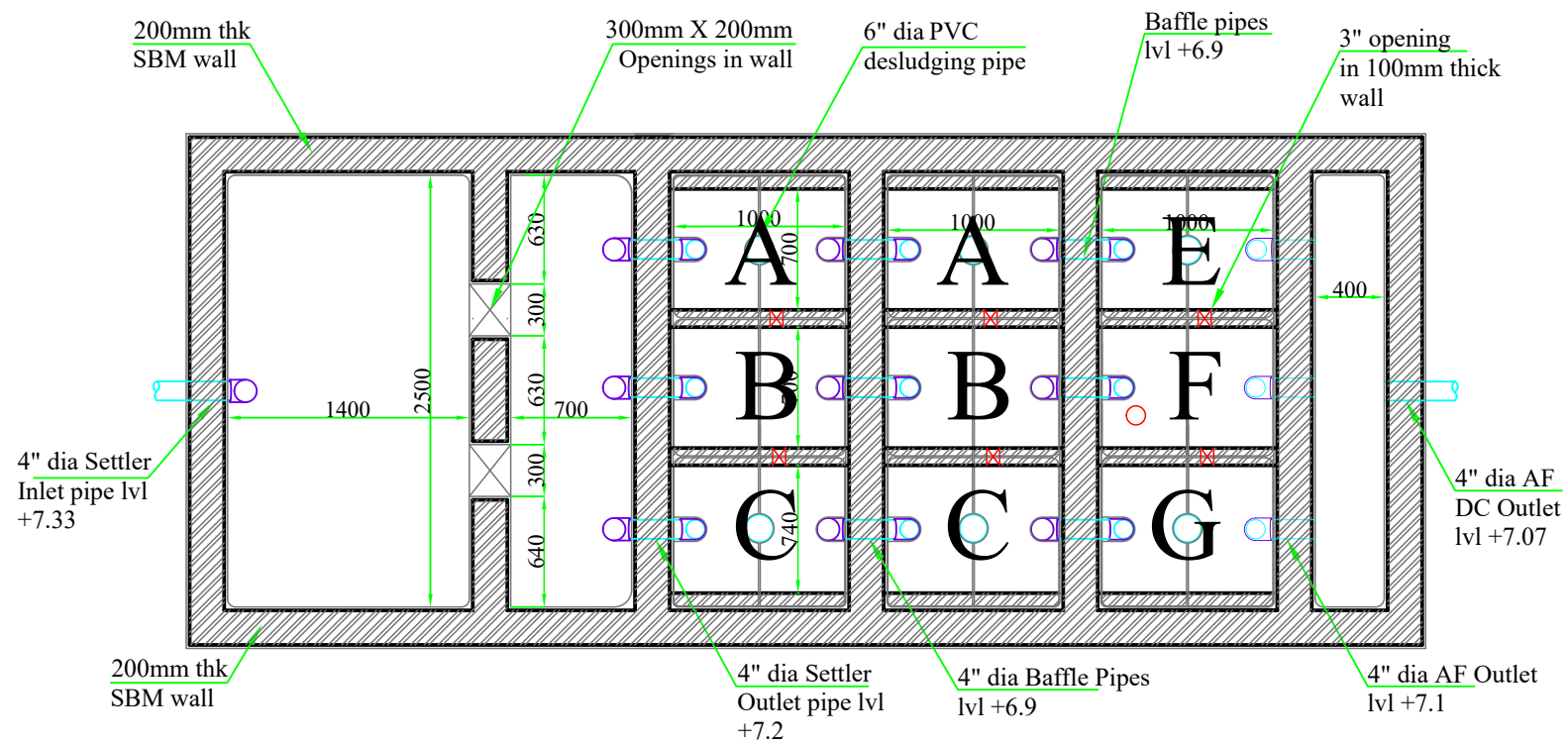
OPP. BEEDI WORKERS COLONY
 KENGERI SATILLITE TOWN
 BANGALORE - 560 060
 KARNATAKA.

DRAWN BY	CHECKED BY
SHRINIVAS	PRAVEEN
DATE	DATE
22-11-2017	22-11-2017

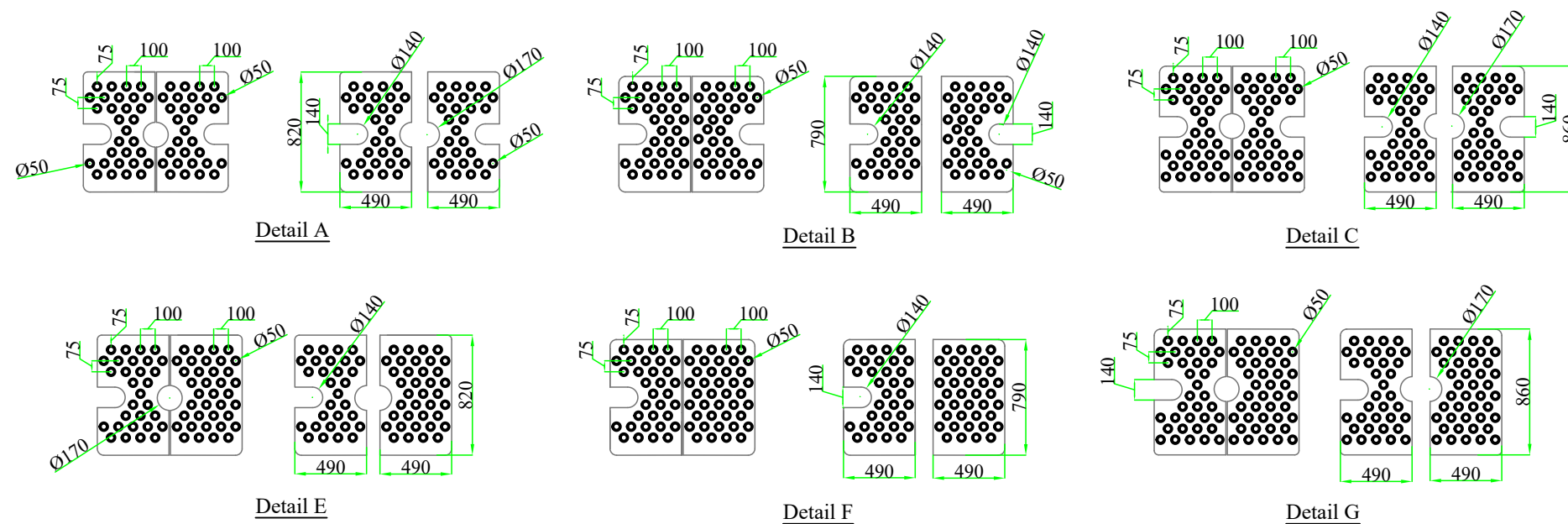
Faecal Sludge Treatment Plant

NOTES

1. ALL DIMENSIONS ARE IN MM UNLESS MENTIONED OTHERWISE.
2. ALL DIMENSIONS ARE CHECKED AND CO-RELATED WITH THE ARCHITECTURAL DRAWINGS AND ANY DISCREPANCY OR OMISSION SHALL BE BROUGHT TO THE NOTICE.
3. THIS IS THE PROPERTY OF CDD SOCIETY & IS NOT TO BE COPIED OR PRODUCED ANYWHERE WITHOUT THEIR PERMISSION
4. ALL INTERNAL DIMENSIONS SHOWN ARE CLEAR (EXCLUDING PLASTERING THK).
5. E G L = EXISTING GROUND LEVEL
6. F G L = FINISHED GROUND LEVEL
7. I L = INVERTED LEVEL
8. B.M : REF B.M 10.00M ON EXISTING ROAD
9. 20MM THK PLASTERING 1:4 C.M ON BOTH SIDES.
10. DIMENSIONS ARE INDICATED TO BE CHECKED AT SITE
11. PIPE INVERT IN WALL TO BE EMBEDDED IN P.C.C. 1:3:6
12. ABR INDICATES ANEROBIC BAFFLE REACTOR, AF INDICATES ANEROBIC FILTER AND DC INDICATES DISTRIBUTION CHAMBER
FSTP INDICATES FECAL SLUDGE TREATMENT PLANT



