

DESIGN, ESTIMATES, DRAWINGS

OF

10 KLD TO 2000 KLD STP

BASED ON

TIGER BIO FILTER TECHNOLOGY

**10 KLD STP
BASED ON TBF TECHNOLOGY**

PROCESS CALCULATIONS
TIGER BIO FILTER OF 10 KLD CAPACITY

Design flow	=	10.00	KLD
	=	0.010	MLD
Peak flow factor	=	3.00	
1 SCREEN CHANNELS: MANUAL			
No. of Manual Screen	=	1	No.
Average Flow	=	0.01	MLD
Peak Flow Factor	=	3.00	
Design Flow	=	Peak Flow	
	=	0.03	MLD
	=	1.25	m ³ /hr
	=	0.000	m ³ /sec
Average Flow	=	0.01	MLD
	=	0.417	m ³ /hr
	=	0.000	m ³ /sec
Design Flow in each Screen	=	0.000	m ³ /sec
		1	No.
	=	0.000	m ³ /sec
Average Flow in each Screen	=	0.000	m ³ /sec
		1	No.
	=	0.000	m ³ /sec
Maximum Velocity through Screen at Peak Flow	=	1.2	m/sec
Minimum Velocity through Screen at Average Flow	=	0.6	m/sec
Clear Area of Opening through Screen for Peak Flow	=	0.000	m ³ /sec
		1.2	m/sec
	=	0.000000	m ²
Clear Area of Opening through Screen for Average Flow	=	0.000	m ³ /sec
		0.6	m/sec
	=	0.000	m ²
Considering maximum Area of Opening through Screen	=	0.000	m ²

Clear Spacing of Bars	=	10	mm	
Thickness of Bars	=	5	mm	
Gross Area of Screen	=	$0 \times (10+5)/10$		
	=	0.000	m ²	
Assuming Depth of Screen Channel	=	100.00	mm	
Gross Width of Screen	=	0/0.1		
	=	0.000	m	
No. of Bars	=	(Gross Width of Screen / Center to Center Spacing of Bars) - 1		
	=	$0 / ((10+5)/1000) - 1$		
	=	-1.0	Nos.	
Say	=	-1	Nos.	
Width of Screen provided	=	(Number of Bars+1) x Clear Spacing + (Number of Bars x Bar Thickness)		
	=	$(-1+1) \times 10 + (-1 \times 5)$		
	=	-5	mm	
Width Say	=	0.50	m	
Liquid Depth of Screen Channel provided	=	0.30	m	
L:B	=	3.00		
Length of Screen Channel provided	=	1.50	m	
Freeboard provided	=	0.70	m	Invert Depth of incoming sewer
Total Depth of Screen Chamber	=	1.00	m	
Velocity in Channel at Average Flow	=	Average Flow / Cross Sectional Area of Screen Channel		
	=	$0 / ((0.5 \times 0.3) / 1000 \times 1000)$		
	=	0.000	m/sec	
	>	0.300	m/sec	

2 CONVENTIONAL GRIT CHAMBER: MANUAL

No. of Grit Chamber	=	1	
Average Flow	=	0.01	MLD
Peak Flow Factor	=	3.00	
Design Flow	=	Peak Flow	
Peak Flow	=	0.03	MLD
	=	30	m ³ /day
	=	1	m ³ /hr
	=	0.000	m ³ /sec
Design Flow to each Grit Chamber	=	30/1	
	=	30	m ³ /day
	=	1	m ³ /hr
	=	0.000	m ³ /sec
According to CPHEEO Manual			
Particle Size	=	0.15	mm

Specific Gravity	=	2.65	
Surface Overflow Rate for 100% removal efficiency in an ideal Grit Chamber	=	Settling Velocity of the minimum size of Particles to be removed	
	=	1.5	m/s
	=	1296	m ³ /m ² /day
Considering Efficiency of removal of desired Particles, $\eta = 75\%$	=	75%	
and Measure of Settling Basin Performance, $n = 1/8$ for very good performance	=	0.125	
Design Overflow Rate	=	857	m ³ /m ² /day
Surface Overflow Rate for 0.15 mm dia. Particle Size with Specific Gravity $S_s > 2.65$ Table 5.6	=	1555	m ³ /m ² /day
Considering Design Overflow Rate	=	960	m ³ /m ² /day
Area of Grit Chamber required	=	30	m ³ /day
		960	m ³ /m ² /day
	=	0.03	m ²
L:B ratio	=	2	
Length of Chamber provided	=	1.50	m
Width of Chamber provided	=	0.50	m
Hydraulic Retention Time (HRT) in Grit Chamber at Peak Flow	=	60	sec
Volume of Grit Chamber required	=	0x60	
	=	0	m ³
Depth required in Grit Chamber	=	0 / (1.5x0.5)	
	=	0	m
Say	=	0.30	m
Grit Storage Depth	=	0.20	m
Total Liquid Depth required	=	0.50	m
Length of Grit Pit	=	0.50	m
Width of Grit Pit	=	0.50	m
Depth of Grit Pit	=	0.30	m
Free Board	=	1.00	m
3 RAW SEWAGE SUMP (WET WELL)			
No. of Units	=	1	No.
Average Flow	=	0.01	MLD
	=	0.417	m ³ /hr
	=	0.0001	m ³ /sec
Peak Flow Factor	=	3.00	

Design Flow	=	Peak Flow	
	=	0.03	MLD
	=	1	m ³ /hr
	=	0.0	m ³ /sec
Hydraulic Retention Time (HRT) at Average Flow	=	180	min
Volume required	=	0.0001 x 180 x 60	
	=	1.08	m ³
Total Volume of Wet Well	=	1.08	m ³
Side Water Depth (SWD) provided	=	1.00	m
Plan Area of Wet Well	=	1.08	m ²
Length/width of Sump required	=	1.04	m
Length/width of Sump provided	=	1.0	m
Volume of Sump provided	=	1.08	m ³
Length of Pump Pit	=	1.00	m
Width of Pump Pit	=	0.50	m
Depth of Pump Pit	=	0.25	m
Free Board	=	1.00	m

3.1 DESIGN STATEMENT-RSS E&M

Design Considerations

Design flow	=	0.01	MLD
	=	10.00	Cum/Day
Peak flow factor	=	3.00	

Pumping machinery

Friction factor for Fittings in Pressure Mains

Elbow 90 degrees	=	8
Friction Factor for each	=	1
Friction factor for all	=	8
Elbow 45 degrees	=	0
Friction Factor for each	=	0.75
Friction factor for all	=	0
Elbow 22 degrees	=	0
Friction Factor for each	=	0.5
Friction factor for all	=	0
Tee 90 degrees	=	0
Friction Factor for each	=	1.5
Friction factor for all	=	0
Tee in straight pipe	=	6
Friction Factor for each	=	0.3
Friction factor for all	=	1.8
Gate valve open	=	1
Friction Factor for each	=	0.4

Friction factor for all	=	0.4		
Swing check	=	1		
Friction Factor for each	=	2.5		
Friction factor for all	=	2.5		
Total friction factor	=	12.7		
Stage		low	ave	peak
Average flow, cum / day	=		10.00	
Proportion	=	0.6	1	2
Design flow, cum / day	=	6	10	20
Hazen Williams C	=	140	140	140
Desired velocity, m/s	=	0.6	1.0	1.5
Number of Pumping hours	=	16.0	16.0	16.0
Area needed, sqm	=	0.0002	0.0002	0.0002
Dia needed, m	=	0.015	0.015	0.017
Dia needed, mm	=	15	15	17
Dia provided, mm (User)	=	63	63	63
Radius, m	=	0.032	0.032	0.032
Radius power 0.63	=	0.113	0.113	0.113
S power 0.54	=	0.045	0.074	0.112
S	=	0.003	0.008	0.017
Slope 1 in	=	316.6	123.0	58.0
length, m	=	15	15	15
Friction in pipeline, m	=	0.0	0.1	0.3
Velocity head, m	=	0.018	0.051	0.115
Friction factor in fittings	=	12.7	12.7	12.7
Friction in fittings, m	=	0.2	0.6	1.5
Static lift, m	=	3.0	3.0	3.0
Total head, m	=	3.2	3.6	4.5
Efficiency of pumpset	=	0.8	0.8	0.8
Discharge, lps	=	0.1	0.2	0.3
Discharge, Cum/Hr	=	0.4	0.6	1.3
Kw required	=	0.017	0.026	0.056
HP required	=	0.5	0.5	0.5
Number of Pumps	=	2	2	2

4 TIGER BIO FILTER DESIGN STATEMENT-TBF1- 10 KLD

Number of pumping hours	=	16	Hrs	
Number of BMF tanks provided	=	1	Nos	
Design flow to each tank	=	10.00	Cum/day	
	=	0.63	Cum/ Hr for 16 Hr	
	=	0.17	lps	
Inlet BOD	=	250.00	mg/l	
Inlet TSS	=	400.00	mg/l	
BOD load applied	=	2.5	kg/day	
BOD uptake rate	=	0.1	Kg of BOD / Kg of worms	(0.5 - 1.0)
Worms required	=	25	Kg worms	

Sewage application rate	=	1.85	Cum/Sqm/day	(1 - 2 Cum/Sqm/day)
Area required	=	5.41	Sqm	
Area Provided	=	6	Sqm	
Area of each crate	=	0.4	Sqm	
Number of crates	=	15	Nos	
say	=	16	Nos	
Crate in longitudinal direction	=	4	Nos	
Crate in travers direction	=	4	Nos	
crates provided	=	16	Nos	OK
Width provided	=	4.00	m	
Length required	=	3.00	m	
Depth provided	=	1.2	m	

5 TERTIARY TREATMENT UNIT

Design Considerations

Design flow	=	0.01	MLD
	=	10.00	Cum/Day
Peak flow factor	=	3.00	

5.1 FILTER FEED TANK

Number of FFT provided	=	1	Nos
Number of operating hours	=	16	Hrs
Design flow	=	10.00	Cum/Day
	=	0.63	Cum/Hr
	=	0.00017	Cum/Sec
Hydraulic Retention time	=	60	min
Volume required	=	0.63	Cum
Depth	=	1.00	m
Civil Tanks			
Area	=	0.63	Sqm
Length/Width required	=	0.79	m
Length/Width provided	=	1.00	m
Freeboard provided	=	0.50	m
Volume Provided	=	1.00	Cum

DESIGN STATEMENT-TTU E&M

Design Considerations

Design flow	=	0.01	MLD
	=	10.00	Cum/Day
Peak flow factor	=	3.00	

Pumping machinery

Friction factor for Fittings in Pressure Mains			
Elbow 90 degrees	=	5	
Friction Factor for each	=	1	
Friction factor for all	=	5	

Elbow 45 degrees	=	0		
Friction Factor for each	=	0.75		
Friction factor for all	=	0		
Elbow 22 degrees	=	0		
Friction Factor for each	=	0.5		
Friction factor for all	=	0		
Tee 90 degrees	=	0		
Friction Factor for each	=	1.5		
Friction factor for all	=	0		
Tee in straight pipe	=	5		
Friction Factor for each	=	0.3		
Friction factor for all	=	1.5		
Gate valve open	=	1		
Friction Factor for each	=	0.4		
Friction factor for all	=	0.4		
Swing check	=	1		
Friction Factor for each	=	2.5		
Friction factor for all	=	2.5		
Total friction factor	=	9.4		
Stage		low	ave	peak
Average flow, cum / day	=		10.00	
Proportion	=	0.6	1	2
Design flow, cum / day	=	6	10	20
Hazen Williams C	=	140	140	140
Desired velocity, m/s	=	0.8	1.0	1.5
Number of Pumping hours	=	16.0	16.0	16.0
Area needed, sqm	=	0.0001	0.0002	0.0002
Dia needed, m	=	0.013	0.015	0.017
Dia needed, mm	=	13	15	17
Dia provided, mm (User)	=	63	63	63
Radius, m	=	0.032	0.032	0.032
Radius power 0.63	=	0.113	0.113	0.113
S power 0.54	=	0.060	0.074	0.112
S	=	0.005	0.008	0.017
Slope 1 in	=	185.9	123.0	58.0
length, m	=	20	20	20
Friction in pipeline, m	=	0.1	0.2	0.3
Velocity head, m	=	0.033	0.051	0.115
Friction factor in fittings	=	9.4	9.4	9.4
Friction in fittings, m	=	0.3	0.5	1.1
Static lift, m	=	8.0	8.0	8.0
Total head, m	=	8.3	8.5	9.1
Efficiency of pumpset	=	0.8	0.8	0.8
Discharge, lps	=	0.1	0.2	0.3
Discharge, Cum/Hr	=	0.4	0.6	1.3
Kw required	=	0.029	0.044	0.096
HP provided	=	0.5	0.5	0.5
Number of Pumps	=	2	2	2

5.2 PRESSURE SAND FILTER

Number of unit provided	=	1	Nos.
Designed @ 16 hrs working for flow of	=	0.63	m ³ /h
Loading rate	=	12.00	m ³ /m ² /h
Area of DMF	=	0.05	m ²
Dia of DMF	=	0.26	m
Provided	=	0.300	m
Backwash water			
Backwash velocity	=	15.00	m/hr
backwash flowrate	=	0.91	m ³ /h
Backwash volume for 20 mins	=	0.30	m ³

5.3 ACTIVATED CARBON FILTER

Number of unit provided	=	1	Nos.
Designed @ 16 hrs working for flow of	=	0.63	m ³ /h
Loading rate	=	12.00	m ³ /m ² /h
Area of ACF	=	0.05	m ²
Dia of ACF	=	0.26	m
Provided	=	0.300	m
Backwash water			
Backwash velocity	=	15.00	m/hr
backwash flowrate	=	0.91	m ³ /h
Backwash volume for 20 mins	=	0.30	m ³

5.4 CHLORINE DOSING SYSTEM NaOCl DOSING SYSTEM

Average Flow	=	0.63	m ³ /hr
Design Chlorine Dosage (Max)	=	3	mg/l
Concentration of Chlorine in commercially available NaOCl	=	10%	
Design NaOCl Dosage	=	30	mg/l
Operating hours	=	16.0	hr
Quantity of NaOCl required	=	$0.625 \times 30 \times 16 / 1000$	
	=	0.30	Kg/day
Design Strength of NaOCl Solution	=	100%	
Volume of NaOCl Solution	=	$0.3 / (1 \times 1000)$	
	=	0.010	m ³
No. of Dosing Tanks provided	=	1	Nos.
Volume of each Dosing Tank	=	0.01 / 1	

	=	0.01	m ³
	=	100	Litres
	=	1	No.
No. of Working NaOCl Dosing Pump provided	=		
Capacity of each NaOCl Dosing Pump required	=	Total Volume of NaOCl Solution / (No. of Dosing pumps)	
	=	0.01 / (1 X 16)	
	=	0.001	m ³ /hr
	=	1.00	LPH
	=	1.00	LPH
Capacity of each NaOCl Dosing Pump provided	=	1.00	LPH
No. of Standby NaOCl Dosing Pump provided	=	1	No.