Integrated Settler and Anaerobic Filter Plan



Note: Thickness of Perforated Slab is 75mm

REV NO.	DATE	REMARKS	SIGNATURE

REVISIONS

TITLE
INTEGRATED SETTLER WITH ANAEROBIC FILTERS: PERFORATED SLAB DETAILS

DRG. No.
D-06/CHIRKUNDA/FSTP/ISAF-01

PROJECT NAME
IMPLEMENTATION OF FSTP AT CHIRKUNDA

FOR TENDER

CONSULTANTS: Wastewater Treatment System



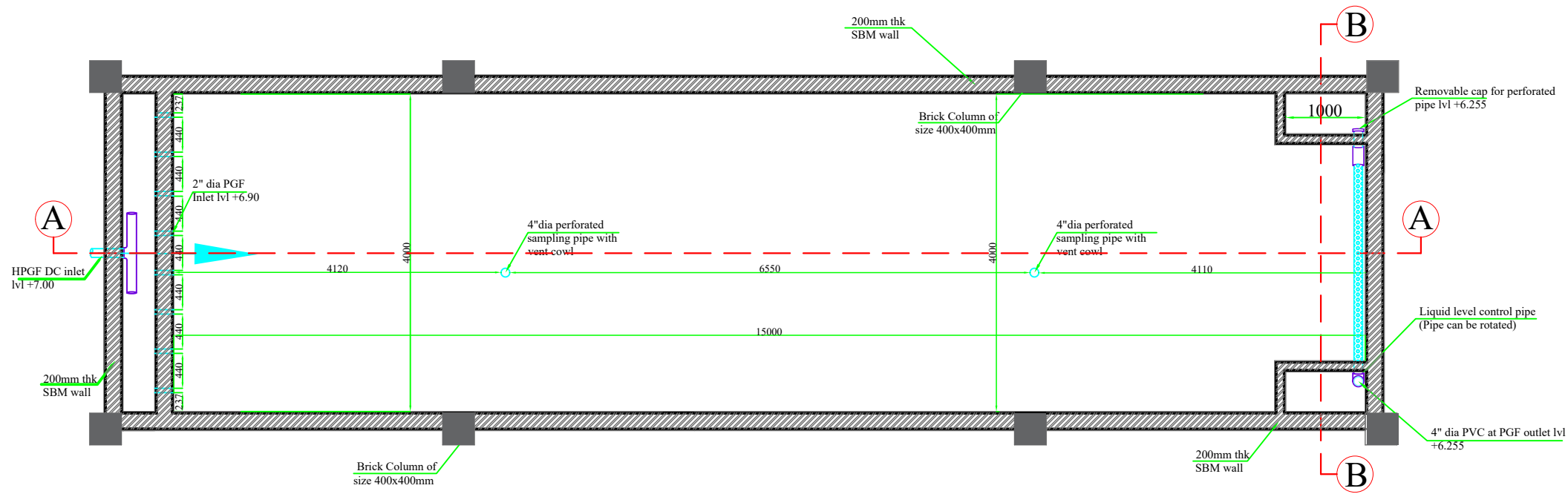
OPP. BEEDI WORKERS COLONY
 KENGERI SATILLITE TOWN
 BANGALORE - 560 060
 KARNATAKA.

DRAWN BY	CHECKED BY
SHRINIVAS	PRAVEEN
DATE	DATE
22-11-2017	22-11-2017

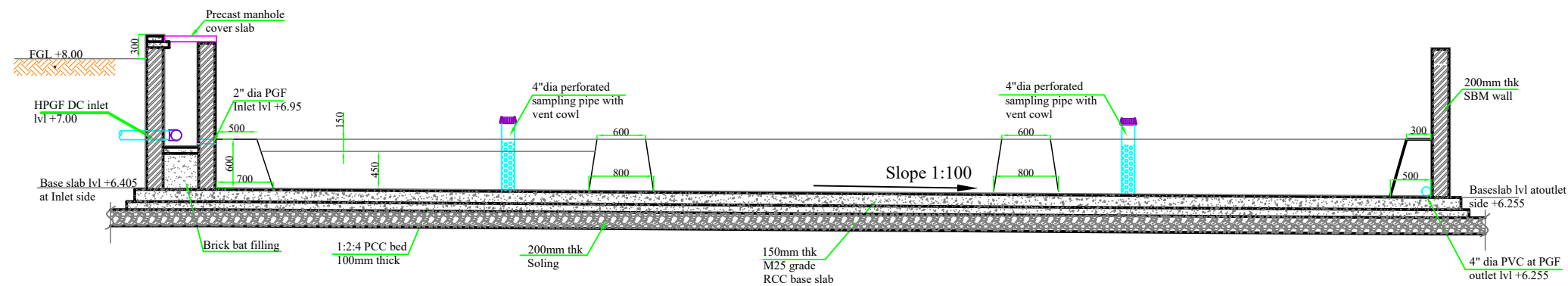
Faecal Sludge Treatment Plant

NOTES

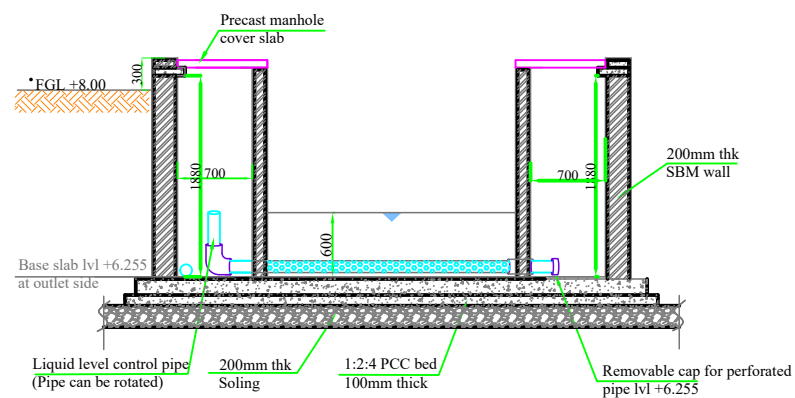
1. ALL DIMENSIONS ARE IN MM UNLESS MENTIONED OTHERWISE.
2. ALL DIMENSIONS ARE CHECKED AND CO-RELATED WITH THE ARCHITECTURAL DRAWINGS AND ANY DISCREPANCY OR OMISSION SHALL BE BROUGHT TO THE NOTICE.
3. THIS IS THE PROPERTY OF CDD SOCIETY & IS NOT TO BE COPIED OR PRODUCED ANYWHERE WITHOUT THEIR PERMISSION
4. ALL INTERNAL DIMENSIONS SHOWN ARE CLEAR (EXCLUDING PLASTERING THK).
5. E G L = EXISTING GROUND LEVEL
6. F G L = FINISHED GROUND LEVEL
7. I L = INVERTED LEVEL
8. B.M : REF B.M 10.00M ON EXISTING ROAD
9. 20MM THK PLASTERING 1:4 C.M ON BOTH SIDE (WATER PROOF)
10. DIMENSIONS ARE INDICATED TO BE CHECKED AT SITE
11. PIPE INVERT IN WALL TO BE EMBEDDED IN P.C.C. 1:3:6
12. PGF INDICATES PLANTED GRAVEL FILTER , FSTP INDICATES FÆCAL SLUDGE TREATMENT PLANT AND DC INDICATES DISTRIBUTION CHAMBER



SECTIONAL PLAN OF PLANTED GRAVEL FILTER



Section @ A-A



Section @ B-B

REV NO.	DATE	REMARKS	SIGNATURE

REVISIONS

TITLE

PLANTED GRAVEL FILTER: PLAN AND SECTIONS

DRG. No.

D-07/CHIRKUNDA/FSTP/PGF-01

PROJECT NAME

IMPLEMENTATION OF FSTP AT CHIRKUNDA

FOR TENDER

CONSULTANTS: Wastewater Treatment System



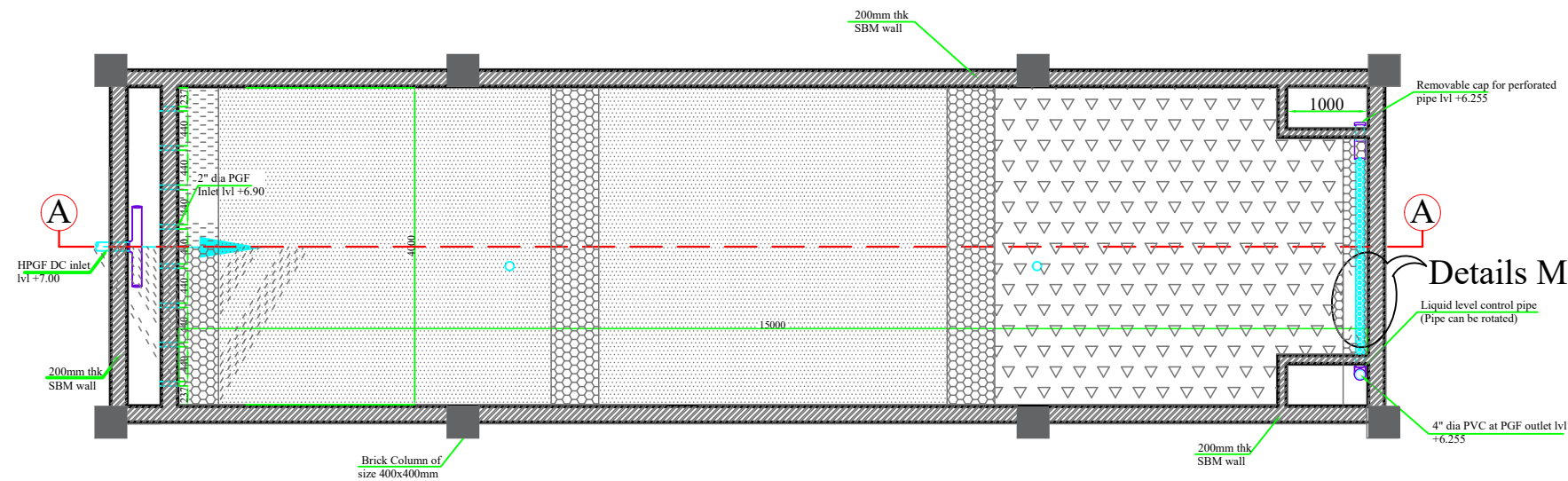
OPP. BEEDI WORKERS COLONY
KENGRI SATILLITE TOWN
BANGALORE - 560 060
KARNATAKA.

DRAWN BY	CHECKED BY
SHRINIVAS	PRAVEEN
DATE	DATE
22-11-2017	22-11-2017

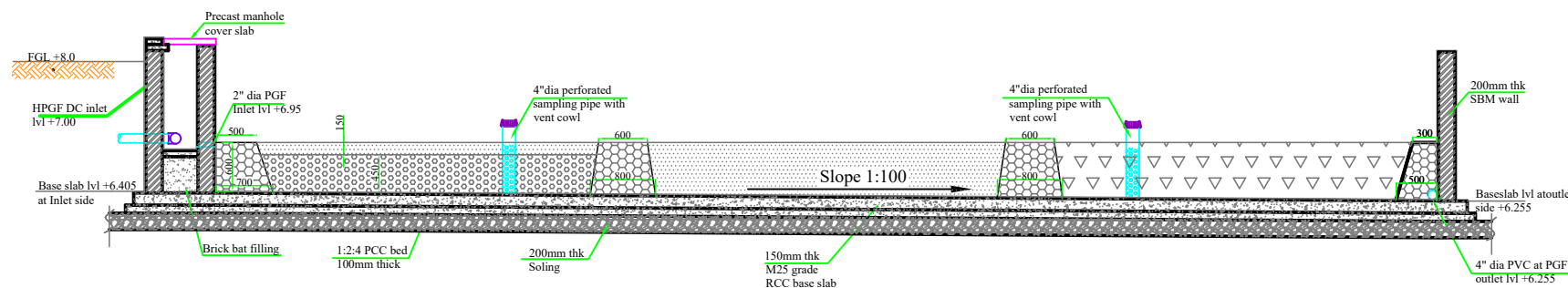
Faecal Sludge Treatment Plant

NOTES

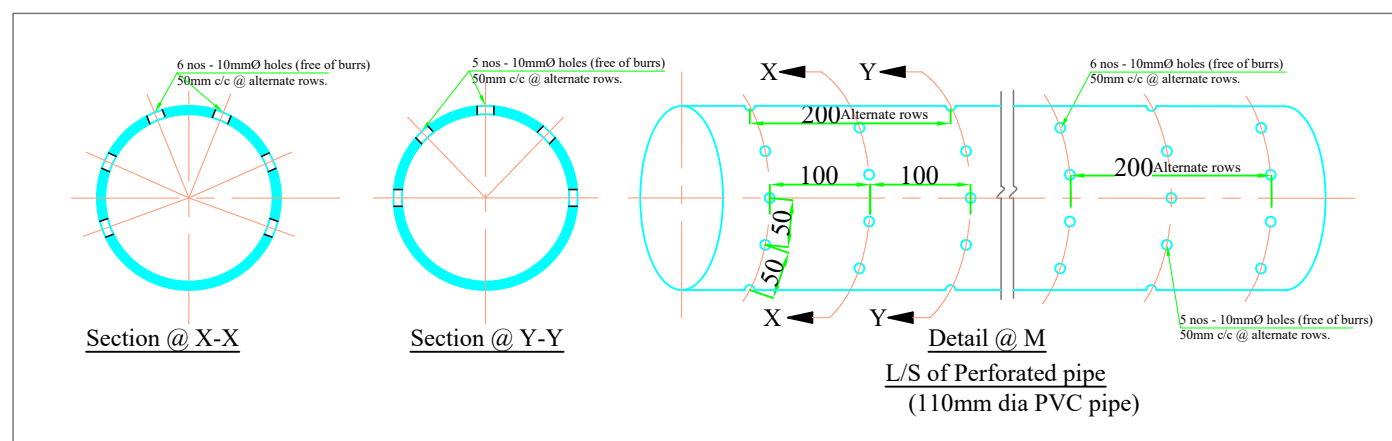
1. ALL DIMENSIONS ARE IN MM UNLESS MENTIONED OTHERWISE.
2. ALL DIMENSIONS ARE CHECKED AND CO-RELATED WITH THE ARCHITECTURAL DRAWINGS AND ANY DISCREPANCY OR OMISSION SHALL BE BROUGHT TO THE NOTICE.
3. THIS IS THE PROPERTY OF CDD SOCIETY & IS NOT TO BE COPIED OR PRODUCED ANYWHERE WITHOUT THEIR PERMISSION
4. ALL INTERNAL DIMENSIONS SHOWN ARE CLEAR (EXCLUDING PLASTERING THK).
5. E G L = EXISTING GROUND LEVEL
6. F G L = FINISHED GROUND LEVEL
7. I L = INVERTED LEVEL
8. B.M : REF B.M 10.00M ON EXISTING ROAD
9. 20MM THK PLASTERING 1:4 C.M ON BOTH SIDES (WATER PROOF)
10. DIMENSIONS ARE INDICATED TO BE CHECKED AT SITE
11. PIPE INVERT IN WALL TO BE EMBEDDED IN P.C.C. 1:3:6
12. PGF INDICATES PLANTED GRAVEL FILTER , FSTP INDICATES FAECAL SLUDGE TREATMENT PLANT AND DC INDICATES DISTRIBUTION CHAMBER



SECTIONAL PLAN OF PLANTED GRAVEL FILTER



Section @ A-A



Filter Material Size (Gravel)

- Passing through seive size 120 mm and retained on seive size 90mm
- Passing through seive size 16 mm and retained on seive size 20mm
- Passing through seive size 10mm and retained on seive size 12mm
- Charcoal size 15mm to 20mm

REV NO.	DATE	REMARKS	SIGNATURE

REVISIONS

TITLE
PLANTED GRAVEL FILTER: FILTER MEDIA AND PERFORATED PIPE DETAILS

DRG. No.
D-08/CHIRKUNDA/FSTP/PGF-02

PROJECT NAME
IMPLEMENTATION OF FSTP AT CHIRKUNDA

FOR TENDER

CONSULTANTS: Wastewater Treatment System



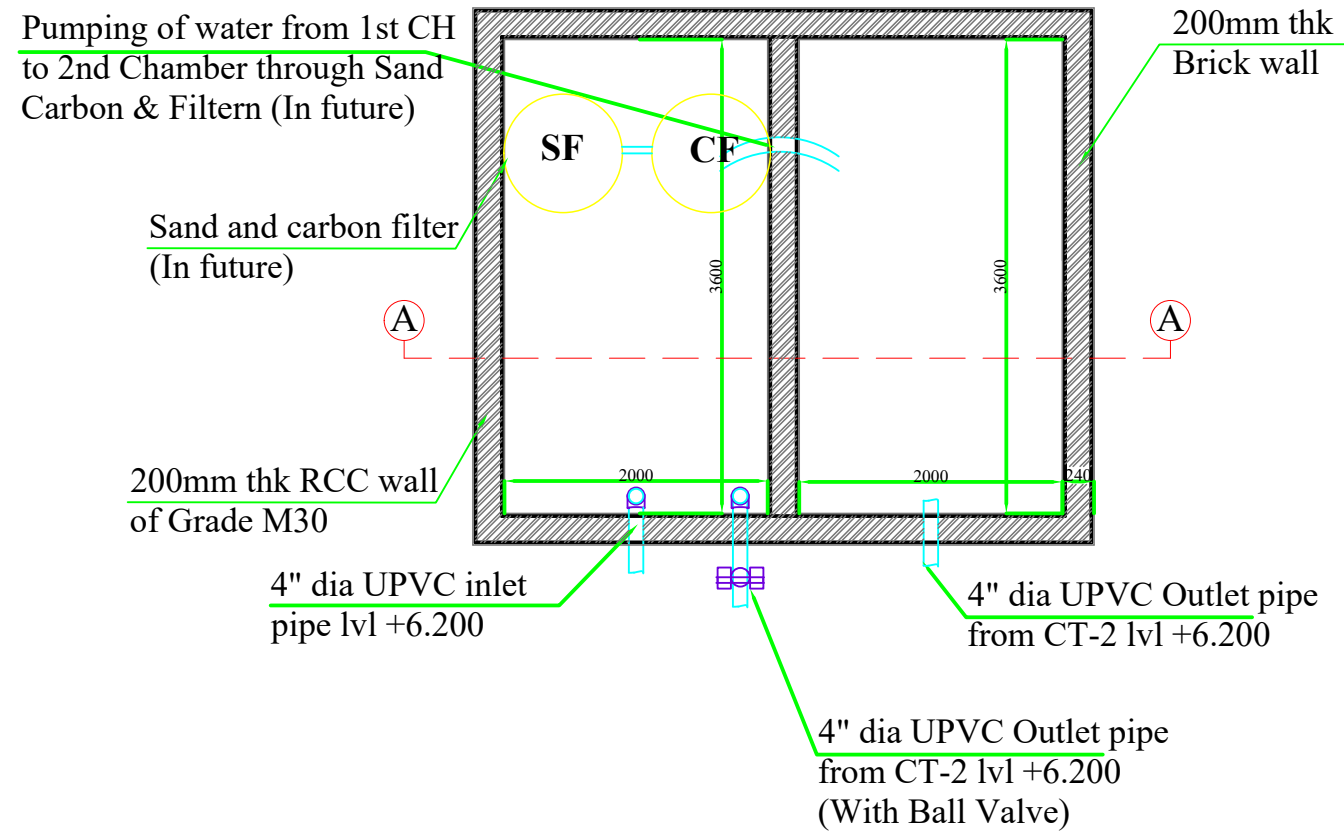
OPP. BEEDI WORKERS COLONY
 KENGERI SATILLITE TOWN
 BANGALORE - 560 060
 KARNATAKA.