SIZING DETAILS (CIVIL)
TIGER BIO FILTER OF 10 KLD CAPACITY

S I. N o	Unit name	N o s	Leng th	Widt h	Height			Soling		PCC		Raft		RCC Wall thk	Bric k Wall thk	Slab Thk	Steel - HCR M/ Kg/C
					SW	FB	Tota	offs	Thk	offs	Thk	offs	Thk				
		N	m	m	m	m	m	m	m	m	m	m	m	m	m	m	
1	Screen Chamber	1	1.5	0.5	0.3	0.7	1.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1			80
2	Grit Chamber	1	1.5	0.5	0.5	1.0	1.5	0.1	0.1	0.1	0.1	0.1	0.1	0.1			80
3	Raw Sewage Sump	1	1.0	1.0	1.0	1.0	2.0	0.1	0.1	0.1	0.1	0.1	0.2	0.1		0.1	100
4	TBF Bed 50 KLD	1	3.0	4.0			1.2	0.1	0.1	0.1	0.1	0.1	0.1		0.2		60
5	Filter Feed tank	1	1.0	1.0	1.0	0.5	1.5	0.1	0.1	0.1	0.1	0.1	0.2	0.1		0.1	100
6	Filter Platform	1	1.4	1.7				0.1	0.1	0.1	0.1	0.1	0.1				60

Assumptions

Incoming Sewer Invert 1.0 m Below Ground level

Method of excavation Mechanical means

Underground strata		soil	Muru m	Soft roc	har d	Tota l
0.0 to 1.5 m	=	25	25	25	25	100
1.5 m to 3.0 m	=	25	25	25	25	100
3.0 to 4.5 m	=	25	25	25	25	100
4.5 to 6.0	=	25	25	25	25	100

**TIGER BIO FILTER OF 10 KLD CAPACITY
BILL OF QUANTITIES**

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
1	Excavation for foundation / pipe trenches in earth, soils of all types, sand, gravel and soft murum, including removing the excavated material upto a distance of 50 metres and lifts as below, stacking and spreading as directed, normal dewatering, preparing the bed for foundation and excluding backfilling, etc.				
	0.0 to 1.5 m	20.40	Cum	150.00	3,060.00
	1.5 to 3.0 m	5.57	Cum	164.00	913.50
	3.0 to 4.5 m	0.00	Cum	178.00	0.00
	4.5 to 6.0 m	0.00	Cum	192.00	0.00
	MJP/ SSR/ 2021-22 / Section E / Excavation Item No.1/ Page no. 42				
2	Excavation for foundation / pipe trenches in hard murum and boulders, W.B.M. road including removing the excavated material upto a distance of 50 M beyond the area and lifts as below, stacking and spreading as directed by Engineer- in-charge, normal dewatering, preparing the bed for foundation and excluding backfilling, etc.			8.00	
	0.0 to 1.5 m	20.40	Cum	192.00	3,916.80
	1.5 to 3.0 m	5.57	Cum	206.00	1,147.50
	3.0 to 4.5 m	0.00	Cum	220.00	0.00
	4.5 to 6.0 m	0.00	Cum	234.00	0.00
	MJP/ SSR/ 2021-22/ Section E/ Excavation Item No.3, Page no. 42				
3	Excavation for foundation / pipe trenches in soft rock and old cement and lime masonry foundation asphalt road including removing the excavated material upto a distance of 50 M beyond the area and lifts as below, stacking as directed by Engineer-in-charge, normal dewatering, preparing the bed for foundation and excluding backfilling, etc. complete. (Bd-A-4/259)				
	0.0 to 1.5 m	20.40	Cum	572.00	11,668.80
	1.5 to 3.0 m	5.57	Cum	597.00	3,325.30
	3.0 to 4.5 m	0.00	Cum	622.00	0.00
	4.5 to 6.0 m	0.00	Cum	647.00	0.00
	MJP/ SSR/ 2021-22 / Section E/ Excavation Item No.5, Page no. 42				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
4	Excavation for foundation / pipe trenches in hard rock and concrete road by chiselling, wedging, line drilling by mechanical means or by all means other than blasting including trimming and levelling the bed, removing the excavated material upto a distance of 50 metres beyond the area and lifts as below, stacking as directed by Engineer-in-charge, normal dewatering, excluding backfilling, etc. complete by all means. (Bd-A-6/259)				
	0.0 to 1.5 m	20.40	Cum	1,017.00	20,746.80
	1.5 to 3.0 m	5.57	Cum	1,042.00	5,804.00
	3.0 to 4.5 m	0.00	Cum	1,067.00	0.00
	4.5 to 6.0 m	0.00	Cum	1,092.00	0.00
	MJP/ SSR/ 2021-22 / Section E/ Excavation Item No.7, Page no. 43				
5	Providing dry trap/ granite/ quartzite/ gneiss, rubble stone soling in 15 cm to 20 cm thick layers including hand packing and compacting, etc. complete. (Bd-A-12/264)	5.43	Cum	1,175.00	6,380.30
	MJP/ SSR/ 2021-22 / Section E/Excavation Item No.18, Page no. 46				
6	Providing and laying in situ Cement Concrete M- 15 of trap/ granite / quartzite / gneiss metal for foundation and bedding including bailing out water, form work, compaction, curing, etc. complete. (Cement 5.90 bags / cum) Spec. No. - Bd E /1 Page No. 287 and B- 7, Page No. 38	3.21	Cum	5,640.00	18,104.40
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY				
7	Providing and laying in situ Cement Concrete of trap/ granite / quartzite / gneiss metal for RCC work in foundation like raft, grillage, strip foundation and footing of RCC columns and steel stanchions including normal dewatering, form work, compaction, finishing and curing, etc. complete. (By weigh batching and mix design for M250 and M-300 only. Use of L&T, A.C.C., Ambuja, Birla Gold, Manikgad, Rajashree, etc. cement is permitted.) (Excluding M.S. or Tor reinforcement)	3.48	Cum	7,448.00	25,919.10

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY				
8	Providing and casting in situ C.C. of trap / granite/ quartzite / gneiss metal of approved quality for RCC works as per detailed drawings and designs or as directed by Engineer-in- charge including normal dewatering, centering, form work, compaction, finishing the formed surfaces with C.M. 1:3 of sufficient minimum thickness to give a smooth and even surface wherever necessary or roughening if special finish is to be provided and curing, etc. complete. (By weigh batching and mix design for M-250 and M-300 only. Use of L&T, A.C.C., Ambuja, Birla Gold, Manikgad, Rajashree, etc. cement is permitted.) (Excluding M.S. or Tor	0.00	Cum	8,624.00	0.00
	For Beams / Braces / Lintels In RCC M-300				
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY				
9	Providing and casting in situ C.C. of trap / granite/ quartzite / gneiss metal of approved quality for RCC works as per detailed drawings and designs or as directed by Engineer-in- charge including normal dewatering, centering, form work, compaction, finishing the formed surfaces with C.M. 1:3 of sufficient minimum thickness to give a smooth and even surface wherever necessary or roughening if special finish is to be provided and curing, etc. complete. (By weigh batching and mix design for M-250 and M-300 only. Use of L&T, A.C.C., Ambuja, Birla Gold, Manikgad, Rajashree, etc. cement is permitted.) (Excluding M.S. or Tor reinforcement)	0.27	Cum	9,247.00	2,496.70
	Slabs / Landings / Vertical Walls / Waist Slabs / Steps for Staircase In RCC M-300				
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
10	Providing and casting in situ C.C. of trap / granite/ quartzite / gneiss metal of approved quality for RCC works as per detailed drawings and designs or as directed by Engineer-in-charge including normal dewatering, centering, form work, compaction, finishing the formed surfaces with C.M. 1:3 of sufficient minimum thickness to give a smooth and even surface wherever necessary or roughening if special finish is to be provided and curing, etc. complete. (By weigh batching and mix design for M-250 and M-300 only. Use of L&T, A.C.C., Ambuja, Birla Gold, Manikgad, Rajashree, etc. cement is permitted.) (Excluding M.S. or Tor reinforcement)	3.51	Cum	9,218.00	32,355.20
	Chajjas / Parapets / Curtain Walls /Partition Walls / Pardies In RCC M-300				
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.6 / Page no. 51				
11	Providing and fixing in position steel bar reinforcement of various diameters for RCC piles, caps, footings, foundations, slabs, beams, columns, canopies, staircases, newels, chajjas, lintels, pardies, copings, fins, arches, etc. as per detailed designs, drawings and schedules; including cutting, bending, hooking the bars, binding with wires or tack welding and supporting as required, etc. complete (including cost of binding wire). (Bd-F-17/306)				
	c) Corrosion Resistant Steel (Fe 500)	0.64	MT	70,658.00	45,221.20
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.8 / Page no. 52				
12	Providing and fixing mild steel grill work for windows/ ventilators of 20 Kg/Sqm. As per drawings including necessary welding and painting with one coat of anticorrosive paint and two coats of oil painting, etc. complete. (Bd-U-1/537)	3.89	Sqm	1,895.00	7,371.60
	MJP/ SSR/ 2021-22 / SECTION - F : IRON AND STRUCTURAL STEEL WORK Item No.1 / Page no. 47				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
13	Providing structural steel work in rolled stanchions fixed with connecting plates or angle cleats as in main and cross beams, hip and jack rafters, purlins connecting to truss members and like as per detailed designs and drawings or as directed by Engineer-in-charge including cutting, fabricating, hoisting, erecting, fixing in position, making riveted / bolted / welded connections and one coat of anticorrosive paint and over it two coats of oil painting, etc. complete. (Bd.C.	0.31	MT	71,286.00	22,286.20
	MJP/ SSR/ 2021-22 / SECTION - F :: IRON AND STRUCTURAL STEEL WORK Item No.3,				
14	Providing and fixing corrugated galvanised iron sheets of 0.63 mm thick (24B .W .G.) for roofing without wind tiles including fastening with galvanised iron screws and bolts , lead and bitumen washers as per drawing etc. complete.	29.00	Sqm	777.00	22,533.00
	PWD / SSR 2020-21 / Roofing and Ceiling SSR Item No.38.04 Reference No. Bd.R.5, Page No. 453 Item No.1133, Page no. 224				
15	Providing fly ash brick masonry with conventional / I.S. type bricks in cement mortar 1:6 in superstructure including striking joints, raking out joints, watering and scaffolding etc. Complete	5.85	Cum	6,305.00	36,884.30
	PWD / SSR 2020-21 / Brick Masonry SSR Item No.27.13 Reference No. As director by engineer incharge and BDG- 2 and 5 Item No.893, Page no. 190				
16	Providing internal cement plaster 12 mm thick in single coat in cement mortar 1:5 without neeru finish to concrete or brick surfaces, in all positions including scaffolding and curing etc. complete.	29.25	Sqm	257.00	7,517.30
	PWD / SSR 2020-21 / Plastering and Pointing SSR Item No. 32.03 Reference No. Bd. L.2 Page No. 368 Item No.950. Page no. 201				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
17	Providing rough cast cement plaster externally in two coats to concrete, brick or stone masonry surfaces in all positions with base coat of 12 to 15 mm thick in C.M. 1:4 and rough cast treatment 12 mm thick in proportion 1:11 / 2:3 including scaffolding and	23.50	Sqm	529.00	12,431.50
	PWD / SSR 2020-21 / Plastering and Pointing SSR Item No. 32.12 Reference No. Bd.L.8				
18	Providing and applying white-wash in two coats on old / new plastered or masonry surfaces and asbestos cement sheets including scaffolding and preparing the surface by brushing and	23.50	Sqm	10.00	235.00
	PWD / SSR 2020-21 / Colouring SSR Item No. 36.03 Reference No. Bd. P. I Page No. 411				
19	Providing and applying colour-wash of approved colour and shade in one coat to new surface including scaffolding, brushing and brooming down (excluding base coats of white wash) etc. complete.	23.50	Sqm	8.00	188.00
	PWD / SSR 2020-21 / Colouring SSR Item No. 36.04 Reference No. Bd. P.2 Page No. 412				
20	Dewatering the excavated trenches and pools of water in the building trenches / pipeline trenches, well works by using pumps and other devices including disposing off water to safe distance as directed by Engineer-in-charge (including cost of machinery, labour, fuel), etc.	8.00	HP/ Hr.	77.00	616.00
	MJP/ SSR/ 2021-22 / Section E/ Exca				
21	Refilling the trenches with available excavated stuff with soft material first over pipeline and then hard material in 15 cm layers with all leads and lifts including consolidation, surcharging, etc. complete.	83.49	Cum	84.00	7,013.20
	MJP/ SSR/ 2021-22 / Section E/ Exca				
22	Transportation as per STATEMENT VI Including loading, unloading and stacking Earth (4.8 Cum) lead 15 Km	28.32	Cum	604.45	17,118.10

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
	Electromechanical Items				
23	Screen (Manual) of size 1.5 m length x 0.5 m width of SS 304 MOC and Manual hand rake for cleaning screen of SS handle 1 m in length and cleaning area of 6 nos 5 mm SS rod of total length 200 mm straight and 50 mm of 90 degree bend.	0.75	Sqm	20,000.00	15,000.00
24	Grit pump Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application v				
	MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION Pumps, Page no. 6, 7 of size 1.5 m length				
	1 HP (Up to 9000 LPH)	1.00	No	68,654.00	68,654.00
25	Raw Sewage Pumps Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste a standard MOC and given duty points as below				
	MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION				
	1 HP (Up to 9000 LPH)	2.00	Nos	68,654.00	137,308.00
26	TTU Feed pumps Supplying Non-clog Submersible Pump suitable for sewage/ Liquid v standard MOC and given duty points as below				
	MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION				
	1 HP (Up to 9000 LPH)	2.00	Nos	68,654.00	137,308.00
27	Pressure Sand Filter of FRP / MSEP vessel with suitable thickness to withstand a water pressure including MPV or 5 Valve system and PVC / UPVC / MSEP interconnecting and underdrain piping including fittings, with standard filter media layer with minimum depth of filter sand 1.0 m supported by gravels. The piping arrangement should provide sufficient pressure for backwash operations and avoid loss of sand during backwash operation. Suitable openings to be provided to ease addition and removal the media.				
	Dia 0.3 m x 2 m minimum height	1.00	Nos	18,800.00	18,800.00

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
28	Activated Carbon Filter of FRP / MSEP vessel with suitable thickness to withstand a water pressure including MPV or 5 Valve system and PVC / UPVC / MSEP interconnecting and underdrain piping including fittings, with standard filter media layer with minimum depth of Activated Carbon 1.0 m supported by gravels. The piping arrangement should provide sufficient pressure for backwash operations and avoid loss of Activated carbon during backwash operation. Suitable openings to be provided to				
	Dia 0.3 m x 2 m minimum height	1.00	Nos	18,800.00	18,800.00
29	NaOCI Chlorinator Pump Diaphragm Type / peristaltic type / Solenoid Max Flow Rate Upto 10LPH Power Source Electric Phase Single Material PP / PTFE(Teflon) Voltage 230 Volt Frequency				
	Mixing Tank of 100 Ltrs capacity	100.00	Ltrs	8.00	800.00
	Dosing Pump	2.00	Nos	12,000.00	24,000.00
30	Control Panel				
	Designing, Supplying, Installing, commissioning & testing of PLC Panel. Including PLC with CPU & Power supply unit, power supply cables interfacing cards, interfacing cables,	1.00	No	32,272.00	32,272.00
	MJP/ MECH/ ELECT / SSR/ 2021-22/ SECTION 19 - SA [SCADA & AUTOMATION]				
31	Supplying and erecting Fully Automatic Star Delta starter to operate squirrel cage induction motor working on 380- 440 Volt, 3 phase, 50 Hz with no volt coil, over load element, and ON - OFF push buttons, with necessary material and connected to supply, etc complete. Starter with				
	> 7.5 HP & Up to 12.5 HP	6.00	nos	7,150.00	42,900.00
	MJP /MECH/ ELECT/ SSR/ 2021-22 SECTION 10 - LG [L.T. SWITCHGEAR AND PROTECTION] Item no. LG 3 Page no. 27				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
32	Main power supply cable				
	3 core PVC insulated, PVC sheathed copper conductor flat submersible cable				
	Supplying and erecting, Flat flexible submersible cable with, Copper Conductor, PVC insulated, and PVC				
	3 core 16 sq mm	25.00	m	549.00	13,725.00
33	Power cables				
	Aluminium conductor 4 Core, XLPE / PVC insulated & armoured cable				
	Supplying and erecting, XLPE / PVC insulated, armoured cable 1100 V grade with ISI mark Four core, solid / stranded aluminium conductor with 6 mm thick 25 mm width M.S. spacer with G.I. Earth wire 6 sq mm, complete erected on				
	4 Core 6 sq mm	30.00	m	137.00	4,110.00
	MJP MECH/ ELECT/ SSR/ 2021-22 SECTION 12 - CB [L.T. CABLE] Item no. CB 6				
34	Control Cables				
	Copper conductor PVC insulated, Unarmoured control cable				
	Supplying and erecting Un-armoured control cable with ISI mark stranded / solid copper conductor 1.1 kV grade complete erected on wall / panel or in provided trench in an approved manner.				
	4 core 2.5 sq mm	30.00	m	137.00	4,110.00
	MJP MECH/ ELECT/ SSR/ 2021-22/ SECTION 12 - CB [L.T. CABLE] Item no. CB 8-				
	Plumbing Items				
35	Providing and supplying in standard lengths ISI mark rigid unplasticised PVC pipes suitable for potable water with solvent cement joints including cost of couplers, as per IS specification no. 4985 / 1988 excluding GST levied by GOI and GOM in all respect, including transportation, freight charges, inspection charges, loading, unloading, conveyance to the departmental stores and stacking the same in closed shed duly protected from sun rays and rains including cost of jointing material i.e. solvent cement, etc.				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
	1) 10% of cost of pipes shall be considered for cost of PVC specials for estimate purpose only. 2) One coupler and required cement solvent shall be provided with each full				
	MJP/ SSR/ 2021-22 / SECTION – I(II) P.V.C.				
1	Raw Sewage pump to TBF Distribution				
a	Main header				
	63 mm.	10.00	m	149.00	1,490.00
	PVC Specials- 10%				149.00
b	Distribution				
	63 mm.	10.00	m	149.00	1,490.00
	PVC Specials- 10%				149.00
2	TBF collection to FFT (gravity)				
a	Main header				
	63 mm.	15.00	m	149.00	2,235.00
	PVC Specials- 10%				223.50
b	collection tributary				
	63 mm.	5.00	m	149.00	745.00
	PVC Specials- 10%				74.50
3	TTU Plumbing				
	63 mm.	15.00	m	149.00	2,235.00
	PVC Specials- 10%				223.50
4	TBF distribution				
	63 mm.	5.00	m	149.00	745.00
	PVC Specials- 10%				74.50
36	Labour				
	Plumber	4.00	days	641.00	2,564.00
	Helper	4.00	days	579.00	2,316.00
	MJP/ SSR/ 2021-22 / SECTION - B LABOUR & MACHINERY , Page no. 14				
37	Providing double flange sluice valve confirming for IS- 14846 including worn gear arrangements as per test pressure, stainless steel spindle, caps, including inspection charges, transportation upto departmental store, unloading, stacking excluding GST levied by				
	Sluice valves - PN -1 (Without by pass)				
	Raw Sewage pump				
	65 mm.	2.00	Nos	4,966.00	9,932.00
	Filter Feed Pump				
	65 mm.	2.00	Nos	4,966.00	9,932.00
	MJP/ SSR/ 2021-22 / SECTION - I(XII) : PIPES APPURTENANCES , Page no. 132				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
38	Providing and supplying ISI mark CI D/F reflux valves (non-return valves) of following dia including railway freight, inspection charges, unloading from railway wagon, loading into truck, transportation upto departmental stores, unloading, stacking excluding GST levied by GOI & GOM in all respect etc. complete. Reflux Without by pass arrangement -PN -1				
	Raw Sewage pump				
	65 mm.	2.00	Nos	3,885.00	7,770.00
	Filter Feed Pump				
	65 mm.	2.00	Nos	3,885.00	7,770.00
	MJP/ SSR/ 2021-22 / SECTION - I(XII) : PIPES APPURTENANCES , Page no. 131				
	Bio media Items				
39	Supplying of Specially designed container for holding Filter media including Lightweight Expanded Clay Aggregates size (8-30 mm) and Bio media including mixture of woodchips Vermicompost, cocopeat and bacterial culture with special worms per designed quantity including transportation & fixing in position as	16.00	Nos	4,750.00	76,000.00
	Market rate				
40	Rapid sand Gravity filter sand At Source (Godhara, Gokak, Kanhan, Yesagi	1.53	Cum	1,730.00	2,646.90
	MJP/ SSR/ 2021-22 / SECTION- A MATERIALS				
41	Trasnportation Godhara to Pune distance by Road 660 Km.	1.53	Cum	11,031.37	16,878.00
	MJP/ SSR/ 2021-22 / SECTION - C				
42	Stone Aggregate 20 mm	1.53	Cum	900.00	1,377.00
	MJP/ SSR/ 2021-22 / SECTION- A MATERIALS Item No. 49,50,51 Page no. 13				
43	Transportation as per STATEMENT VI Including loading, unloading and stacking				
	Manure or sludge (5.52 Cum) lead 25 Km	5.88	Cum	747.48	4,395.20
	MJP/ SSR/ 2021-22 / SECTION - C				
NET TOTAL Rs.					984,455.90

MEASUREMENT SHEET - SCREEN CHAMBER, GRIT CHAMBER AND RAW SEWAGE SUMP

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	Screen And Grit chamber						
1	Excavation				1.90		
A	0.0 to 1.5 m	1	4.30	2.50	1.5	16.13	Cum
	soil					4.04	Cum
	Murum					4.04	Cum
	Soft rock					4.04	Cum
	hard rock					4.04	Cum
B	1.5 to 3.0 m	1	4.3	2.50	0.4	4.3	Cum
	soil					1.08	Cum
	Murum					1.08	Cum
	Soft rock					1.08	Cum
	hard rock					1.08	Cum
C	3.0 to 4.5 m	1	3.3	2.00	0	0	Cum
	soil					0	Cum
	Murum					0	Cum
	Soft rock					0	Cum
	hard rock					0	Cum
D	4.5 to 6.0 m	1	3.3	2.00	0	0	Cum
	soil					0	Cum
	Murum					0	Cum
	Soft rock					0	Cum
	hard rock					0	Cum
2	Soling						
	Screen	1	2.30	1.00	0.15	0.35	Cum
	Grit	1	2.30	0.50	0.15	0.18	Cum
	extra for grit chamber	1	0.00	0.40	0.15	0	Cum
				Total for grit		0.18	Cum
3	PCC M20						
	Screen	1	2.10	0.90	0.10	0.19	Cum
	Grit	1	2.10	0.50	0.10	0.11	Cum
		1	0.00	0.30	0.10	0	Cum
	Internal slope	1	Area	0.06	0.50	0.03	Cum
	Internal slope	1	Area	0.03	0.50	0.02	Cum
				Total for grit		0.16	Cum
4	Raft M30						
	Screen	1	1.90	0.80	0.15	0.23	Cum
	Grit	1	1.90	0.50	0.15	0.15	Cum
		1	0.00	0.20	0.15	0	Cum
				Total for grit		0.15	Cum
5	RCC Wall						
	Screen						
	Long Wall	2	1.70	0.10	1.20	0.41	Cum

MEASUREMENT SHEET - SCREEN CHAMBER, GRIT CHAMBER AND RAW SEWAGE SUMP

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	Short Wall	2	0.70	0.10	1.20	0.17	Cum
				Total for screen		0.58	Cum
	Grit						
	Long Wall (extra than screen chamber)	1	0.00	0.10	1.70	0	Cum
	Short Wall	2	0.50	0.10	1.70	0.17	Cum
				Total for grit		0.17	Cum
6	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	80	Cum	1.13	0.1	MT
7	Fabrication work in Frame and Grating for Access						
	Screen	1	1.70	0.70		1.19	Sqm
	Grit	1	1.70	0.60		1.02	Sqm
					Total	2.21	Sqm
8	Removing excess excavated material out of site						
	Screen chamber	1	1.70	0.70	1.00	1.19	Cum
	Grit Chamber	1	1.70	0.50	1.50	1.28	Cum
	soling, PCC, Raft volume					1.21	Cum
	Total Volume					3.68	Cum
	bulkage @ 40%					5.16	Cum
9	Refilling and compaction						
	Total Excavation					20.43	Cum
	Deduction for tank volume, soling, PCC, Raft					3.68	Cum
	Refilling and compaction volume					16.75	Cum

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	Raw Sewage Sump						
1	Excavation				2.45		
A	0.0 to 1.5 m	1	4.7	4.74	1.5	33.7	Cum
	soil					8.43	Cum
	Murum					8.43	Cum
	Soft rock					8.43	Cum
	hard rock					8.43	Cum
B	1.5 to 3.0 m	1	3.74	3.74	0.95	13.29	Cum
	soil					3.33	Cum
	Murum					3.33	Cum
	Soft rock					3.33	Cum
	hard rock					3.33	Cum
C	3.0 to 4.5 m	1	3.74	3.74	0	0	Cum

MEASUREMENT SHEET - SCREEN CHAMBER, GRIT CHAMBER AND RAW SEWAGE SUMP

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	soil					0	Cum
	Murum					0	Cum
	Soft rock					0	Cum
	hard rock					0	Cum
D	4.5 to 6.0 m	1	2.74	2.74	0	0	Cum
	soil					0	Cum
	Murum					0	Cum
	Soft rock					0	Cum
	hard rock					0	Cum
2	Soling						
	RSS	1	1.94	1.94	0.15	0.57	Cum
3	PCC M20						
	RSS	1	1.74	1.74	0.10	0.31	Cum
4	Raft M30						
	RSS	1	1.54	1.54	0.20	0.48	Cum
5	RCC Wall						
	Long Wall	2	1.34	0.15	2.20	0.89	Cum
	Short Wall	2	1.04	0.15	2.20	0.69	Cum
					Total	1.58	Cum
6	Beams						
	Beam 1	0	1.04	0.2	0.3	0	Cum
	Beam 2	0	1.04	0.2	0.3	0	Cum
					Total	0	Cum
7	Slab	1	1.34	1.34	0.15	0.27	Cum
	Deduction for manhole	-1	1.20	0.70	0.15	-0.13	Cum
					Total	0.14	Cum
8	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	100	Cum	2.2	0.22	MT
9	Fabrication work in Frame and Grating for Access						
	RSS	1	1.20	0.70		0.84	Sqm
10	Removing excess excavated material out of site						
	RSS	1	1.34	1.34	2.00	3.59	Cum
	soling, PCC, Raft volume					1.36	Cum
	Total Volume					4.95	Cum
	bulkage @ 40%					6.93	Cum
11	Refilling and compaction						

MEASUREMENT SHEET - SCREEN CHAMBER, GRIT CHAMBER AND RAW SEWAGE SUMP

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	Total Excavation					46.99	Cum
	Deduction for tank volume, soling, PCC, Raft					4.95	Cum
	Refilling and compaction volume					42.04	Cum
12	Dewatering						
	2 Days x 2 hours/day	days	2	hours / day	2	4	Hrs

MEASUREMENT SHEET - TIGER BIO FILTER

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	TIGER BIO FILTER						
1	Excavation				0.35		
A	0.0 to 1.5 m soil	1	4.46	5.46	0.35	8.53	Cum
	Murum					2.14	Cum
	Soft rock					2.14	Cum
	hard rock					2.14	Cum
2	Soling						
	TBF	1	4.06	5.06	0.15	3.09	Cum
3	PCC M20						
	TBF	1	3.86	4.86	0.10	1.88	Cum
4	Raft M30						
	TBF	1	3.66	4.66	0.10	1.71	Cum
5	Brick Wall						
	TBF						
	Long Wall	2	3.46	0.23	1.20	1.91	Cum
	Short Wall	2	4.00	0.23	1.20	2.21	Cum
	Crate Support Wall	5	3.00	0.23	0.50	1.73	Cum
						Total for T	5.85 Cum
6	Plaster						
	Internal						
	Crate Support Wall						
	Long Wall	6	3.00		0.50	9	Sqm
	Wall top	5	3.00		0.23	3.45	Sqm
	Long Wall	2	3.00		1.20	7.2	Sqm
	Short Wall	2	4.00		1.20	9.6	Sqm
						Total	29.25 Sqm
	External						
	Long Wall	2	3.46		1.20	8.31	Sqm
	Short Wall	2	4.46		1.20	10.71	Sqm
	Wall Top	1	14.92	0.3		4.48	Sqm
						Total	23.50 Sqm
7	External-white-wash	1				23.50	Sqm
8	External-colour-wash	1				23.50	Sqm
9	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	60	Cum	1.71	0.11	MT
10	Removing excess excavated material out of site						
	soling, PCC, Raft volume					6.68	Cum
	Total Volume					6.68	Cum
	bulkage @ 40%					9.36	Cum

MEASUREMENT SHEET - TIGER BIO FILTER

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
11	Refilling and compaction						
	Total Excavation					8.53	Cum
	Deduction for tank volume, soling, PCC, Raft					6.68	Cum
	Refilling and compaction volume					1.85	Cum
12	MS Fabricated Shed						
	TBF-II Shed in Fabrication work Shed Size-4 m X 5 m x 3 m		4.00	5.00	3.00		
	for column 50*50*5 Unit Weight 6.97 kg/m	4	3.00	6.97	kg/m	83.64	KG
	for truss 50*50*3 Unit Weight 3.71 kg/m	2	5.00	3.71	kg/m	37.10	KG
	for principle rafter 50*50*3 Unit Weight	4	2.90	3.71	kg/m	43.04	KG
	for strut rafter 50*50*3 Unit Weight 3.71 kg/m	4	0.20	3.71	kg/m	2.97	KG
	for central strut rafter 50*50*3 Unit Weight	2	0.30	3.71	kg/m	2.23	KG
	for bottom frame below truss 50*50*3 Unit Weight 3.71 kg/m	1	18.00	3.71	kg/m	66.78	KG
	for perlin 30*30*3 Unit Weight 2.51 kg/m	5	5.00	2.51	kg/m	62.75	KG
	for Base Plate 150*150*10 mm	8	0.15	0.15	0.010	14.13	KG
					Total Wei	312.63	Kg
						0.31	MT
13	corrugated galvanised iron sheets	2	5.00	2.90		29	Sqm

MEASUREMENT SHEET - FILTER FEED TANK

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	FILTER FEED TANK						
1	Excavation				1.95		
A	0.0 to 1.5 m	1	3.7	3.70	1.5	20.54	Cum
	soil					5.14	Cum
	Murum					5.14	Cum
	Soft rock					5.14	Cum
	hard rock					5.14	Cum
B	1.5 to 3.0 m	1	3.20	3.20	0.45	4.61	Cum
	soil					1.16	Cum
	Murum					1.16	Cum
	Soft rock					1.16	Cum
	hard rock					1.16	Cum
C	3.0 to 4.5 m	1	2.70	2.70	0	0	Cum
	soil					0	Cum
	Murum					0	Cum
	Soft rock					0	Cum
	hard rock					0	Cum
D	4.5 to 6.0 m	1	2.70	2.70	0	0	Cum
	soil					0	Cum
	Murum					0	Cum
	Soft rock					0	Cum
	hard rock					0	Cum
2	Soling						
	FFT	1	1.90	1.90	0.15	0.55	Cum
3	PCC M20						
	FFT	1	1.70	1.70	0.10	0.29	Cum
4	Raft M30						
	FFT	1	1.50	1.50	0.20	0.45	Cum
5	RCC Wall						
	Long Wall	2	1.30	0.15	1.70	0.67	Cum
	Short Wall	2	1.00	0.15	1.70	0.51	Cum
					Total	1.18	Cum
6	Beams						
	Beam 1	0	1.00	0.2	0.3	0	Cum
	Beam 2	0	1.00	0.2	0.3	0	Cum
					Total	0	Cum
7	Slab	1	1.30	1.30	0.15	0.26	Cum
	Deduction for manhole	-	1.20	0.70	0.15	-0.13	Cum
					Total	0.13	Cum

MEASUREMENT SHEET - FILTER FEED TANK

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
8	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	100	Cum	1.76	0.18	MT
9	Fabrication work in Frame and Grating for Access						
	FFT	1	1.20	0.70		0.84	Sqm
10	Removing excess excavated material out of site						
	FFT	1	1.30	1.30	1.50	2.54	Cum
	soling, PCC, Raft volume					1.29	Cum
	Total Volume					3.83	Cum
	bulkage @ 40%					5.37	Cum
11	Refilling and compaction						
	Total Excavation					25.15	Cum
	Deduction for tank volume, soling, PCC, Raft					3.83	Cum
	Refilling and compaction volume					21.32	Cum
12	Dewatering						
	2 Days x 2 hours/day	days	2	hours/day	2	4	Hrs

MEASUREMENT SHEET - FILTER PLATFORM

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	FILTER PLATFORM						
1	Excavation				0.40		
A	0.0 to 1.5 m	1	2.4	2.70	0.4	2.6	Cum
	soil					0.65	Cum
	Murum					0.65	Cum
	Soft rock					0.65	Cum
	hard rock					0.65	Cum
2	Soling						
	Filter Platform	1	2.00	2.30	0.15	0.69	Cum
3	PCC M20						
	Filter Platform	1	1.80	2.10	0.10	0.38	Cum
4	Raft M30						
	Filter Platform	1	1.60	1.90	0.15	0.46	Cum
5	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	60	Cum	0.46	0.03	MT
6	Removing excess excavated material out of site						
	soling and PCC volume					1.07	Cum
	Total Volume					1.07	Cum
	bulkage @ 40%					1.5	Cum
7	Refilling and compaction						
	Total Excavation					2.6	Cum
	Deduction for tank volume, soling, PCC, Raft					1.07	Cum
	Refilling and compaction volume					1.53	Cum

MEASUREMENT SHEET - BIO MEDIA

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
1	Supplying of Specially designed container for holding Filter media including Lightweight Expanded Clay Aggregates size (8-30 mm) and Bio media including mixture of woodchips Vermicompost, cocopeat and bacterial culture with special worms per designed quantity including transportation & fixing in position as directed etc.	16				16	Nos
2	Rapid sand Gravity filter sand At Source (Godhara, Gokak, Kanhan, Yesagi sand)	16	0.82	0.58	0.2	1.53	Cum
3	Trasnsportation Godhara to					1.53	Cum
4	Stone Aggregate 20 mm	16	0.82	0.58	0.2	1.53	Cum
5	Transportation as per STATEMENT VI Including loading,						
	Manure or sludge (5.52 Cum) lead	16	0.82	0.56	0.8	5.88	Cum