DRAWN BY	CHECKED BY
SHRINIVAS	PRAVEEN
DATE	DATE
22-11-2017	22-11-2017

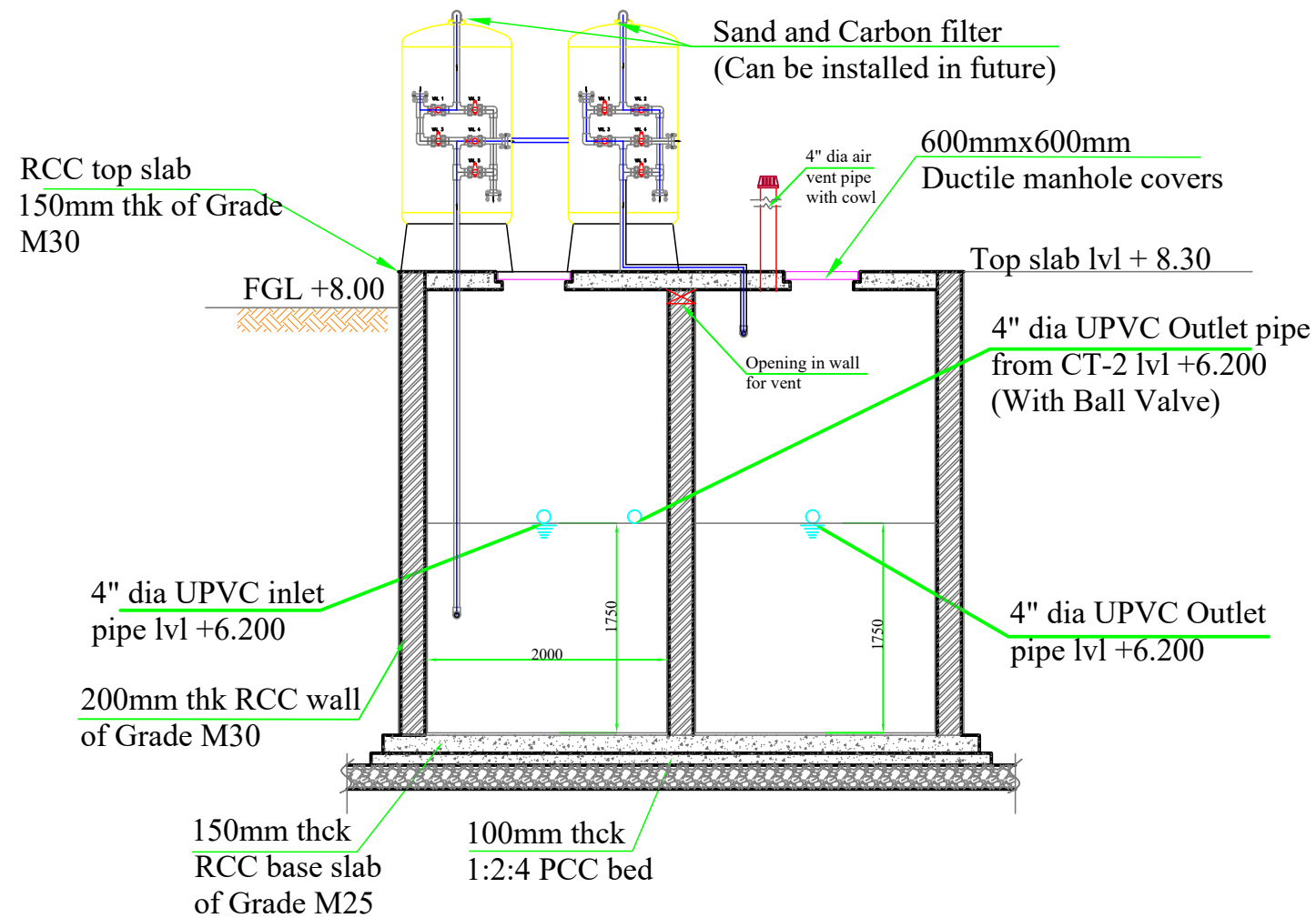
Faecal Sludge Treatment Plant

NOTES

1. ALL DIMENSIONS ARE IN MM UNLESS MENTIONED OTHERWISE.
2. ALL DIMENSIONS ARE CHECKED AND CO-RELATED WITH THE ARCHITECTURAL DRAWINGS AND ANY DISCREPANCY OR OMISSION SHALL BE BROUGHT TO THE NOTICE.
3. THIS IS THE PROPERTY OF CDD SOCIETY & IS NOT TO BE COPIED OR PRODUCED ANYWHERE WITHOUT THEIR PERMISSION
4. ALL INTERNAL DIMENSIONS SHOWN ARE CLEAR (EXCLUDING PLASTERING THK).
5. E G L = EXISTING GROUND LEVEL
6. F G L = FINISHED GROUND LEVEL
7. I L = INVERTED LEVEL
8. B.M : REF B.M 10.00M ON EXISTING ROAD
9. 20MM THK PLASTERING 1:4 C.M ON BOTH SIDES.
10. DIMENSIONS ARE INDICATED TO BE CHECKED AT SITE
11. PIPE INVERT IN WALL TO BE EMBEDDED IN P.C.C. 1:3:6
12. CT INDICATED COLLECTION TANK , FSTP INDICATES FECAL SLUDGE TREATMENT PLANT AND SACF INDICATES SAND AND CARBON FILTER



COLLECTION TANK PLAN



SECTION @ A-A

REV NO.	DATE	REMARKS	SIGNATURE

REVISIONS

TITLE
COLLECTION TANK: PLAN AND SECTION

DRG. No.
D-09/CHIRKUNDA/FSTP/CT-01

PROJECT NAME
IMPLEMENTATION OF FSTP AT CHIRKUNDA

FOR TENDER

CONSULTANTS: Wastewater Treatment System



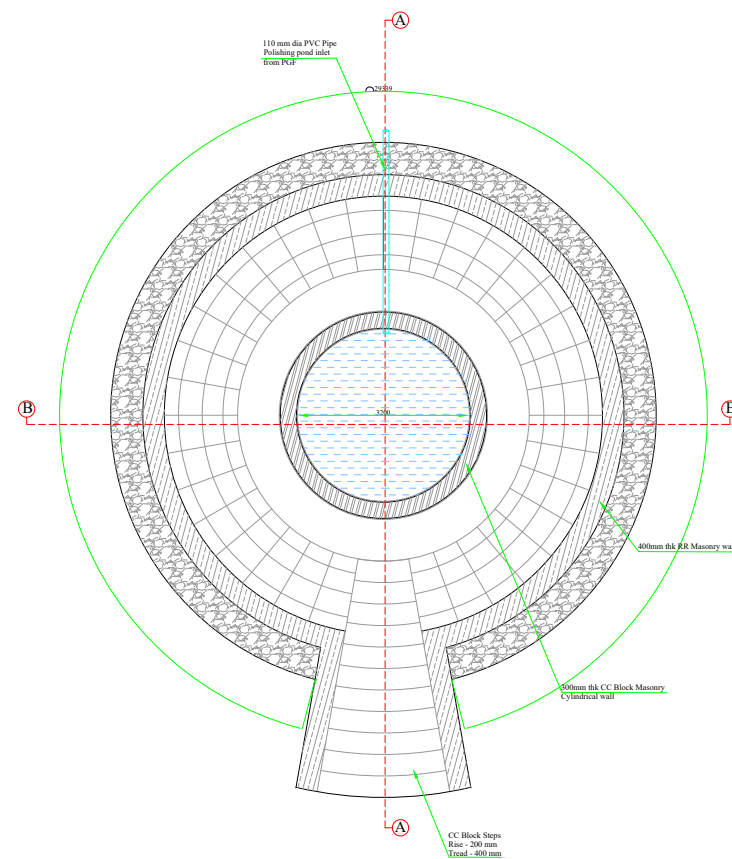
OPP. BEEDI WORKERS COLONY
KENGRI SATILLITE TOWN
BANGALORE - 560 060
KARNATAKA.