MEASUREMENT SHEET - ELECTROMECHANICAL WORKS

Sr. No.	Item Description	Nos.	Unit
1	Screen (Manual) of size 1.5 m length x 0.5 m width of SS 304 MOC and Manual hand rake for cleaning screen of SS handle 1 m in length and cleaning area of 6 nos 5 mm SS rod of total length 200 mm straight and 50 mm of 90 degree bend.	1	No
2	Grit pump Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION - Pumps, Page no. 6, 7 of size 1.5 m length x 0.5 m width of SS304 MOC 1 HP (Up to 9000 LPH)	1	No
3	Raw Sewage Pumps Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION - Pumps, Page no. 6, 7 1 HP (Up to 9000 LPH)	2	Nos
4	TTU Feed pumps Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION - Pumps, Page no. 6, 7 1 HP (Up to 9000 LPH)	2	Nos
5	Pressure Sand Filter of FRP / MSEP vessel with suitable thickness to withstand a water pressure including MPV or 5 Valve system and PVC / UPVC / MSEP interconnecting and underdrain piping including fittings, with standard filter media layer with minimum depth of filter sand 1.0 m supported by gravels. The piping arrangement should provide sufficient pressure for backwash operations and avoid loss of sand during backwash operation. Suitable openings to be provided to ease addition and removal the media. Dia 0.3 m x 2 m minimum height	1	Nos
6	Activated Carbon Filter of FRP / MSEP vessel with suitable thickness to withstand a water pressure including MPV or 5 Valve system and PVC / UPVC / MSEP interconnecting and underdrain piping including fittings, with standard filter media layer with minimum depth of Activated Carbon 1.0 m supported by gravels. The piping arrangement should provide sufficient pressure for backwash operations and avoid loss of Activated carbon during backwash operation. Suitable openings to be provided to ease addition and removal the media. Dia 0.3 m x 2 m minimum height	1	Nos
7	PurAll Tablet Chlorinator + cartridge	0	nos

MEASUREMENT SHEET - ELECTROMECHANICAL WORKS

Sr. No.	Item Description	Nos.	Unit
7	NaOCl Chlorinator Pump Diaphragm Type / peristaltic type / Solenoid Max Flow Rate Upto 10LPH Power Source Electric Phase Single Material PP / PTFE(Teflon) Voltage 230 Volt Frequency 50Hz		
a	Mixing Tank of 100 Ltrs capacity	1	Nos
b	Dosing Pump	2	Nos
8	Control Panel		
	Designing, Supplying, Installing, commissioning & testing of PLC Panel. Including PLC with CPU & Power supply unit, power supply cables interfacing cards, interfacing cables, wireless modules with 25% extra quantity of all accessories.		
	PLC Panel	1	No
	MJP/ MECH/ ELECT / SSR/ 2021-22/ SECTION 19 - SA [SCADA & AUTOMATION] Item no. 1.4 Page no. 69		
9	Supplying and erecting Fully Automatic Star Delta starter to operate squirrel cage induction motor working on 380- 440 Volt, 3 phase, 50 Hz with no volt coil, over load element, and ON - OFF push buttons, with necessary material and connected to supply, etc complete. Starter with original sheet steel encloser.		
	> 7.5 HP & Up to 12.5 HP	6	nos
	1 nos extra starter considered as spare.		
	MJP /MECH/ ELECT/ SSR/ 2021-22 SECTION 10 - LG [L.T. SWITCHGEAR AND PROTECTION] Item no. LG 3 Page no. 27		
10	Main power supply cable		
	3 core PVC insulated, PVC sheathed copper conductor flat submersible cable		
	Supplying and erecting, Flat flexible submersible cable with, Copper Conductor, PVC insulated, and PVC sheathed.		
	3 core 16 sq mm	25	m
11	Power cables		
	Aluminium conductor 4 Core, XLPE / PVC insulated & armoured cable		
	Supplying and erecting, XLPE / PVC insulated, armoured cable 1100 V grade with ISI mark Four core, solid / stranded aluminium conductor with 6 mm thick 25 mm width M.S. spacer with G.I. Earth wire 6 sq mm, complete erected on wall / on pole with 25 X 3 mm M.S. clamps or in provided trench in an approved manner.		
	4 Core 6 sq mm	30	m
	MJP MECH/ ELECT/ SSR/ 2021-22 SECTION 12 - CB [L.T. CABLE] Item no. CB 6 Page no. 35		
12	Control Cables		
	Copper conductor PVC insulated, Unarmoured control cable		

MEASUREMENT SHEET - ELECTROMECHANICAL WORKS

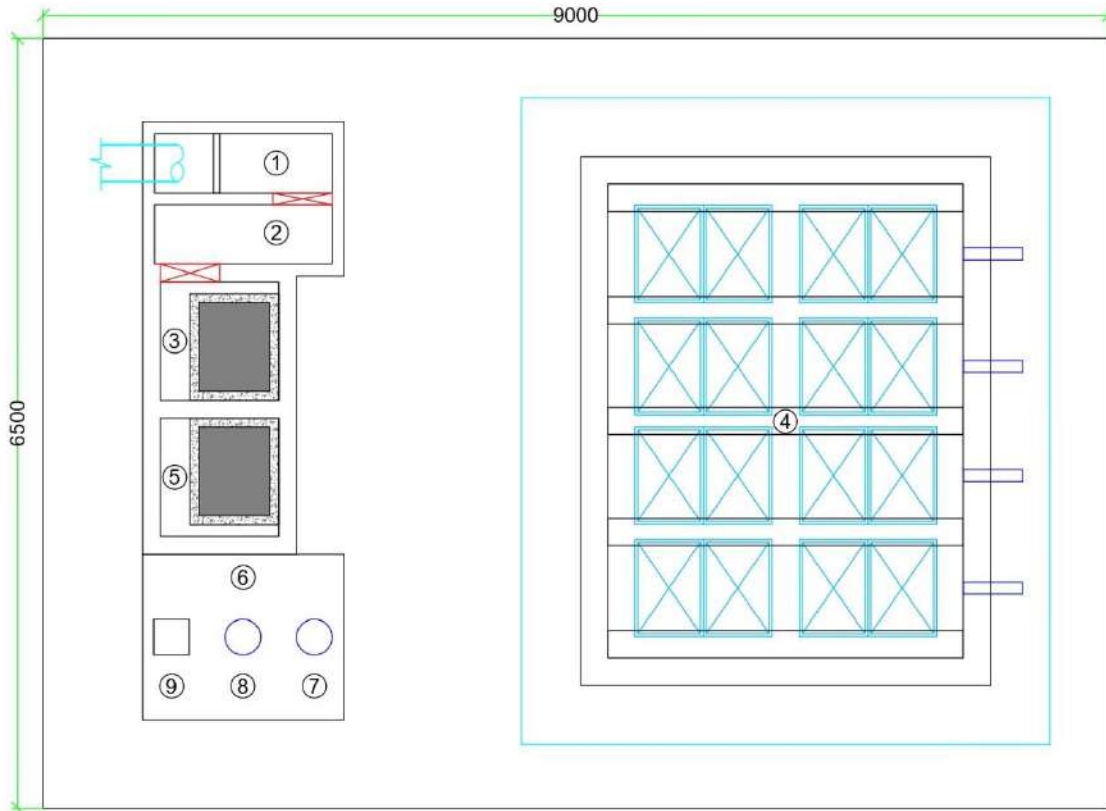
Sr. No.	Item Description	Nos.	Unit
	Supplying and erecting Un-armoured control cable with ISI mark stranded / solid copper conductor 1.1 kV grade complete erected on wall / panel or in provided trench in an approved manner.		
	4 core 2.5 sq mm	30	m
	MJP MECH/ ELECT/ SSR/ 2021-22/ SECTION 12 - CB [L.T. CABLE] Item no. CB 8-2 Page no. 36		

MEASUREMENT SHEET - PLUMBING

Sr. No.	Item Description	Nos.	L (m)	B (m)	Quantity	Unit
	Providing and supplying in standard lengths ISI mark rigid unplasticised PVC pipes suitable for potable water with solvent cement joints including cost of couplers, as per IS specification no. 4985 / 1988 excluding GST levied by GOI and GOM in all respect, including transportation, freight charges, inspection charges, loading, unloading, conveyance to the departmental stores and stacking the same in closed shed duly protected from sun rays and rains including cost of jointing material i.e. solvent cement, etc. complete (selffit type to be jointed with cement solvent).					
	1) 10% of cost of pipes shall be considered for cost of PVC specials for estimate purpose only. 2) One coupler and required cement solvent shall be provided with each full length pipe cost of which is included in rates below.					
	MJP/ SSR/ 2021-22 / SECTION – I(II) P.V.C. PIPES, Page no.77					
1	Raw Sewage pump to TBF Distribution					
a	Main header	Dia	63			
	63 mm.	1	10		10	m
	PVC Specials- 10%					
b	Distribution					
	63 mm.	1	10		10	m
	PVC Specials- 10%					
2	TBF collection to FFT (gravity)					
a	Main header					
	63 mm.	1	15		15	m
	PVC Specials- 10%					
b	collection tributary					
	63 mm.	1	5		5	m
	PVC Specials- 10%					
3	TTU Plumbing	Dia	63			
	63 mm.	1	15		15	m
	PVC Specials- 10%					
4	TBF distribution			No. of beds		
	63 mm.	1	5	1	5	m
	PVC Specials- 10%					
5	Labour	Nos	Days			
	Plumber	1	4		4	days
	Helper	1	4		4	days
6	Sluice valves					

MEASUREMENT SHEET - PLUMBING

Sr. No.	Item Description	Nos.	L (m)	B (m)	Quantity	Unit
	Providing double flange sluice valve confirming for IS- 14846 including worn gear arrangements as per test pressure, stainless steel spindle, caps, including inspection charges, transportation upto departmental store, unloading, stacking excluding GST levied by GOI & GOM in all respect etc. complete.					
	MJP/ SSR/ 2021-22 / SECTION - I(XII) : PIPES APPURTENANCES , Page no. 132					
	Raw Sewage pump					
	65 mm.	2			2	Nos
	Filter Feed Pump					
	65 mm.	2			2	Nos
7	Reflux valves (non-return valves)					
	Providing and supplying ISI mark CI D/F reflux valves (non-return valves) of following dia including railway freight, inspection charges, unloading from railway wagon, loading into truck, transportation upto departmental stores, unloading, stacking excluding GST levied by GOI & GOM in all respect etc. complete. Reflux valves as per I.S.5312 Part I (1984)					
	MJP/ SSR/ 2021-22 / SECTION - I(XII) : PIPES APPURTENANCES , Page no. 131					
	Raw Sewage pump					
	65 mm.	2			2	Nos
	Filter Feed Pump					
	65 mm.	2			2	No



PLANT LAYOUT
AREA = 58.5 SQM.

Process Unit Details								
Sr. No	Description	No	L/D	B	H	FB	Total H	MOC
			m.	m.	m.	m.	m.	
1	Screen Chamber	1	1.50	0.50	0.30	0.70	1.00	RCC
2	Grit Chamber	1	1.50	0.50	0.50	1.00	1.50	RCC
3	Raw Sewage Sump	1	1.00	1.00	1.00	1.00	2.00	RCC
4	Tiger Bio Filter	1	3.00	4.00	-	-	1.20	BRICK
5	Filter Feed Tank	1	1.00	1.00	1.00	0.50	1.50	RCC
6	Filter Platform	1	1.40	1.70	-	-	-	RCC
7	Pressure Sand Filter	DIA	0.30	-	-	-	2.00	MSEF
8	Activated Carbon Filter	DIA	0.30	-	-	-	2.00	MSEF
9	Chlorination Unit	1	-	-	-	-	-	-

PROJECT NAME :

10 KLD SEWAGE TREATMENT PLANT
 BASED ON TIGER BIO FILTER
 TECHNOLOGY.

NOTES

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PLANT LAYOUT

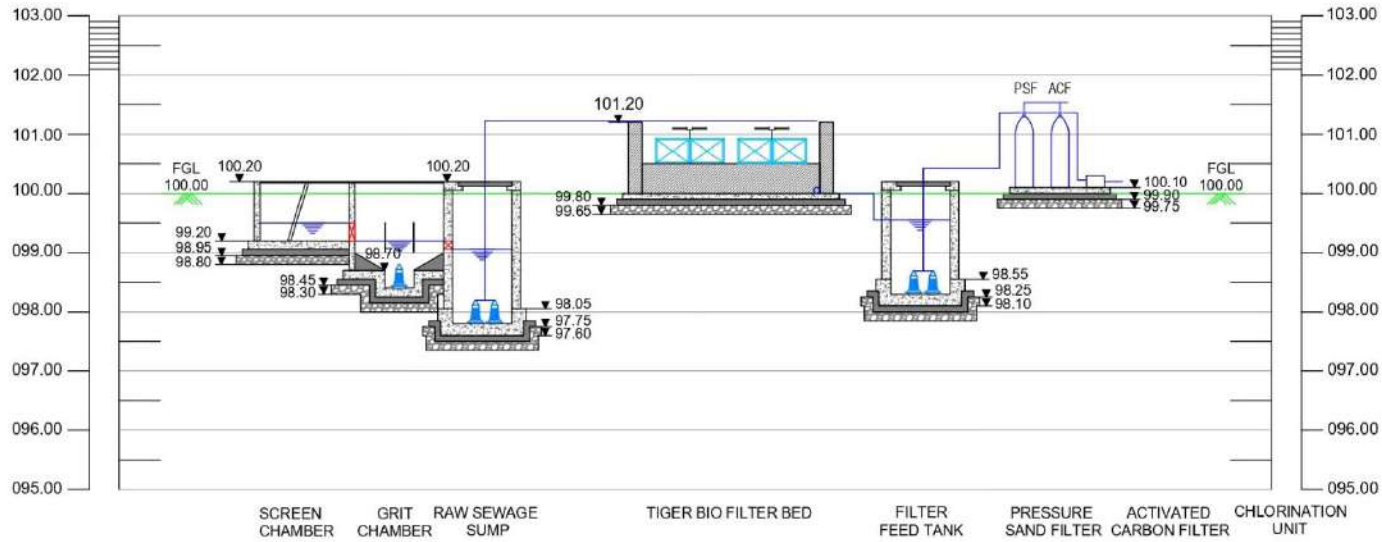
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 10 KLD SEWAGE TREATMENT PLANT
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HYDRAULIC FLOW DIAGRAM

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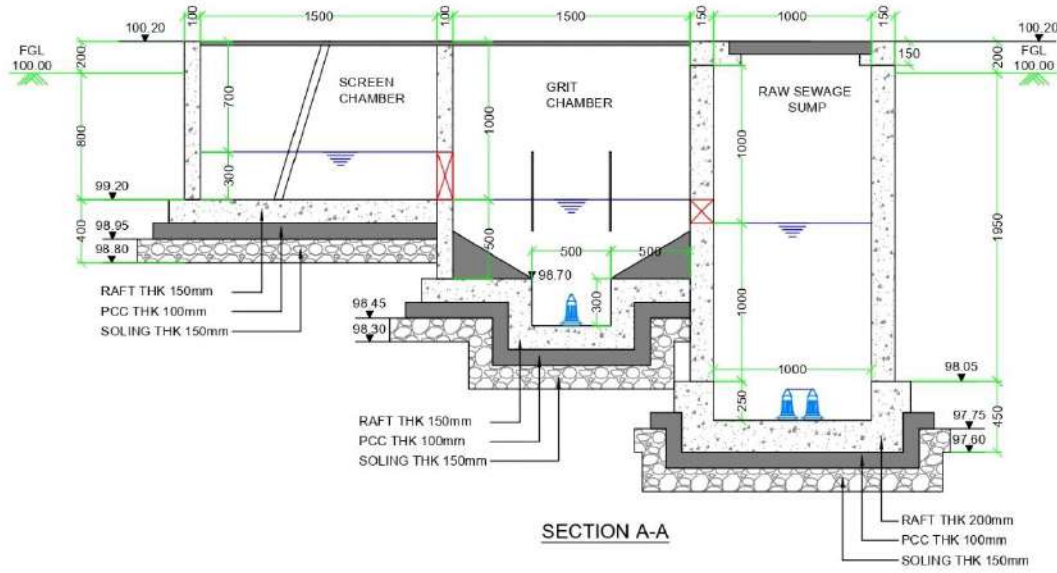
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HYDRAULIC FLOW DIAGRAM