DRAWN BY	CHECKED BY
SHRINIVAS	PRAVEEN
DATE	DATE
22-11-2017	22-11-2017

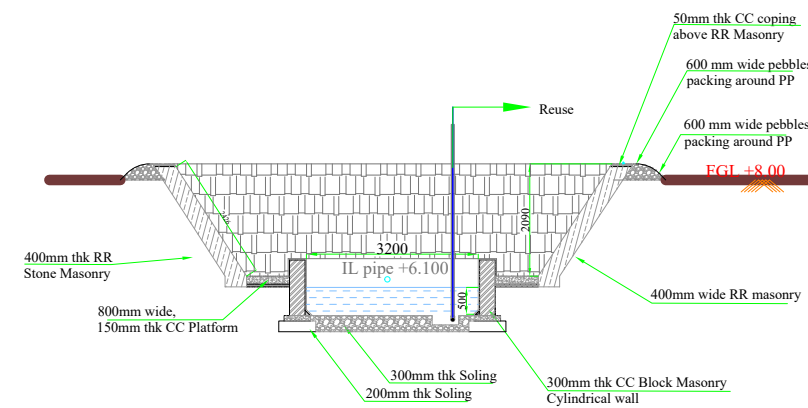
Faecal Sludge Treatment Plant

NOTES

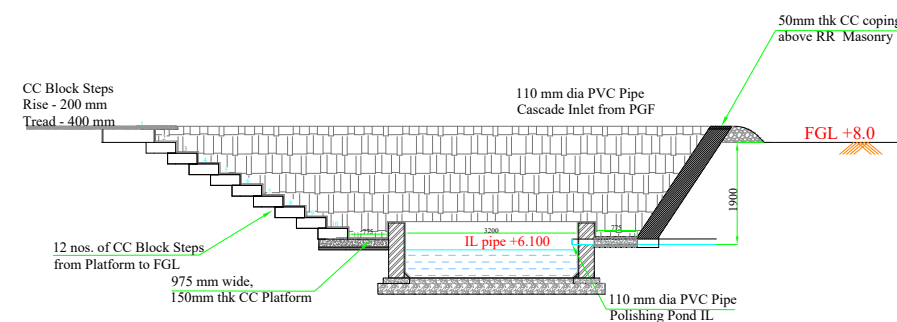
1. ALL DIMENSIONS ARE IN MM UNLESS MENTIONED OTHERWISE.
2. ALL DIMENSIONS ARE CHECKED AND CO-RELATED WITH THE ARCHITECTURAL DRAWINGS AND ANY DISCREPANCY OR OMISSION SHALL BE BROUGHT TO THE NOTICE.
3. THIS IS THE PROPERTY OF CDD SOCIETY & IS NOT TO BE COPIED OR PRODUCED ANYWHERE WITHOUT THEIR PERMISSION
4. ALL INTERNAL DIMENSIONS SHOWN ARE CLEAR (EXCLUDING PLASTERING THK).
5. E G L = EXISTING GROUND LEVEL
6. F G L = FINISHED GROUND LEVEL
7. I L = INVERTED LEVEL
8. B.M : REF B.M 10.00M ON EXISTING ROAD
9. 20MM THK PLASTERING 1:4 C.M ON BOTH SIDES (WATER PROOF)
10. DIMENSIONS ARE INDICATED TO BE CHECKED AT SITE
11. PIPE INVERT IN WALL TO BE EMBEDDED IN P.C.C. 1:3:6
12. PP INDICATES POLISHING POND , FSTP INDICATES FAECAL SLUDGE TREATMENT PLANT AND DC INDICATES DISTRIBUTION CHAMBER



Plan of Polishing Pond



Section at B-B



Section at A-A

REV NO.	DATE	REMARKS	SIGNATURE

REVISIONS

TITLE
POLISHING POND: PLAN AND SECTION

DRG. No.
D-10/CHIRKUNDA/FSTP/PP-01

PROJECT NAME
IMPLEMENTATION OF FSTP AT CHIRKUNDA

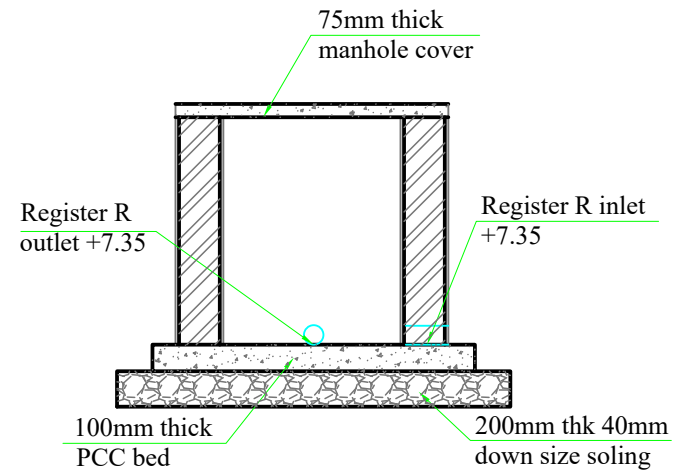
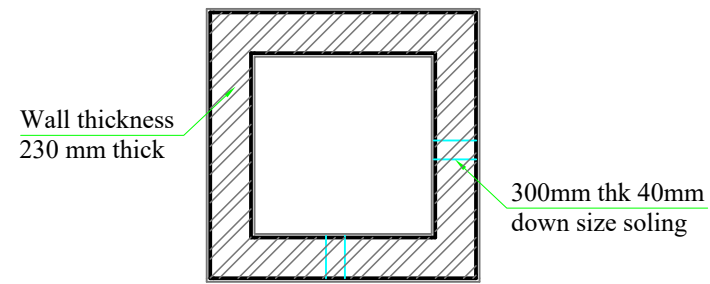
FOR TENDER

CONSULTANTS: Wastewater Treatment System



OPP. BEEDI WORKERS COLONY
KENGRI SATILLITE TOWN
BANGALORE - 560 060
KARNATAKA.

DRAWN BY	CHECKED BY
SHRINIVAS	PRAVEEN
DATE	DATE
22-11-2017	22-11-2017



REGISTER R

All PDB Outlet level	+7.78	
Register	Inlet level	Outlet level
R1	--	+7.75
R2	+7.70	+7.68
R3	+7.63	+7.61
R4	+7.56	+7.54
R5	+7.49	+7.47
R6	+7.42	+7.40
R	+7.35	+7.35

Faecal Sludge Treatment Plant

NOTES

1. ALL DIMENSIONS ARE IN MM UNLESS MENTIONED OTHERWISE.
2. ALL DIMENSIONS ARE CHECKED AND CO-RELATED WITH THE ARCHITECTURAL DRAWINGS AND ANY DISCREPANCY OR OMISSION SHALL BE BROUGHT TO THE NOTICE.
3. THIS IS THE PROPERTY OF CDD SOCIETY & IS NOT TO BE COPIED OR PRODUCED ANYWHERE WITHOUT THEIR PERMISSION
4. ALL INTERNAL DIMENSIONS SHOWN ARE CLEAR (EXCLUDING PLASTERING THK).
5. E G L = EXISTING GROUND LEVEL
6. F G L = FINISHED GROUND LEVEL
7. I L = INVERTED LEVEL
8. B.M : REF B.M 10.00M ON EXISTING ROAD
9. 20MM THK PLASTERING 1:4 C.M ON BOTH SIDES.
10. DIMENSIONS ARE INDICATED TO BE CHECKED AT SITE
11. PIPE INVERT IN WALL TO BE EMBEDDED IN P.C.C. 1:3:6
12. ABR INDICATES ANEROBIC BAFFLE REACTOR, AF INDICATES ANEROBIC FILTER AND DC INDICATES DISTRIBUTION CHAMBER
FSTP INDICATES FECAL SLUDGE TREATMENT PLANT

REV NO.	DATE	REMARKS	SIGNATURE

REVISIONS

TITLE

REGISTERS DETAILS

DRG. No.

D-14/CHIRKUNDA/FSTP/R-01

PROJECT NAME

IMPLEMENTATION OF FSTP AT CHIRKUNDA

FOR TENDER

CONSULTANTS: Wastewater Treatment System



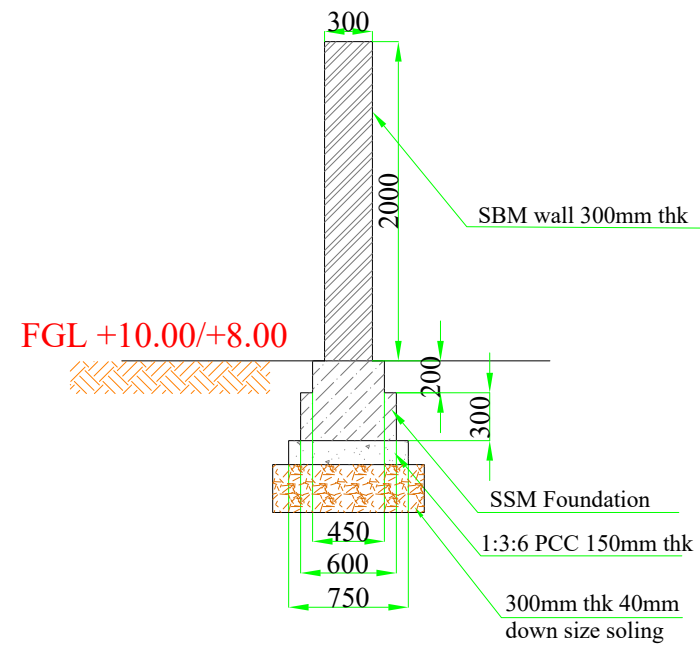
OPP. BEEDI WORKERS COLONY
KENGARI SATILLITE TOWN
BANGALORE - 560 060
KARNATAKA.

DRAWN BY	CHECKED BY
SHRINIVAS	PRAVEEN
DATE	DATE
22-11-2017	22-11-2017

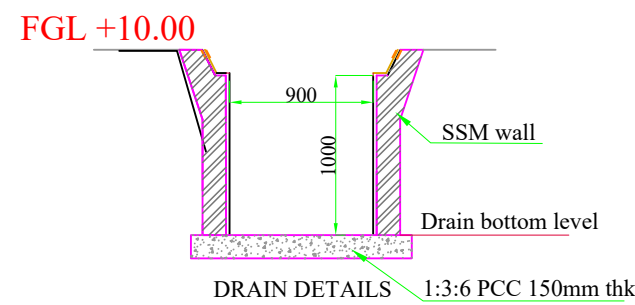
Faecal Sludge Treatment Plant

NOTES

1. ALL DIMENSIONS ARE IN MM UNLESS MENTIONED OTHERWISE.
2. ALL DIMENSIONS ARE CHECKED AND CO-RELATED WITH THE ARCHITECTURAL DRAWINGS AND ANY DISCREPANCY OR OMISSION SHALL BE BROUGHT TO THE NOTICE.
3. THIS IS THE PROPERTY OF CDD SOCIETY & IS NOT TO BE COPIED OR PRODUCED ANYWHERE WITHOUT THEIR PERMISSION
4. ALL INTERNAL DIMENSIONS SHOWN ARE CLEAR (EXCLUDING PLASTERING THK).
5. E G L = EXISTING GROUND LEVEL
6. F G L = FINISHED GROUND LEVEL
7. I L = INVERTED LEVEL
8. B.M : REF B.M 10.00M ON EXISTING ROAD
9. 20MM THK PLASTERING 1:4 C.M ON BOTH SIDES (WATER PROOF)
10. DIMENSIONS ARE INDICATED TO BE CHECKED AT SITE
11. PIPE INVERT IN WALL TO BE EMBEDDED IN P.C.C. 1:3:6



Compound Wall Details



Drain bottom level - +9.00 at Entrance gate side
 - +8.35 at Exit gate side

Drain bottom level - +7.00 at Sludge storage shed side
 - +6.35 at Polishing Pond side

Drain Details

REV NO.	DATE	REMARKS	SIGNATURE

REVISIONS

TITLE
COMPOUND WALL AND DRAIN DETAILS-01

DRG. No.
D-16/CHIRKUNDA/FSTP/CD-01

PROJECT NAME
IMPLEMENTATION OF FSTP AT CHIRKUNDA

FOR TENDER

CONSULTANTS: Wastewater Treatment System



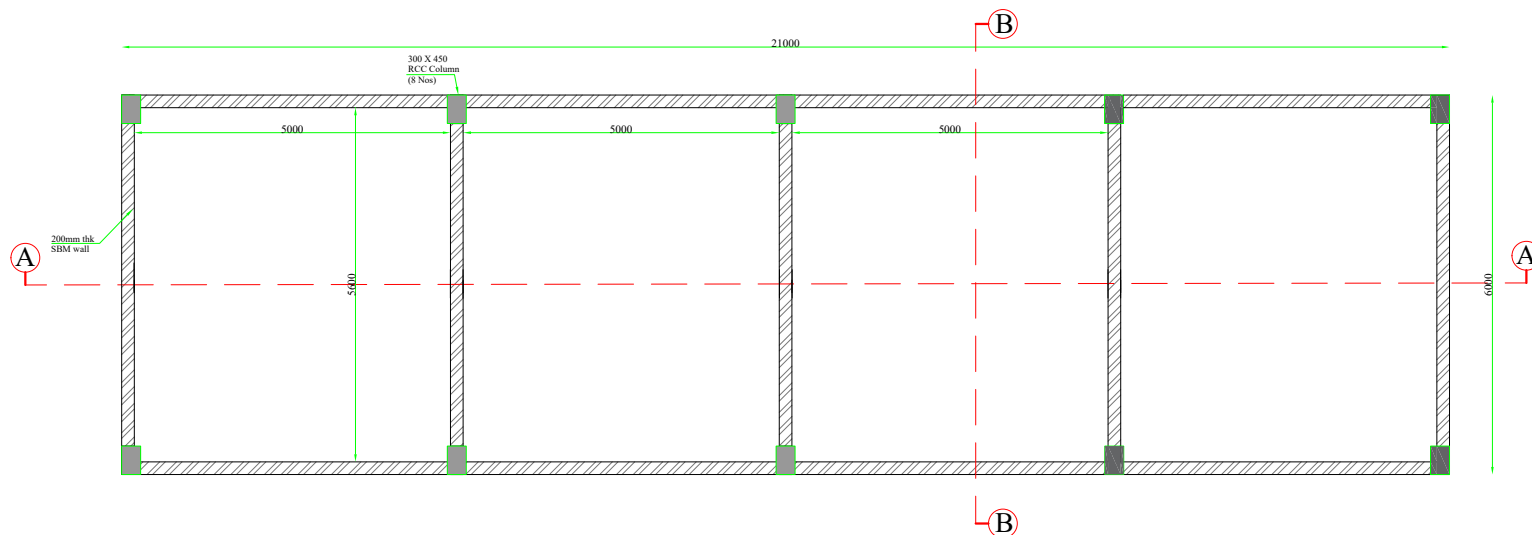
OPP. BEEDI WORKERS COLONY
 KENGERI SATILLITE TOWN
 BANGALORE - 560 060
 KARNATAKA.