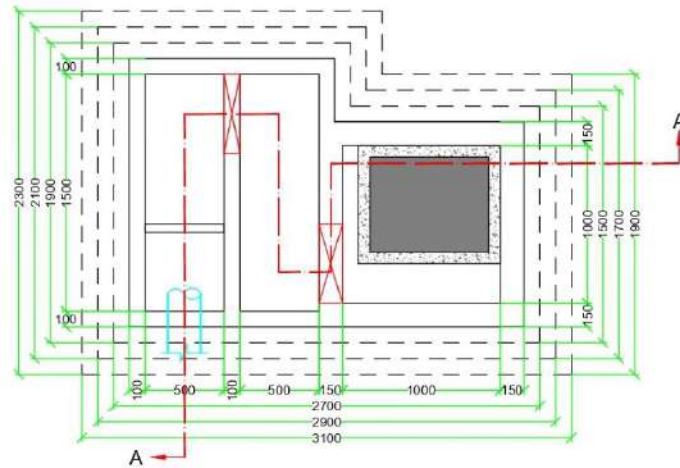
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SECTION A-A



PLAN

SCREEN CHAMBER, GRIT CHAMBER & RAW SEWAGE SUMP

PROJECT NAME :

10 KLD SEWAGE TREATMENT PLANT
BASED ON TIGER BIO FILTER
TECHNOLOGY.

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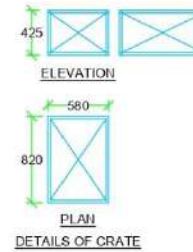
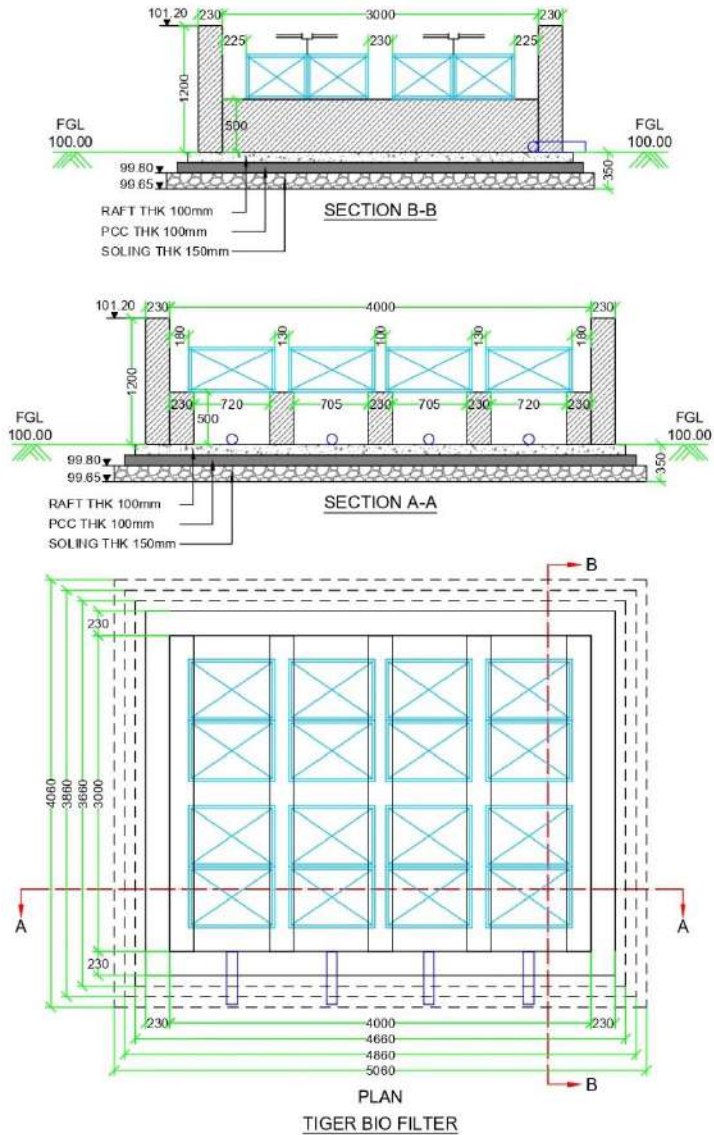
REVISION		
DATE	REMARKS	SIGNATURE

CLIENT : SWSM

DRAWING NAME:
SCREEN CHAMBER, GRIT CHAMBER
& RAW SEWAGE SUMP

PROJECT CODE : TBF-	DRAWING NO : D.03/SC.GCRS.S01	DATE : APRIL-2022
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PROJECT NAME :
10 KLD SEWAGE TREATMENT PLANT
BASED ON TIGER BIO FILTER
TECHNOLOGY.

NOTES

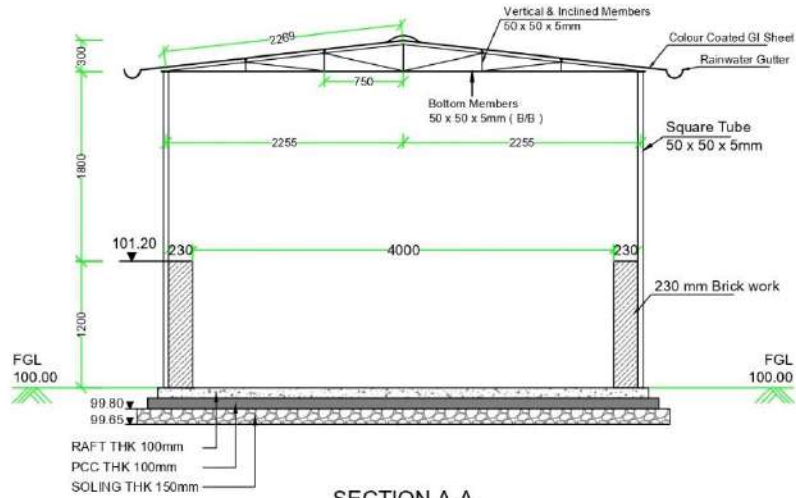
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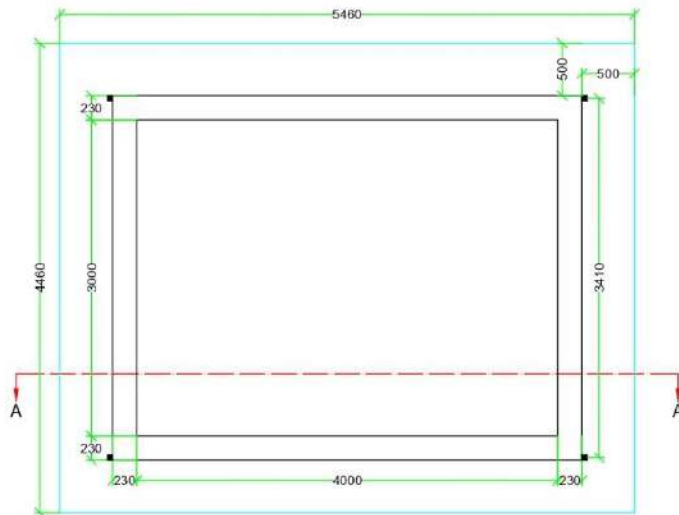
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DRAWING NAME :
TIGER BIO FILTER

PROJECT CODE : TBF-	DRAWING NO : D-04/TBF/01	DATE : APRIL-2022
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SECTION A-A



PLAN
TIGER BIO FILTER

PROJECT NAME :

10 KLD SEWAGE TREATMENT PLANT
BASED ON TIGER BIO FILTER
TECHNOLOGY.

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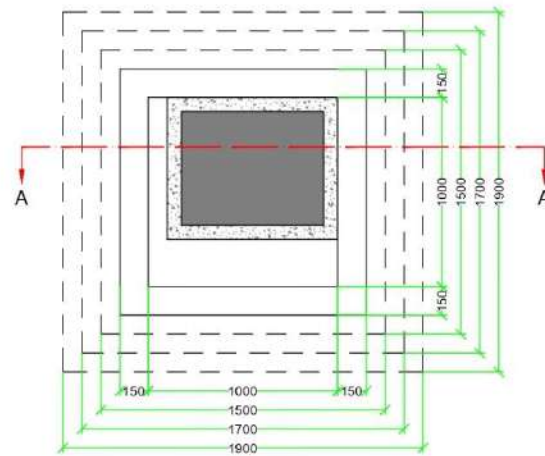
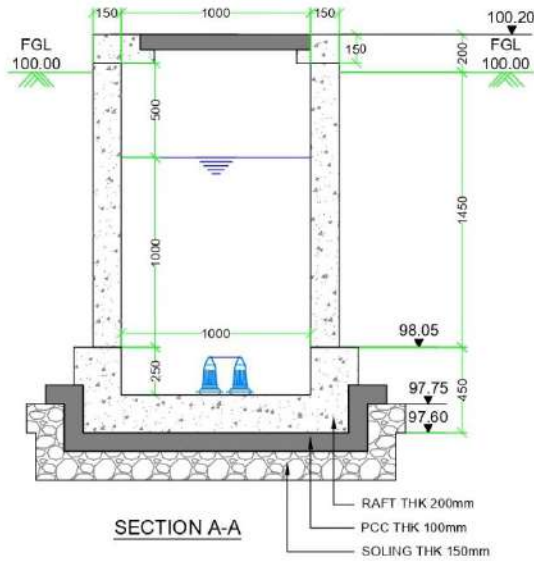
CLIENT : SWSM

DRAWING NAME :

TIGER BIO FILTER

PROJECT CODE : TBF-	DRAWING NO : D-04/TBF/02	DATE : APRIL-2022
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PLAN
FILTER FEED TANK

PROJECT NAME :

10 KLD SEWAGE TREATMENT PLANT
BASED ON TIGER BIO FILTER
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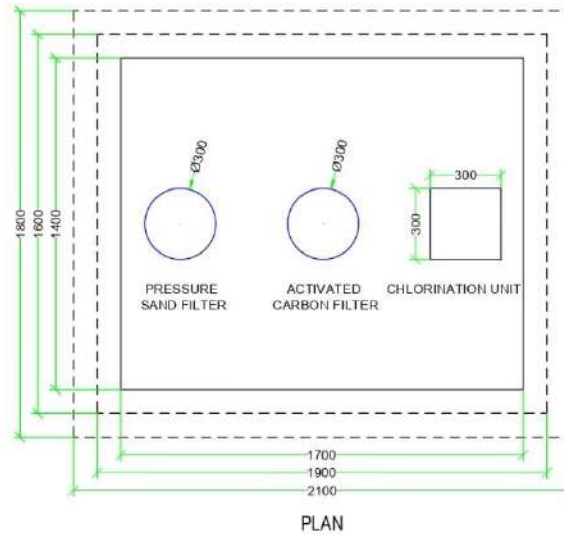
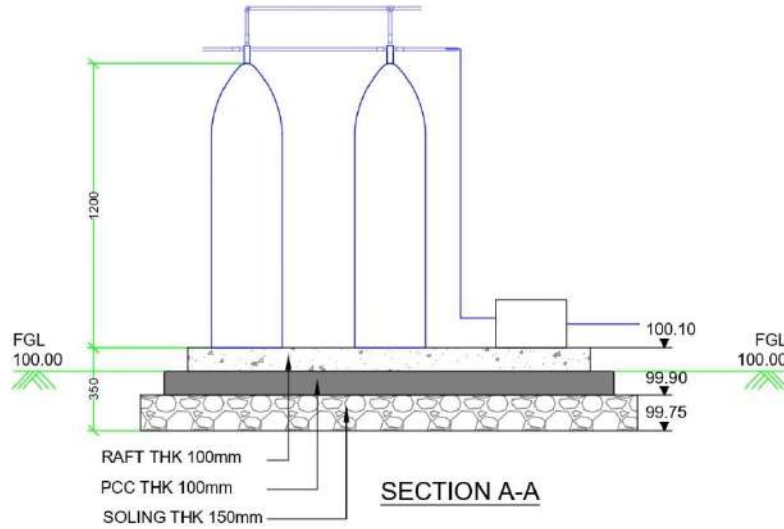
DRAWING NAME:

FILTER FEED TANK

PROJECT CODE : TBF-	DRAWING NO : D-05/FF TAD1	DATE : APRIL-2022
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PRESSURE SAND FILTER,
ACTIVATED CARBON FILTER & CHLORINATION UNIT

PROJECT NAME :

10 KLD SEWAGE TREATMENT PLANT
BASED ON TIGER BIO FILTER
TECHNOLOGY.

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REVISION		
DATE	REMARKS	SIGNATURE

CLIENT : SWSM

DRAWING NAME:
PRESSURE SAND FILTER,
ACTIVATED CARBON FILTER
& CHLORINATION UNIT

PROJECT CODE : TBF-	DRAWING NO : D-06PSF,ACF&CU01	DATE: APRIL-2022
DRAWN BY : L.D.B.	CHECKED BY : S.B.	SCALE : NTS.



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**50 KLD STP
BASED ON TBF TECHNOLOGY**

PROCESS CALCULATIONS
TIGER BIO FILTER OF 50 KLD CAPACITY

Design flow	=	50.00	KLD
	=	0.050	MLD
Peak flow factor	=	3.00	

1 SCREEN CHANNELS: MANUAL

No. of Manual Screen	=	1	No.
Average Flow	=	0.05	MLD
Peak Flow Factor	=	3.00	
Design Flow	=	Peak Flow	
	=	0.15	MLD
	=	6.25	m ³ /hr
	=	0.002	m ³ /sec
 Average Flow	=	0.05	MLD
	=	2.083	m ³ /hr
	=	0.001	m ³ /sec
 Design Flow in each Screen	=	0.002	m ³ /sec
		1	No.
	=	0.002	m ³ /sec
 Average Flow in each Screen	=	0.001	m ³ /sec
		1	No.
	=	0.001	m ³ /sec
 Maximum Velocity through Screen at Peak Flow	=	1.2	m/sec
Minimum Velocity through Screen at Average Flow	=	0.6	m/sec
 Clear Area of Opening through Screen for Peak Flow	=	0.002	m ³ /sec
		1.2	m/sec
	=	0.002	m ²
 Clear Area of Opening through Screen for Average Flow	=	0.001	m ³ /sec
		0.6	m/sec
	=	0.002	m ²
 Considering maximum Area of Opening through Screen	=	0.002	m ²

Clear Spacing of Bars	=	10	mm	
Thickness of Bars	=	5	mm	
Gross Area of Screen	=	$0.002 \times (10+5) / 10$		
	=	0.003	m ²	
Assuming Depth of Screen Channel	=	100.00	mm	
Gross Width of Screen	=	$0.003 / 0.1$		
	=	0.030	m	
No. of Bars	=	(Gross Width of Screen / Center to Center Spacing of Bars) - 1		
	=	$0.03 / ((10+5) / 1000) - 1$		
	=	1		
	=	1.0	Nos.	
Say	=	1	Nos.	
Width of Screen provided	=	(Number of Bars+1) x Clear Spacing + (Number of Bars x Bar Thickness)		
	=	$(1+1) \times 10 + (1 \times 5)$		
	=	25	mm	
Width Say	=	0.50	m	
Liquid Depth of Screen Channel provided	=	0.10	m	
L:B	=	4.00		
Length of Screen Channel provided	=	2.00	m	
Freeboard provided	=	1.00	m	Invert Depth of incoming sewer
Total Depth of Screen Chamber	=	1.10	m	
Velocity in Channel at Average Flow	=	Average Flow / Cross Sectional Area of Screen Channel		
	=	$0.001 / ((0.5 \times 0.1) / 1000 \times 1000)$		
	=	0.020	m/sec	
	>	0.300	m/sec	
Head Loss across Screen				
Head Loss across Screen	=	$0.0728 (V^2 - v^2)$		
V = Velocity through Screen at Peak Flow	=	Peak Flow through Screen Channel / Clear Area of Opening through Screen		
	=	1.000	m/sec	
v = Velocity in approach Channel at Peak Flow	=	Peak Flow through Screen Channel / Cross Sectional Area of Screen Channel		
	=	0.7	m/sec	
Head Loss across Screen at Peak Flow	=	0.040	m	
Head Loss across Screen at 50% Clogged Condition				
Velocity through Screen at 50% Clogged Condition at Peak Flow	=	2.000	m/sec	
Head Loss across screen at 50% Clogged Condition at Peak Flow	=	0.259	m	
	>	0.300	m/sec	OK

2 CONVENTIONAL GRIT CHAMBER: MANUAL

No. of Grit Chamber	=	1	
Average Flow	=	0.05	MLD
Peak Flow Factor	=	3.00	
Design Flow	=	Peak Flow	
Peak Flow	=	0.15	MLD
	=	150	m ³ /day
	=	6	m ³ /hr
	=	0.002	m ³ /sec
Design Flow to each Grit Chamber	=	150/1	
	=	150	m ³ /day
	=	6	m ³ /hr
	=	0.002	m ³ /sec
According to CPHEEO Manual			
Particle Size	=	0.15	mm
Specific Gravity	=	2.65	
Surface Overflow Rate for 100% removal efficiency in an ideal Grit Chamber	=	Settling Velocity of the minimum size of Particles to be removed	
	=	1.5	m/s
	=	1296	m ³ /m ² /day
Considering Efficiency of removal of desired Particles, $\eta = 75\%$ and Measure of Settling Basin Performance, $n = 1/8$ for very good performance	=	0.125	
Design Overflow Rate	=	857	m ³ /m ² /day
Surface Overflow Rate for 0.15 mm dia. Particle Size with Specific Gravity $S_s > 2.65$ Table 5.6	=	1555	m ³ /m ² /day
Considering Design Overflow Rate	=	960	m ³ /m ² /day
Area of Grit Chamber required	=	150	m ³ /day
		960	m ³ /m ² /day
	=	0.16	m ²
L:B ratio	=	2	
Length of Chamber provided	=	2.00	m
Width of Chamber provided	=	0.50	m
Hydraulic Retention Time (HRT) in Grit Chamber at Peak Flow	=	60	sec
Volume of Grit Chamber required	=	0.002x60	
	=	0.12	m ³

Depth required in Grit Chamber	=	$0.12 / (2 \times 0.5)$	
	=	0.12	m
Say	=	0.30	m
Grit Storage Depth	=	0.25	m
Total Liquid Depth required	=	0.55	m
Length of Grit Pit	=	0.50	m
Width of Grit Pit	=	0.50	m
Depth of Grit Pit	=	0.30	m
Free Board	=	1.10	m

3 RAW SEWAGE SUMP (WET WELL)

No. of Units	=	1	No.
Average Flow	=	0.05	MLD
	=	2.083	m ³ /hr
	=	0.0006	m ³ /sec

Peak Flow Factor	=	3.00	
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Design Flow	=	Peak Flow	
	=	0.15	MLD
	=	6	m ³ /hr
	=	0.002	m ³ /sec

Hydraulic Retention Time (HRT) at Average Flow	=	120	min
Volume required	=	$0.0006 \times 120 \times 60$	
	=	4	m ³

Hydraulic Retention Time (HRT) at Peak Flow	=	Volume / Average Flow	
	=	36	min
	<	30	min

Total Volume of Wet Well	=	4	m ³
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Side Water Depth (SWD) provided	=	1.10	m
Plan Area of Wet Well	=	3.93	m ²
Length/width of Sump required	=	1.98	m
Length/width of Sump provided	=	2.00	m
Volume of Sump provided	=	4.40	m ³
Length of Pump Pit	=	1.00	m
Width of Pump Pit	=	0.50	m
Depth of Pump Pit	=	0.25	m
Free Board	=	1.10	m

3.1 DESIGN STATEMENT-RSS E&M

Design Considerations

Design flow	=	0.05	MLD
	=	50.00	Cum/Day
Peak flow factor	=	3.00	

Pumping machinery

Friction factor for Fittings in Pressure Mains

Elbow 90 degrees	=	8
Friction Factor for each	=	1
Friction factor for all	=	8
Elbow 45 degrees	=	0
Friction Factor for each	=	0.75
Friction factor for all	=	0
Elbow 22 degrees	=	0
Friction Factor for each	=	0.5
Friction factor for all	=	0
Tee 90 degrees	=	0
Friction Factor for each	=	1.5
Friction factor for all	=	0
Tee in straight pipe	=	6
Friction Factor for each	=	0.3
Friction factor for all	=	1.8
Gate valve open	=	1
Friction Factor for each	=	0.4
Friction factor for all	=	0.4
Swing check	=	1
Friction Factor for each	=	2.5
Friction factor for all	=	2.5
Total friction factor	=	12.7

Stage		low	ave	peak
Average flow, cum / day	=		50.00	
Proportion	=	0.6	1	2
Design flow, cum / day	=	30	50	100
Hazen Williams C	=	140	140	140
Desired velocity, m/s	=	0.6	1.0	1.5
Number of Pumping hours	=	16.0	16.0	16.0
Area needed, sqm	=	0.0009	0.0009	0.0012
Dia needed, m	=	0.033	0.033	0.038
Dia needed, mm	=	33	33	38
Dia provided, mm (User)	=	63	63	63
Radius, m	=	0.032	0.032	0.032
Radius power 0.63	=	0.113	0.113	0.113
S power 0.54	=	0.045	0.074	0.112
S	=	0.003	0.008	0.017
Slope 1 in	=	316.6	123.0	58.0
length, m	=	15	15	15

Friction in pipeline, m	=	0.0	0.1	0.3
Velocity head, m	=	0.018	0.051	0.115
Friction factor in fittings	=	12.7	12.7	12.7
Friction in fittings, m	=	0.2	0.6	1.5
Static lift, m	=	3.0	3.0	3.0
Total head, m	=	3.2	3.6	4.5
Efficiency of pumpset	=	0.8	0.8	0.8
Discharge, lps	=	0.5	0.9	1.7
Discharge, Cum/Hr	=	1.9	3.1	6.3
Kw required	=	0.082	0.133	0.271
HP required	=	0.5	0.5	0.5
Number of Pumps	=	2	2	2

4 TIGER BIO FILTER

DESIGN STATEMENT-TBF1- 50 KLD

Number of pumping hours	=	16	Hrs	
Number of BMF tanks provided	=	1	Nos	
Design flow to each tank	=	50.00	Cum/day	
	=	3.13	Cum/ Hr for 16 Hr	
	=	0.87	lps	
Inlet BOD	=	250.00	mg/l	
Inlet TSS	=	400.00	mg/l	
BOD load applied	=	12.5	kg/day	
BOD uptake rate	=	0.1	Kg of BOD / Kg of worms	(0.5 - 1.0)
Worms required	=	125	Kg worms	
Sewage application rate	=	1.85	Cum/Sqm/day	(1 - 2 Cum/Sqm/day)
Area required	=	27.03	Sqm	
Area Provided	=	28	Sqm	
Area of each crate	=	0.4	Sqm	
Number of crates	=	70	Nos	
say	=	72	Nos	
Crate in longitudinal direction	=	18	Nos	
Crate in travers direction	=	4	Nos	
crates provided	=	72	Nos	OK
Width provided	=	4.00	m	
Length required	=	11.00	m	
Depth provided	=	1.2	m	

5 TERTIARY TREATMENT UNIT

Design Considerations

Design flow	=	0.05	MLD
	=	50.00	Cum/Day
Peak flow factor	=	3.00	

5.1 FILTER FEED TANK

Number of FFT provided	=	1	Nos
Number of operating hours	=	16	Hrs
Design flow	=	50.00	Cum/Day
	=	3.13	Cum/Hr
	=	0.00087	Cum/Sec
Hydraulic Retention time	=	60	min
Volume required	=	3.13	Cum
Depth	=	1.00	m
Civil Tanks			
Area	=	3.13	Sqm
Length/Width required	=	1.77	m
Length/Width provided	=	2.00	m
Freeboard provided	=	0.50	m
Volume Provided	=	4.00	Cum

DESIGN STATEMENT-TTU E&M

Design Considerations

Design flow	=	0.05	MLD
	=	50.00	Cum/Day
Peak flow factor	=	3.00	

Pumping machinery

Friction factor for Fittings in Pressure Mains

Elbow 90 degrees	=	5
Friction Factor for each	=	1
Friction factor for all	=	5
Elbow 45 degrees	=	0
Friction Factor for each	=	0.75
Friction factor for all	=	0
Elbow 22 degrees	=	0
Friction Factor for each	=	0.5
Friction factor for all	=	0
Tee 90 degrees	=	0
Friction Factor for each	=	1.5
Friction factor for all	=	0
Tee in straight pipe	=	5
Friction Factor for each	=	0.3
Friction factor for all	=	1.5
Gate valve open	=	1
Friction Factor for each	=	0.4
Friction factor for all	=	0.4
Swing check	=	1
Friction Factor for each	=	2.5
Friction factor for all	=	2.5
Total friction factor	=	9.4

Stage	low	ave	peak
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Average flow, cum / day	=		50.00	
Proportion	=	0.6	1	2
Design flow, cum / day	=	30	50	100
Hazen Williams C	=	140	140	140
Desired velocity, m/s	=	0.8	1.0	1.5
Number of Pumping hours	=	16.0	16.0	16.0
Area needed, sqm	=	0.0007	0.0009	0.0012
Dia needed, m	=	0.029	0.033	0.038
Dia needed, mm	=	29	33	38
Dia provided, mm (User)	=	63	63	63
Radius, m	=	0.032	0.032	0.032
Radius power 0.63	=	0.113	0.113	0.113
S power 0.54	=	0.060	0.074	0.112
S	=	0.005	0.008	0.017
Slope 1 in	=	185.9	123.0	58.0
length, m	=	20	20	20
Friction in pipeline, m	=	0.1	0.2	0.3
Velocity head, m	=	0.033	0.051	0.115
Friction factor in fittings	=	9.4	9.4	9.4
Friction in fittings, m	=	0.3	0.5	1.1
Static lift, m	=	8.0	8.0	8.0
Total head, m	=	8.3	8.5	9.1
Efficiency of pumpset	=	0.8	0.8	0.8
Discharge, lps	=	0.5	0.9	1.7
Discharge, Cum/Hr	=	1.9	3.1	6.3
Kw required	=	0.140	0.229	0.464
HP provided	=	0.5	0.5	1.0
Number of Pumps	=	2	2	2

5.2 PRESSURE SAND FILTER

Number of unit provided	=	1	Nos.
Designed @ 16 hrs working for flow of	=	3.13	m ³ /h
Loading rate	=	12.00	m ³ /m ² /h
Area of DMF	=	0.26	m ²
Dia of DMF	=	0.58	m
Provided	=	0.600	m
Backwash water			
Backwash velocity	=	15.00	m/hr
backwash flowrate	=	4.07	m ³ /h
Backwash volume for 20 mins	=	1.36	m ³

5.3 ACTIVATED CARBON FILTER

Number of unit provided	=	1	Nos.
Designed @ 16 hrs working for flow of	=	3.13	m ³ /h
Loading rate	=	12.00	m ³ /m ² /h
Area of ACF	=	0.26	m ²
Dia of ACF	=	0.58	m
Provided	=	0.600	m

Backwash water			
Backwash velocity	=	15.00	m/hr
backwash flowrate	=	4.07	m ³ /h
Backwash volume for 20 mins	=	1.36	m ³

5.4 CHLORINE DOSING SYSTEM NaOCl DOSING SYSTEM

Average Flow	=	3.13	m ³ /hr
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Design Chlorine Dosage (Max)	=	3	mg/l
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Concentration of Chlorine in commercially available NaOCl	=	10%	
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Design NaOCl Dosage	=	30	mg/l
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Operating hours	=	16.0	hr
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Quantity of NaOCl required	=	3.125 X 30 X 16 / 1000	
	=	1.50	Kg/day

Design Strength of NaOCl Solution	=	100%	
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Volume of NaOCl Solution	=	1.5 / (1 X 1000)	
	=	0.010	m ³

No. of Dosing Tanks provided	=	1	Nos.
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Volume of each Dosing Tank	=	0.01 / 1	
	=	0.01	m ³
	=	100	Litres

No. of Working NaOCl Dosing Pump provided	=	1	No.
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Capacity of each NaOCl Dosing Pump required	=	Total Volume of NaOCl Solution / (No. of Dosing pumps)	
	=	0.01 / (1 X 16)	

	=	0.001	m ³ /hr
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	=	1.00	LPH
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Capacity of each NaOCl Dosing Pump provided	=	1.00	LPH
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No. of Standby NaOCl Dosing Pump provided	=	1	No.
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SIZING DETAILS (CIVIL)
TIGER BIO FILTER OF 50 KLD CAPACITY

S I. N o	Unit name	N o s	Leng th	Widt h	Height			Soling		PCC		Raft		RCC Wall thk	Bric k Wall thk	Slab Thk	Steel - HCR M/ Kg/C
					SW	FB	Tota	offs	Thk	offs	Thk	offs	Thk				
		N	m	m	m	m	m	m	m	m	m	m	m	m	m	m	
1	Screen Chamber	1	2.0	0.5	0.1	1.0	1.1	0.2	0.3	0.1	0.1	0.2	0.1	0.1			80
2	Grit Chamber	1	2.0	0.5	0.5	1.1	1.6	0.2	0.3	0.1	0.1	0.2	0.1	0.1			80
3	Raw Sewage Sump	1	2.0	2.0	1.1	1.1	2.2	0.2	0.3	0.1	0.1	0.2	0.2	0.1		0.1	100
4	TBF Bed 50 KLD	1	11.0	4.0			1.2	0.2	0.3	0.1	0.1	0.2	0.1		0.2		60
5	Filter Feed tank	1	2.0	2.0	1.0	0.5	1.5	0.2	0.3	0.1	0.1	0.2	0.2	0.1		0.1	100
6	Filter Platform	1	1.7	2.3				0.2	0.3	0.1	0.1	0.2	0.1				60

Assumptions

Incoming Sewer Invert 1.0 m Below Ground level
Method of excavation Mechanical means

Underground strata		soil	Muru m	Soft roc	hard	Total
0.0 to 1.5 m	=	25	25	25	25	100
1.5 m to 3.0 m	=	25	25	25	25	100
3.0 to 4.5 m	=	25	25	25	25	100
4.5 to 6.0	=	25	25	25	25	100
		%	%	%	%	%

**TIGER BIO FILTER OF 50 KLD CAPACITY
BILL OF QUANTITIES**

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
1	Excavation for foundation / pipe trenches in earth, soils of all types, sand, gravel and soft murum, including removing the excavated material upto a distance of 50 metres and lifts as below, stacking and spreading as directed, normal dewatering, preparing the bed for foundation and excluding backfilling, etc. complete. (Bd-A-1/259)				
	0.0 to 1.5 m	37.70	Cum	150.00	5,655.00
	1.5 to 3.0 m	13.18	Cum	164.00	2,161.60
	3.0 to 4.5 m	0.00	Cum	178.00	0.00
	4.5 to 6.0 m	0.00	Cum	192.00	0.00
	MJP/ SSR/ 2021-22 / Section E / Excavation Item No.1/ Page no. 42				
2	Excavation for foundation / pipe trenches in hard murum and boulders, W.B.M. road including removing the excavated material upto a distance of 50 M beyond the area and lifts as below, stacking and spreading as directed by Engineer-in-charge, normal dewatering, preparing the bed for foundation and excluding backfilling, etc. complete. (Bd-A-3/259)			8.00	
	0.0 to 1.5 m	37.70	Cum	192.00	7,238.40
	1.5 to 3.0 m	13.18	Cum	206.00	2,715.10
	3.0 to 4.5 m	0.00	Cum	220.00	0.00
	4.5 to 6.0 m	0.00	Cum	234.00	0.00
	MJP/ SSR/ 2021-22/ Section E/ Excavation Item No.3, Page no. 42				
3	Excavation for foundation / pipe trenches in soft rock and old cement and lime masonry foundation asphalt road including removing the excavated material upto a distance of 50 M beyond the area and lifts as below, stacking as directed by Engineer-in-charge, normal dewatering, preparing the bed for foundation and excluding backfilling, etc. complete. (Bd-A-4/259)				
	0.0 to 1.5 m	37.70	Cum	572.00	21,564.40
	1.5 to 3.0 m	13.18	Cum	597.00	7,868.50
	3.0 to 4.5 m	0.00	Cum	622.00	0.00
	4.5 to 6.0 m	0.00	Cum	647.00	0.00