DRAWN BY	CHECKED BY
SHRINIVAS	PRAVEEN
DATE	DATE
22-11-2017	22-11-2017

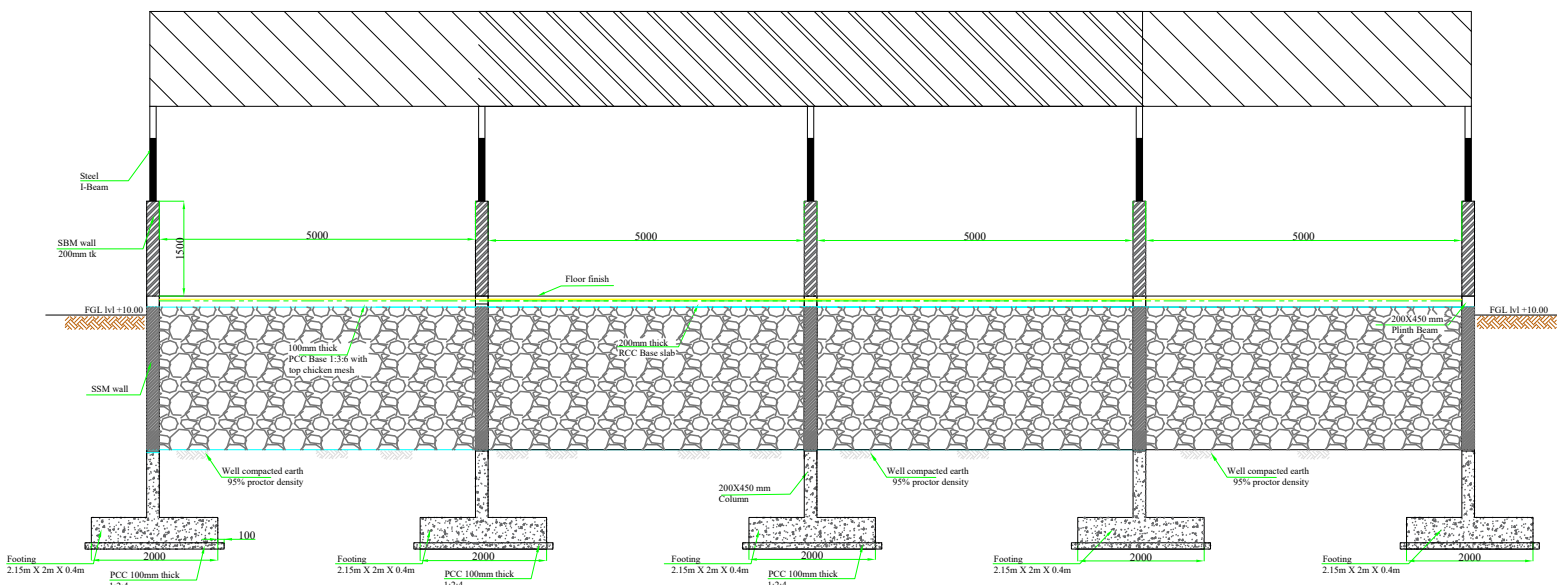
Faecal Sludge Treatment Plant

NOTES

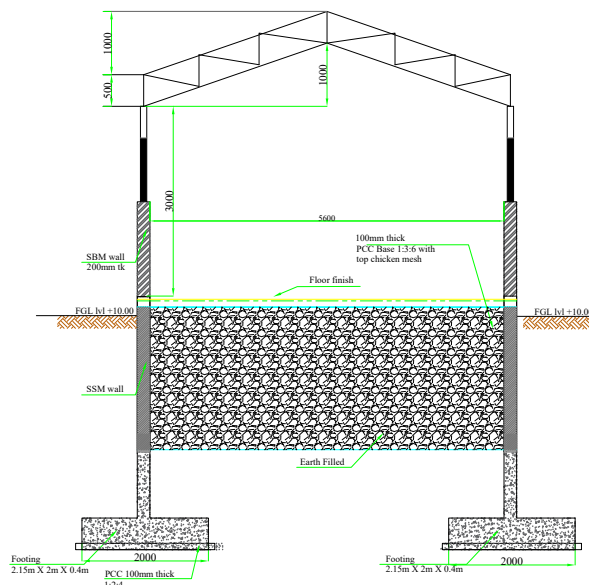
1. ALL DIMENSIONS ARE IN MM UNLESS MENTIONED OTHERWISE.
2. ALL DIMENSIONS ARE CHECKED AND CO-RELATED WITH THE ARCHITECTURAL DRAWINGS AND ANY DISCREPANCY OR OMISSION SHALL BE BROUGHT TO THE NOTICE.
3. THIS IS THE PROPERTY OF CDD SOCIETY & IS NOT TO BE COPIED OR PRODUCED ANYWHERE WITHOUT THEIR PERMISSION
4. ALL INTERNAL DIMENSIONS SHOWN ARE CLEAR (EXCLUDING PLASTERING THK).
5. E G L = EXISTING GROUND LEVEL
6. F G L = FINISHED GROUND LEVEL
7. I L = INVERTED LEVEL
8. B.M : REF B.M 10.00M ON EXISTING ROAD
9. 20MM THK PLASTERING 1:4 C.M ON BOTH SIDES (WATER PROOF)
10. DIMENSIONS ARE INDICATED TO BE CHECKED AT SITE
11. PIPE INVERT IN WALL TO BE EMBEDDED IN P.C.C. 1:3:6



PLAN OF SLUDGE STORAGE SHEAD AND STORE ROOM



Section A-A



Section B-B

REV NO.	DATE	REMARKS	SIGNATURE

REVISIONS

TITLE
SLUDGE STORAGE AND STORE ROOM
PLAN AND SECTIONS

DRG. No.
D-13/CHIRKUNDA/FSTP/SSR-01

PROJECT NAME
IMPLEMENTATION OF FSTP AT CHIRKUNDA

FOR TENDER

CONSULTANTS: Wastewater Treatment System



OPP. BEEDI WORKERS COLONY
 KENGERI SATILLITE TOWN
 BANGALORE - 560 060
 KARNATAKA.

DRAWN BY	CHECKED BY
SHRINIVAS	PRAVEEN
DATE	DATE
22-11-2017	22-11-2017

Faecal Sludge Treatment Plant

NOTES

1. ALL DIMENSIONS ARE IN MM UNLESS MENTIONED OTHERWISE.
2. ALL DIMENSIONS ARE CHECKED AND CO-RELATED WITH THE ARCHITECTURAL DRAWINGS AND ANY DISCREPANCY OR OMISSION SHALL BE BROUGHT TO THE NOTICE.
3. THIS IS THE PROPERTY OF CDD SOCIETY & IS NOT TO BE COPIED OR PRODUCED ANYWHERE WITHOUT THEIR PERMISSION
4. ALL INTERNAL DIMENSIONS SHOWN ARE CLEAR (EXCLUDING PLASTERING THK).
5. E G L = EXISTING GROUND LEVEL
6. F G L = FINISHED GROUND LEVEL
7. I L = INVERTED LEVEL
8. B.M : REF B.M 10.00M ON EXISTING ROAD
9. 20MM THK PLASTERING 1:4 C.M ON BOTH SIDES (WATER PROOF)
10. DIMENSIONS ARE INDICATED TO BE CHECKED AT SITE
11. PIPE INVERT IN WALL TO BE EMBEDDED IN P.C.C. 1:3:6

REV NO.	DATE	REMARKS	SIGNATURE

REVISIONS

TITLE
ELEVATION AND SECTIONAL PLAN OF OPERATOR ROOM

DRG. No.
D-12/CHIRKUNDA/FSTP/OR-01

PROJECT NAME
IMPLEMENTATION OF FSTP AT CHIRKUNDA

FOR TENDER

CONSULTANTS: Wastewater Treatment System



OPP. BEEDI WORKERS COLONY
 KENGERI SATILLITE TOWN
 BANGALORE - 560 060
 KARNATAKA.

DRAWN BY

SHRINIVAS

DATE

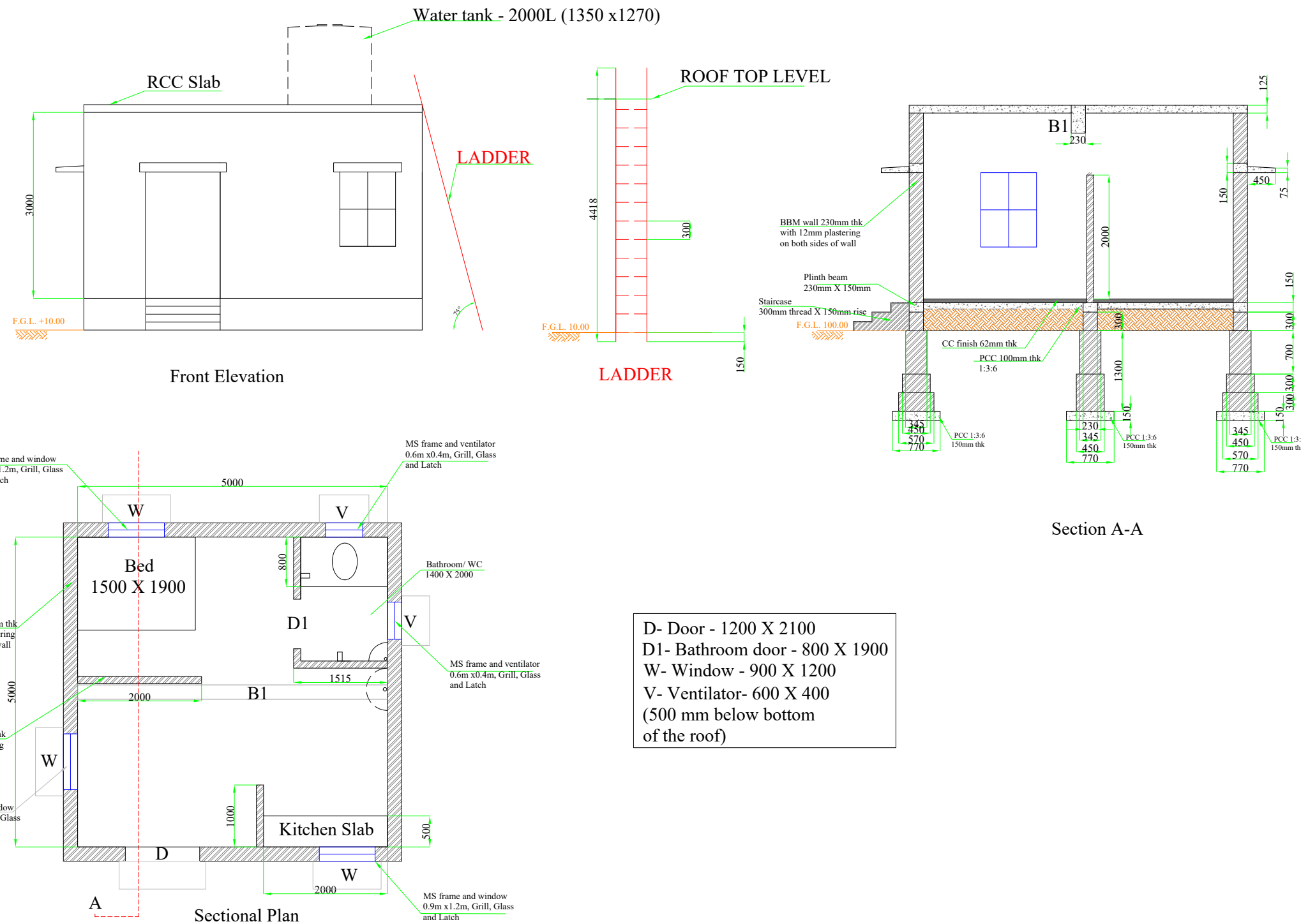
22-11-2017

CHECKED BY

PRAVEEN

DATE

22-11-2017



Faecal Sludge Treatment Plant

NOTES

1. ALL DIMENSIONS ARE IN MM UNLESS MENTIONED OTHERWISE.
2. ALL DIMENSIONS ARE CHECKED AND CO-RELATED WITH THE ARCHITECTURAL DRAWINGS AND ANY DISCREPANCY OR OMISSION SHALL BE BROUGHT TO THE NOTICE.
3. THIS IS THE PROPERTY OF CDD SOCIETY & IS NOT TO BE COPIED OR PRODUCED ANYWHERE WITHOUT THEIR PERMISSION
4. ALL INTERNAL DIMENSIONS SHOWN ARE CLEAR (EXCLUDING PLASTERING THK).
5. E G L = EXISTING GROUND LEVEL
6. F G L = FINISHED GROUND LEVEL
7. I L = INVERTED LEVEL
8. B.M : REF B.M 10.00M ON EXISTING ROAD
9. 20MM THK PLASTERING 1:4 C.M ON BOTH SIDES.
10. DIMENSIONS ARE INDICATED TO BE CHECKED AT SITE
11. PIPE INVERT IN WALL TO BE EMBEDDED IN P.C.C. 1:3:6
12. ABR INDICATES ANEROBIC BAFFLE REACTOR, AF INDICATES ANEROBIC FILTER AND DC INDICATES DISTRIBUTION CHAMBER
FSTP INDICATES FECAL SLUDGE TREATMENT PLANT

REV NO.	DATE	REMARKS	SIGNATURE

REVISIONS

TITLE
SEPTIC TANK AND SOAK PIT DETAILS

DRG. No.
D-15/CHIRKUNDA/FSTP/SS-01

PROJECT NAME
IMPLEMENTATION OF FSTP AT CHIRKUNDA

FOR TENDER

CONSULTANTS: Wastewater Treatment System



OPP. BEEDI WORKERS COLONY
KENGARI SATILLITE TOWN
BANGALORE - 560 060
KARNATAKA.

DRAWN BY

SHRINIVAS

DATE

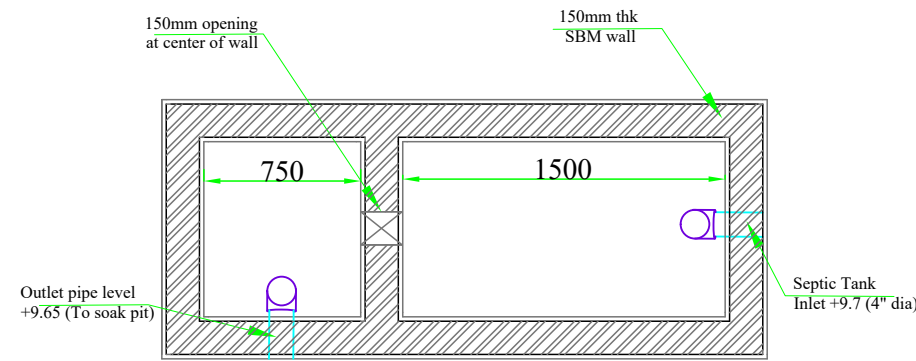
22-11-2017

CHECKED BY

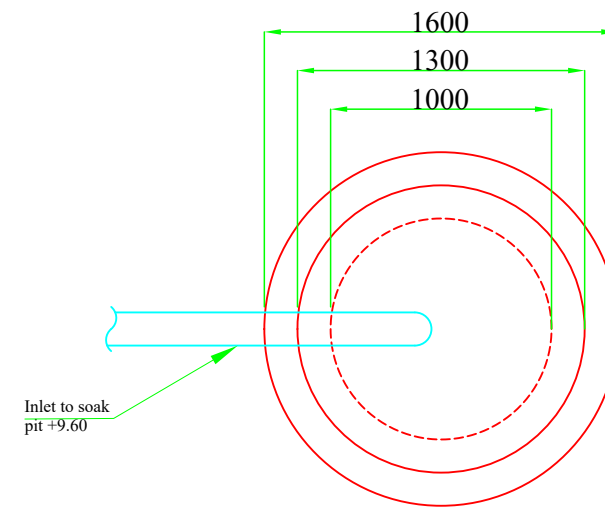
PRAVEEN

DATE

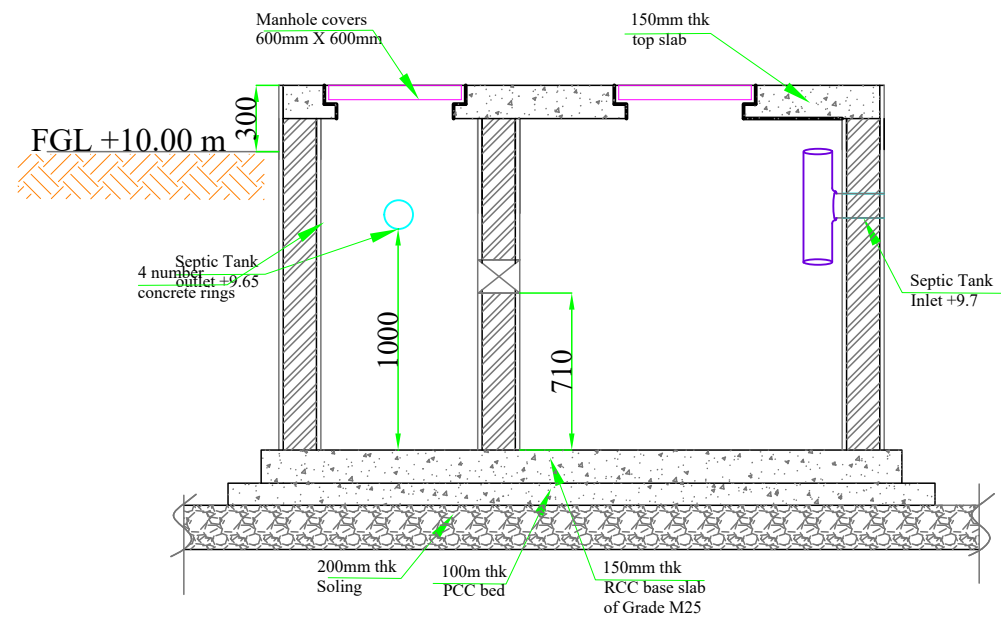
22-11-2017



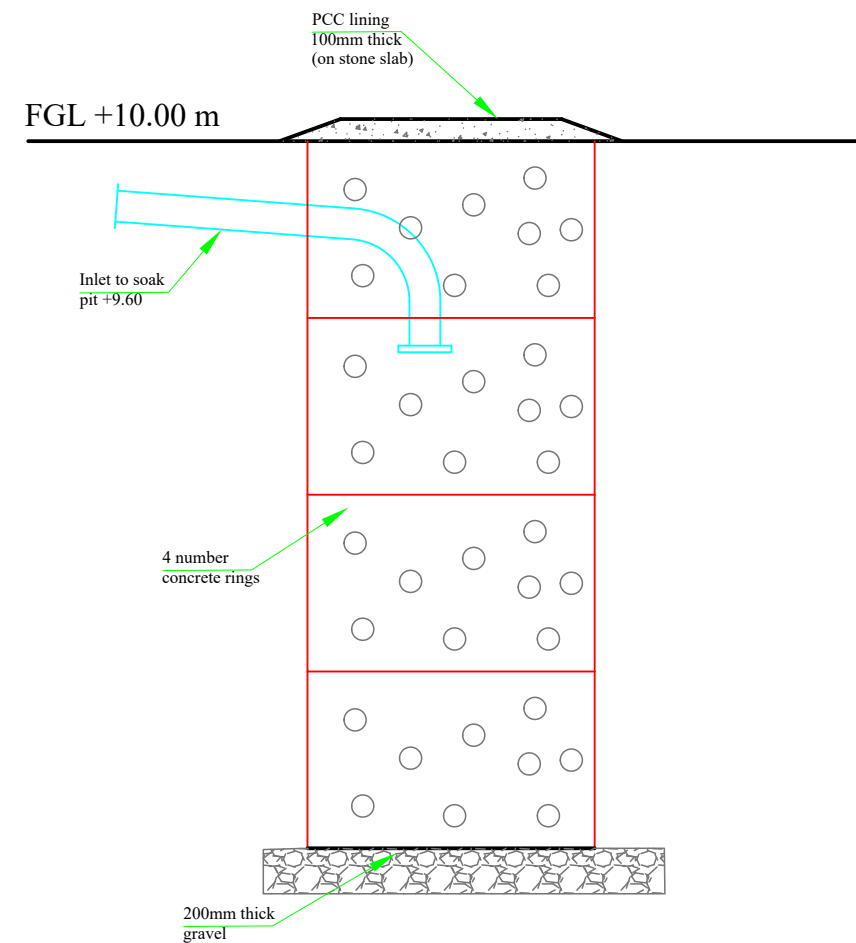
Plan of Septic Tank



Soak pit plan



Sectional view of septic tank



Soak pit section