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
	MJP/ SSR/ 2021-22 / Section E/ Excavation Item No.5, Page no. 42				
4	Excavation for foundation / pipe trenches in hard rock and concrete road by chiselling, wedging, line drilling by mechanical means or by all means other than blasting including trimming and levelling the bed, removing the excavated material upto a distance of 50 metres beyond the area and lifts as below, stacking as directed by Engineer-in-charge, normal dewatering, excluding backfilling, etc. complete by all means. (Bd-A-6/259)				
	0.0 to 1.5 m	37.70	Cum	1,017.00	38,340.90
	1.5 to 3.0 m	13.18	Cum	1,042.00	13,733.60
	3.0 to 4.5 m	0.00	Cum	1,067.00	0.00
	4.5 to 6.0 m	0.00	Cum	1,092.00	0.00
	MJP/ SSR/ 2021-22 / Section E/ Excavation Item No.7, Page no. 43				
5	Providing dry trap/ granite/ quartzite/ gneiss, rubble stone soling in 15 cm to 20 cm thick layers including hand packing and compacting, etc. complete. (Bd-A-12/264)	31.27	Cum	1,175.00	36,742.30
	MJP/ SSR/ 2021-22 / Section E/ Excavation Item No.18, Page no. 46				
6	Providing and laying in situ Cement Concrete M-15 of trap/ granite / quartzite / gneiss metal for foundation and bedding including bailing out water, form work, compaction, curing, etc. complete. (Cement 5.90 bags / cum) Spec. No. - Bd E /1 Page No. 287 and B- 7, Page No. 38	8.98	Cum	5,640.00	50,647.20
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.1, Page no.49				
Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
7	Providing and laying in situ Cement Concrete of trap/ granite / quartzite / gneiss metal for RCC work in foundation like raft, grillage, strip foundation and footing of RCC columns and steel stanchions including normal dewatering, form work, compaction, finishing and curing, etc. complete. (By weigh batching and mix design for M250 and M-300 only. Use of L&T, A.C.C., Ambuja, Birla Gold, Manikgad, Rajashree, etc. cement is permitted.) (Excluding M.S. or Tor reinforcement)	10.11	Cum	7,448.00	75,299.30
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE/ Item No.2, Page no. 49				
8	Providing and casting in situ C.C. of trap / granite/ quartzite / gneiss metal of approved quality for RCC works as per detailed drawings and designs or as directed by Engineer-in-charge including normal dewatering, centering, form work, compaction, finishing the formed surfaces with C.M. 1:3 of sufficient minimum thickness to give a smooth and even surface wherever necessary or roughening if special finish is to be provided and curing, etc. complete. (By weigh batching and mix design for M-250 and M-300 only. Use of L&T, A.C.C., Ambuja, Birla Gold, Manikgad, Rajashree, etc. cement is permitted.) (Excluding M.S. or Tor reinforcement)	0.00	Cum	8,624.00	0.00
	For Beams / Braces / Lintels In RCC M-300				
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.4, Page no. 50				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
9	Providing and casting in situ C.C. of trap / granite/ quartzite / gneiss metal of approved quality for RCC works as per detailed drawings and designs or as directed by Engineer-in-charge including normal dewatering, centering, form work, compaction, finishing the formed surfaces with C.M. 1:3 of sufficient minimum thickness to give a smooth and even surface wherever necessary or roughening if special finish is to be provided and curing, etc. complete. (By weigh batching and mix design for M-250 and M-300 only. Use of L&T, A.C.C., Ambuja, Birla Gold, Manikgad, Rajashree, etc. cement is permitted.) (Excluding M.S. or Tor reinforcement)	1.34	Cum	9,247.00	12,391.00
	Slabs / Landings / Vertical Walls / Waist Slabs / Steps for Staircase In RCC M-300				
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.5, / Page no. 50				
10	Providing and casting in situ C.C. of trap / granite/ quartzite / gneiss metal of approved quality for RCC works as per detailed drawings and designs or as directed by Engineer-in-charge including normal dewatering, centering, form work, compaction, finishing the formed surfaces with C.M. 1:3 of sufficient minimum thickness to give a smooth and even surface wherever necessary or roughening if special finish is to be provided and curing, etc. complete. (By weigh batching and mix design for M-250 and M-300 only. Use of L&T, A.C.C., Ambuja, Birla Gold, Manikgad, Rajashree, etc. cement is permitted.) (Excluding M.S. or Tor reinforcement)	6.26	Cum	9,218.00	57,704.70
	Chajjas / Parapets / Curtain Walls /Partition Walls / Pardies In RCC M-300				
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.6 / Page no. 51				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
11	Providing and fixing in position steel bar reinforcement of various diameters for RCC piles, caps, footings, foundations, slabs, beams, columns, canopies, staircases, newels, chajjas, lintels, pardies, copings, fins, arches, etc. as per detailed designs, drawings and schedules; including cutting, bending, hooking the bars, binding with wires or tack welding and supporting as required, etc. complete (including cost of binding wire). (Bd-F-17/306)				
	c) Corrosion Resistant Steel (Fe 500)	1.51	MT	70,658.00	1,06,693.60
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.8 / Page no. 52				
12	Providing and fixing mild steel grill work for windows/ ventilators of 20 Kg/Sqm. As per drawings including necessary welding and painting with one coat of anticorrosive paint and two coats of oil painting, etc. complete. (Bd-U-1/537)	4.54	Sqm	1,895.00	8,603.30
	MJP/ SSR/ 2021-22 / SECTION - F : IRON AND STRUCTURAL STEEL WORK Item No.1 / Page no. 47				
13	Providing structural steel work in rolled stanchions fixed with connecting plates or angle cleats as in main and cross beams, hip and jack rafters, purlins connecting to truss members and like as per detailed designs and drawings or as directed by Engineer-in-charge including cutting, fabricating, hoisting, erecting, fixing in position, making riveted / bolted / welded connections and one coat of anticorrosive paint and over it two coats of oil painting, etc. complete. (Bd-C-3/275)	0.75	MT	71,286.00	53,253.50
	MJP/ SSR/ 2021-22 / SECTION - F :: IRON AND STRUCTURAL STEEL WORK Item No.3, Page no. 47				
14	Providing and fixing corrugated galvanised iron sheets of 0.63 mm thick (24B .W .G.) for roofing without wind tiles including fastening with galvanised iron screws and bolts , lead and bitumen washers as per drawing etc. complete. (Weight of 5.5 kg/sq.m.).	75.40	Sqm	777.00	58,585.80

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
	PWD / SSR 2020-21 / Roofing and Ceiling SSR Item No.38.04 Reference No. Bd.R.5, Page No. 453 Item No.1133, Page no. 224				
15	Providing fly ash brick masonry with conventional / I.S. type bricks in cement mortar 1:6 in superstructure including striking joints, raking out joints, watering and scaffolding etc. Complete	14.87	Cum	6,305.00	93,755.40
	PWD / SSR 2020-21 / Brick Masonry SSR Item No.27.13 Reference No. As director by engineer incharge and BDG- 2 and 5 Item No.893, Page no. 190				
16	Providing internal cement plaster 12 mm thick in single coat in cement mortar 1:5 without neeru finish to concrete or brick surfaces, in all positions including scaffolding and curing etc. complete.	81.65	Sqm	257.00	20,984.10
	PWD / SSR 2020-21 / Plastering and Pointing SSR Item No. 32.03 Reference No. Bd. L.2 Page No. 368 Item No.950, Page no. 201				
17	Providing rough cast cement plaster externally in two coats to concrete, brick or stone masonry surfaces in all positions with base coat of 12 to 15 mm thick in C.M. 1:4 and rough cast treatment 12 mm thick in proportion 1:11 / 2:3 including scaffolding and fourteen days curing complete.	47.50	Sqm	529.00	25,127.50
	PWD / SSR 2020-21 / Plastering and Pointing SSR Item No. 32.12 Reference No. Bd.L.8 Page No. 370 Item No.957, Page no. 201				
18	Providing and applying white-wash in two coats on old / new plastered or masonry surfaces and asbestos cement sheets including scaffolding and preparing the surface by brushing and brooming down etc. complete.	47.50	Sqm	10.00	475.00
	PWD / SSR 2020-21 / Colouring SSR Item No. 36.03 Reference No. Bd. P. I Page No. 411 Item No.1091, Page no. 218				
19	Providing and applying colour-wash of approved colour and shade in one coat to new surface including scaffolding, brushing and brooming down (excluding base coats of white wash) etc. complete.	47.50	Sqm	8.00	380.00

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
	PWD / SSR 2020-21 / Colouring SSR Item No. 36.04 Reference No. Bd. P.2 Page No. 412 Item No.1092, Page no. 218				
20	Dewatering the excavated trenches and pools of water in the building trenches / pipeline trenches, well works by using pumps and other devices including disposing off water to safe distance as directed by Engineer-in-charge (including cost of machinery, labour, fuel), etc. complete. (Bd-A-9/261)	40.00	HP/ Hr.	77.00	3,080.00
	MJP/ SSR/ 2021-22 / Section E/ Excavation Item No.14, Page no.45				
21	Refilling the trenches with available excavated stuff with soft material first over pipeline and then hard material in 15 cm layers with all leads and lifts including consolidation, surcharging, etc. complete.	130.87	Cum	84.00	10,993.10
	MJP/ SSR/ 2021-22 / Section E/ Excavation Item No.15, Page no. 45				
22	Transportation as per STATEMENT VI Including loading, unloading and stacking Earth (4.8 Cum) lead 15 Km	101.54	Cum	604.45	61,375.90
	Electromechanical Items				
23	Screen (Manual) of size 1.6 m length x 0.5 m width of SS 304 MOC and Manual hand rake for cleaning screen of SS handle 1 m in length and cleaning area of 6 nos 5 mm SS rod of total length 200 mm straight and 50 mm of 90 degree bend.	0.80	Sqm	35,000.00	28,000.00
24	Grit pump				
	Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below				
	MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION - Pumps, Page no. 6, 7 of size 1.6 m length x0.5 m width of SS304 MOC				
	1 HP (Up to 9000 LPH)	1.00	No	68,654.00	68,654.00

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
25	Raw Sewage Pumps				
	Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below				
	MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION - Pumps, Page no. 6, 7				
	1 HP (Up to 9000 LPH)	2.00	Nos	68,654.00	1,37,308.00
26	TTU Feed pumps				
	Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below				
	MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION - Pumps, Page no. 6, 7				
	1 HP (Up to 9000 LPH)	2.00	Nos	68,654.00	1,37,308.00
27	Pressure Sand Filter of FRP / MSEP vessel with suitable thickness to withstand a water pressure including MPV or 5 Valve system and PVC / UPVC / MSEP interconnecting and underdrain piping including fittings, with standard filter media layer with minimum depth of filter sand 1.0 m supported by gravels. The piping arrangement should provide sufficient pressure for backwash operations and avoid loss of sand during backwash operation. Suitable openings to be provided to ease addition and removal the media.				
	Dia 0.6 m x 2 m minimum height	1.00	Nos	33,000.00	33,000.00
28	Activated Carbon Filter of FRP / MSEP vessel with suitable thickness to withstand a water pressure including MPV or 5 Valve system and PVC / UPVC / MSEP interconnecting and underdrain piping including fittings, with standard filter media layer with minimum depth of Activated Carbon 1.0 m supported by gravels. The piping arrangement should provide sufficient pressure for backwash operations and avoid loss of Activated carbon during backwash operation. Suitable openings to be provided to ease addition and removal the media.				
	Dia 0.6 m x 2 m minimum height	1.00	Nos	33,000.00	33,000.00

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
29	NaOCl Chlorinator Pump Diaphragm Type / peristaltic type / Solenoid Max Flow Rate Upto 10LPH Power Source Electric Phase Single Material PP / PTFE(Teflon) Voltage 230 Volt Frequency 50Hz				
	Mixing Tank of 100 Ltrs capacity	100.00	Ltrs	8.00	800.00
	Dosing Pump	2.00	Nos	15,000.00	30,000.00
30	Control Panel				
	Designing, Supplying, Installing, commissioning & testing of PLC Panel. Including PLC with CPU & Power supply unit, power supply cables interfacing cards, interfacing cables, wireless modules with 25% extra quantity of all accessories.	1.00	No	32,272.00	32,272.00
	MJP/ MECH/ ELECT / SSR/ 2021-22/ SECTION 19 - SA [SCADA & AUTOMATION] Item no. 1.4 Page no. 69				
31	Supplying and erecting Fully Automatic Star Delta starter to operate squirrel cage induction motor working on 380- 440 Volt, 3 phase, 50 Hz with no volt coil, over load element, and ON - OFF push buttons, with necessary material and connected to supply, etc complete. Starter with original sheet steel encloser.				
	> 7.5 HP & Up to 12.5 HP	6.00	nos	7,150.00	42,900.00
	MJP /MECH/ ELECT/ SSR/ 2021-22 SECTION 10 - LG [L.T. SWITCHGEAR AND PROTECTION] Item no. LG 3 Page no. 27				
32	Main power supply cable				
	3 core PVC insulated, PVC sheathed copper conductor flat submersible cable				
	Supplying and erecting, Flat flexible submersible cable with, Copper Conductor, PVC insulated, and PVC sheathed.				
	3 core 16 sq mm	25.00	m	549.00	13,725.00

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
33	Power cables				
	Aluminium conductor 4 Core, XLPE / PVC insulated & armoured cable				
	Supplying and erecting, XLPE / PVC insulated, armoured cable 1100 V grade with ISI mark Four core, solid / stranded aluminium conductor with 6 mm thick 25 mm width M.S. spacer with G.I. Earth wire 6 sq mm, complete erected on wall / on pole with 25 X 3 mm M.S. clamps or in provided trench in an approved manner.				
	4 Core 6 sq mm	50.00	m	137.00	6,850.00
	MJP MECH/ ELECT/ SSR/ 2021-22 SECTION 12 - CB [L.T. CABLE] Item no. CB 6 Page no. 35				
34	Control Cables				
	Copper conductor PVC insulated, Unarmoured control cable				
	Supplying and erecting Un-armoured control cable with ISI mark stranded / solid copper conductor 1.1 kV grade complete erected on wall / panel or in provided trench in an approved manner.				
	4 core 2.5 sq mm	50.00	m	137.00	6,850.00
	MJP MECH/ ELECT/ SSR/ 2021-22/ SECTION 12 - CB [L.T. CABLE] Item no. CB 8-2 Page no. 36				

Plumbing Items					
Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
35	Providing and supplying in standard lengths ISI mark rigid unplasticised PVC pipes suitable for potable water with solvent cement joints including cost of couplers, as per IS specification no. 4985 / 1988 excluding GST levied by GOI and GOM in all respect, including transportation, freight charges, inspection charges, loading, unloading, conveyance to the departmental stores and stacking the same in closed shed duly protected from sun rays and rains including cost of jointing material i.e. solvent cement, etc. complete (selffit type to be jointed with cement solvent).				
	1) 10% of cost of pipes shall be considered for cost of PVC specials for estimate purpose only. 2) One coupler and required cement solvent shall be provided with each full length pipe cost of which is included in rates below.				
	MJP/ SSR/ 2021-22 / SECTION – I(II) P.V.C. PIPES, Page no.77				
1	Raw Sewage pump to TBF Distribution				
a	Main header				
	63 mm.	15.00	m	149.00	2,235.00
	PVC Specials- 10%				223.50
b	Distribution				
	63 mm.	10.00	m	149.00	1,490.00
	PVC Specials- 10%				149.00
2	TBF collection to FFT (gravity)				
a	Main header				
	63 mm.	30.00	m	149.00	4,470.00
	PVC Specials- 10%				447.00
b	collection tributary				
	63 mm.	5.00	m	149.00	745.00
	PVC Specials- 10%				74.50
3	TTU Plumbing				
	63 mm.	20.00	m	149.00	2,980.00
	PVC Specials- 10%				298.00
4	TBF distribution				
	63 mm.	5.00	m	149.00	745.00
	PVC Specials- 10%				74.50

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
36	Labour				
	Plumber	4.00	days	641.00	2,564.00
	Helper	4.00	days	579.00	2,316.00
	MJP/ SSR/ 2021-22 / SECTION - B LABOUR & MACHINERY , Page no. 14				
37	Providing double flange sluice valve confirming for IS- 14846 including worn gear arrangements as per test pressure, stainless steel spindle, caps, including inspection charges, transportation upto departmental store, unloading, stacking excluding GST levied by GOI & GOM in all respect etc. complete.				
	Sluice valves - PN -1 (Without by pass)				
	Raw Sewage pump				
	65 mm.	2.00	Nos	4,966.00	9,932.00
	Filter Feed Pump				
	65 mm.	2.00	Nos	4,966.00	9,932.00
	MJP/ SSR/ 2021-22 / SECTION - I(XII) : PIPES APPURTENANCES , Page no. 132				
38	Providing and supplying ISI mark CI D/F reflux valves (non-return valves) of following dia including railway freight, inspection charges, unloading from railway wagon, loading into truck, transportation upto departmental stores, unloading, stacking excluding GST levied by GOI & GOM in all respect etc. complete. Reflux valves as per I.S.5312 Part I (1984)				
	Without by pass arrangement -PN -1				
	Raw Sewage pump				
	65 mm.	2.00	Nos	3,885.00	7,770.00
	Filter Feed Pump				
	65 mm.	2.00	Nos	3,885.00	7,770.00
	MJP/ SSR/ 2021-22 / SECTION - I(XII) : PIPES APPURTENANCES , Page no. 131				
	Bio media Items				
39	Supplying of Specially designed container for holding Filter media including Lightweight Expanded Clay Aggregates size (8-30 mm) and Bio media including mixture of woodchips Vermicompost, cocopeat and bacterial culture with special worms per designed quantity including transportation & fixing in position as directed etc. complete.	72.00	Nos	4,750.00	3,42,000.00
	Market rate				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
40	Rapid sand Gravity filter sand At Source (Godhara, Gokak, Kanhan, Yesagi sand)	6.85	Cum	1,730.00	11,850.50
	MJP/ SSR/ 2021-22 / SECTION- A MATERIALS Item No. 39 Page no. 13				
41	Trasnsportation Godhara to Pune distance by Road 660 Km.	6.85	Cum	11,031.37	75,564.90
	MJP/ SSR/ 2021-22 / SECTION - C : TRANSPORTATION Page no. 23				
42	Stone Aggregate 20 mm	6.85	Cum	900.00	6,165.00
	MJP/ SSR/ 2021-22 / SECTION- A MATERIALS Item No. 49,50,51 Page no. 13				
43	Transportation as per STATEMENT VI Including loading, unloading and stacking				
	Manure or sludge (5.52 Cum) lead 25 Km	26.45	Cum	747.48	19,770.90
	MJP/ SSR/ 2021-22 / SECTION - C : TRANSPORTATION Page no. 23				
NET TOTAL Rs.					18,55,603.00

MEASUREMENT SHEET - SCREEN CHAMBER, GRIT CHAMBER AND RAW SEWAGE SUMP

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	Screen And Grit chamber						
1	Excavation				2.20		
A	0.0 to 1.5 m	1	5.20	2.70	1.5	21.06	Cum
	soil					5.27	Cum
	Murum					5.27	Cum
	Soft rock					5.27	Cum
	hard rock					5.27	Cum
B	1.5 to 3.0 m	1	5.2	2.70	0.7	9.83	Cum
	soil					2.46	Cum
	Murum					2.46	Cum
	Soft rock					2.46	Cum
	hard rock					2.46	Cum
C	3.0 to 4.5 m	1	4.2	2.20	0	0	Cum
	soil					0	Cum
	Murum					0	Cum
	Soft rock					0	Cum
	hard rock					0	Cum
D	4.5 to 6.0 m	1	4.2	2.20	0	0	Cum
	soil					0	Cum
	Murum					0	Cum
	Soft rock					0	Cum
	hard rock					0	Cum
2	Soling						
	Screen	1	3.20	1.20	0.30	1.16	Cum
	Grit	1	3.20	0.50	0.30	0.48	Cum
	extra for grit chamber	1	0.00	0.60	0.30	0	Cum
					Total for grit	0.48	Cum
3	PCC M20						
	Screen	1	2.80	1.00	0.10	0.28	Cum
	Grit	1	2.80	0.50	0.10	0.14	Cum
		1	0.00	0.40	0.20	0	Cum
	Internal slope	1	Area	0.09	0.50	0.05	Cum
	Internal slope	1	Area	0.05	0.50	0.03	Cum
					Total for grit	0.22	Cum
4	Raft M30						
	Screen	1	2.60	0.90	0.15	0.36	Cum
	Grit	1	2.60	0.50	0.15	0.2	Cum
		1	0.00	0.30	0.15	0	Cum
					Total for grit	0.2	Cum
5	RCC Wall						
	Screen						
	Long Wall	2	2.20	0.10	1.30	0.58	Cum

MEASUREMENT SHEET - SCREEN CHAMBER, GRIT CHAMBER AND RAW SEWAGE SUMP

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	Short Wall	2	0.70	0.10	1.30	0.19	Cum
				Total for screen		0.77	Cum
	Grit						
	Long Wall (extra than screen chamber)	1	0.00	0.10	1.85	0	Cum
	Short Wall	2	0.50	0.10	1.85	0.19	Cum
				Total for grit		0.19	Cum
6	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	80	Cum	1.52	0.13	MT
7	Fabrication work in Frame and Grating for Access						
	Screen	1	2.20	0.70		1.54	Sqm
	Grit	1	2.20	0.60		1.32	Sqm
					Total	2.86	Sqm
8	Removing excess excavated material out of site						
	Screen chamber	1	2.20	0.70	1.10	1.7	Cum
	Grit Chamber	1	2.20	0.50	1.65	1.82	Cum
	soling, PCC, Raft volume					2.62	Cum
	Total Volume					6.14	Cum
	bulkage @ 40%					8.6	Cum
9	Refilling and compaction						
	Total Excavation					30.89	Cum
	Deduction for tank volume, soling, PCC, Raft					6.14	Cum
	Refilling and compaction volume					24.75	Cum

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	Raw Sewage Sump						
1	Excavation				2.80		
A	0.0 to 1.5 m	1	5.9	5.90	1.5	52.22	Cum
	soil					13.06	Cum
	Murum					13.06	Cum
	Soft rock					13.06	Cum
	hard rock					13.06	Cum
B	1.5 to 3.0 m	1	4.90	4.90	1.3	31.22	Cum
	soil					7.81	Cum
	Murum					7.81	Cum
	Soft rock					7.81	Cum
	hard rock					7.81	Cum
C	3.0 to 4.5 m	1	4.90	4.90	0	0	Cum

MEASUREMENT SHEET - SCREEN CHAMBER, GRIT CHAMBER AND RAW SEWAGE SUMP

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	soil					0	Cum
	Murum					0	Cum
	Soft rock					0	Cum
	hard rock					0	Cum
D	4.5 to 6.0 m	1	3.90	3.90	0	0	Cum
	soil					0	Cum
	Murum					0	Cum
	Soft rock					0	Cum
	hard rock					0	Cum
2	Soling						
	RSS	1	3.30	3.30	0.30	3.27	Cum
3	PCC M20						
	RSS	1	2.90	2.90	0.10	0.85	Cum
4	Raft M30						
	RSS	1	2.70	2.70	0.20	1.46	Cum
5	RCC Wall						
	Long Wall	2	2.30	0.15	2.40	1.66	Cum
	Short Wall	2	2.00	0.15	2.40	1.44	Cum
					Total	3.1	Cum
6	Beams						
	Beam 1	0	2.00	0.2	0.3	0	Cum
	Beam 2	0	2.00	0.2	0.3	0	Cum
					Total	0	Cum
7	Slab	1	2.30	2.30	0.15	0.8	Cum
	Deduction for manhole	-1	1.20	0.70	0.15	-0.13	Cum
					Total	0.67	Cum
8	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	100	Cum	5.23	0.53	MT
9	Fabrication work in Frame and Grating for Access						
	RSS	1	1.20	0.70		0.84	Sqm
10	Removing excess excavated material out of site						
	RSS	1	2.30	2.30	2.20	11.64	Cum
	soling, PCC, Raft volume					5.58	Cum
	Total Volume					17.22	Cum
	bulkage @ 40%					24.11	Cum
11	Refilling and compaction						

MEASUREMENT SHEET - SCREEN CHAMBER, GRIT CHAMBER AND RAW SEWAGE SUMP

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	Total Excavation					83.44	Cum
	Deduction for tank volume, soling, PCC, Raft					17.22	Cum
	Refilling and compaction volume					66.22	Cum
12	Dewatering						
	5 Days x 4 hours/day	days	5	hours / day	4	20	Hrs

MEASUREMENT SHEET - TIGER BIO FILTER

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	TIGER BIO FILTER						
1	Excavation				0.50		
A	0.0 to 1.5 m	1	12.66	5.66	0.5	35.83	Cum
	soil					8.96	Cum
	Murum					8.96	Cum
	Soft rock					8.96	Cum
	hard rock					8.96	Cum
2	Soling						
	TBF	1	12.46	5.46	0.30	20.41	Cum
3	PCC M20						
	TBF	1	12.06	5.06	0.10	6.11	Cum
4	Raft M30						
	TBF	1	11.86	4.86	0.10	5.77	Cum
5	Brick Wall						
	TBF						
	Long Wall	2	11.46	0.23	1.20	6.33	Cum
	Short Wall	2	4.00	0.23	1.20	2.21	Cum
	Crate Support Wall	5	11.00	0.23	0.50	6.33	Cum
						Total for T	14.87
							Cum
6	Plaster						
	Internal						
	Crate Support Wall						
	Long Wall	6	11.00		0.50	33	Sqm
	Wall top	5	11.00		0.23	12.65	Sqm
	Long Wall	2	11.00		1.20	26.4	Sqm
	Short Wall	2	4.00		1.20	9.6	Sqm
						Total	81.65
							Sqm
	External						
	Long Wall	2	11.46		1.20	27.51	Sqm
	Short Wall	2	4.46		1.20	10.71	Sqm
	Wall Top	1	30.92	0.3		9.28	Sqm
						Total	47.50
							Sqm
7	External-white-wash	1				47.50	Sqm
8	External-colour-wash	1				47.50	Sqm
9	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	60	Cum	5.77	0.35	MT
10	Removing excess excavated material out of site						
	soling, PCC, Raft volume					32.29	Cum
	Total Volume					32.29	Cum
	bulkage @ 40%					45.21	Cum

MEASUREMENT SHEET - TIGER BIO FILTER

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
11	Refilling and compaction						
	Total Excavation					35.83	Cum
	Deduction for tank volume, soling, PCC, Raft					32.29	Cum
	Refilling and compaction volume					3.54	Cum
12	MS Fabricated Shed						
	TBF-II Shed in Fabrication work Shed Size-12 m X 5 m x		12.00	5.00	3.00		
	for column 50*50*5 Unit Weight 6.97 kg/m	10	3.00	6.97	kg/m	209.10	KG
	for truss 50*50*3 Unit Weight 3.71 kg/m	5	5.00	3.71	kg/m	92.75	KG
	for principle rafter 50*50*3 Unit Weight	10	2.90	3.71	kg/m	107.59	KG
	for strut rafter 50*50*3 Unit Weight 3.71 kg/m	10	0.20	3.71	kg/m	7.42	KG
	for central strut rafter 50*50*3 Unit Weight	5	0.30	3.71	kg/m	5.57	KG
	for bottom frame below truss 50*50*3 Unit Weight 3.71 kg/m	1	34.00	3.71	kg/m	126.14	KG
	for perlin 30*30*3 Unit Weight 2.51 kg/m	5	13.00	2.51	kg/m	163.15	KG
	for Base Plate 150*150*10 mm	20	0.15	0.15	0.010	35.33	KG
					Total Wei	747.04	Kg
						0.75	MT
13	corrugated galvanised iron sheets	2	13.00	2.90		75.4	Sqm

MEASUREMENT SHEET - FILTER FEED TANK

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
8	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	100	Cum	4.33	0.44	MT
9	Fabrication work in Frame and Grating for Access						
	FFT	1	1.20	0.70		0.84	Sqm
10	Removing excess excavated material out of site						
	FFT	1	2.30	2.30	1.50	7.94	Cum
	soling, PCC, Raft volume					5.58	Cum
	Total Volume					13.52	Cum
	bulkage @ 40%					18.93	Cum
11	Refilling and compaction						
	Total Excavation					47.64	Cum
	Deduction for tank volume, soling, PCC, Raft					13.52	Cum
	Refilling and compaction volume					34.12	Cum
12	Dewatering						
	5 Days x 4 hours/day	days	5	hours/day	4	20	Hrs

MEASUREMENT SHEET - FILTER PLATFORM

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	FILTER PLATFORM						
1	Excavation				0.55		
A	0.0 to 1.5 m	1	2.9	3.50	0.55	5.59	Cum
	soil					1.4	Cum
	Murum					1.4	Cum
	Soft rock					1.4	Cum
	hard rock					1.4	Cum
2	Soling						
	Filter Platform	1	2.70	3.30	0.30	2.68	Cum
3	PCC M20						
	Filter Platform	1	2.30	2.90	0.10	0.67	Cum
4	Raft M30						
	Filter Platform	1	2.10	2.70	0.15	0.86	Cum
5	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	60	Cum	0.86	0.06	MT
6	Removing excess excavated material out of site						
	soling and PCC volume					3.35	Cum
	Total Volume					3.35	Cum
	bulkage @ 40%					4.69	Cum
7	Refilling and compaction						
	Total Excavation					5.59	Cum
	Deduction for tank volume, soling, PCC, Raft					3.35	Cum
	Refilling and compaction volume					2.24	Cum

MEASUREMENT SHEET - ELECTROMECHANICAL WORKS

Sr. No.	Item Description	Nos.	Unit
1	Screen (Manual) of size 1.6 m length x 0.5 m width of SS 304 MOC and Manual hand rake for cleaning screen of SS handle 1 m in length and cleaning area of 6 nos 5 mm SS rod of total length 200 mm straight and 50 mm of 90 degree bend.	1	No
2	Grit pump Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION - Pumps, Page no. 6, 7 of size 1.6 m length x 0.5 m width of SS304 MOC 1 HP (Up to 9000 LPH)	1	No
3	Raw Sewage Pumps Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION - Pumps, Page no. 6, 7 1 HP (Up to 9000 LPH)	2	Nos
4	TTU Feed pumps Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION - Pumps, Page no. 6, 7 1 HP (Up to 9000 LPH)	2	Nos
5	Pressure Sand Filter of FRP / MSEP vessel with suitable thickness to withstand a water pressure including MPV or 5 Valve system and PVC / UPVC / MSEP interconnecting and underdrain piping including fittings, with standard filter media layer with minimum depth of filter sand 1.0 m supported by gravels. The piping arrangement should provide sufficient pressure for backwash operations and avoid loss of sand during backwash operation. Suitable openings to be provided to ease addition and removal the media. Dia 0.6 m x 2 m minimum height	1	Nos
6	Activated Carbon Filter of FRP / MSEP vessel with suitable thickness to withstand a water pressure including MPV or 5 Valve system and PVC / UPVC / MSEP interconnecting and underdrain piping including fittings, with standard filter media layer with minimum depth of Activated Carbon 1.0 m supported by gravels. The piping arrangement should provide sufficient pressure for backwash operations and avoid loss of Activated carbon during backwash operation. Suitable openings to be provided to ease addition and removal the media. Dia 0.6 m x 2 m minimum height	1	Nos
7	PurAll Tablet Chlorinator + cartridge	0	nos

MEASUREMENT SHEET - ELECTROMECHANICAL WORKS

Sr. No.	Item Description	Nos.	Unit
7	NaOCl Chlorinator Pump Diaphragm Type / peristaltic type / Solenoid Max Flow Rate Upto 10LPH Power Source Electric Phase Single Material PP / PTFE(Teflon) Voltage 230 Volt Frequency 50Hz		
a	Mixing Tank of 100 Ltrs capacity	1	Nos
b	Dosing Pump	2	Nos
8	Control Panel		
	Designing, Supplying, Installing, commissioning & testing of PLC Panel. Including PLC with CPU & Power supply unit, power supply cables interfacing cards, interfacing cables, wireless modules with 25% extra quantity of all accessories.		
	PLC Panel	1	No
	MJP/ MECH/ ELECT / SSR/ 2021-22/ SECTION 19 - SA [SCADA & AUTOMATION] Item no. 1.4 Page no. 69		
9	Supplying and erecting Fully Automatic Star Delta starter to operate squirrel cage induction motor working on 380- 440 Volt, 3 phase, 50 Hz with no volt coil, over load element, and ON - OFF push buttons, with necessary material and connected to supply, etc complete. Starter with original sheet steel encloser.		
	> 7.5 HP & Up to 12.5 HP	6	nos
	1 nos extra starter considered as spare.		
	MJP /MECH/ ELECT/ SSR/ 2021-22 SECTION 10 - LG [L.T. SWITCHGEAR AND PROTECTION] Item no. LG 3 Page no. 27		
10	Main power supply cable		
	3 core PVC insulated, PVC sheathed copper conductor flat submersible cable		
	Supplying and erecting, Flat flexible submersible cable with, Copper Conductor, PVC insulated, and PVC sheathed.		
	3 core 16 sq mm	25	m
11	Power cables		
	Aluminium conductor 4 Core, XLPE / PVC insulated & armoured cable		
	Supplying and erecting, XLPE / PVC insulated, armoured cable 1100 V grade with ISI mark Four core, solid / stranded aluminium conductor with 6 mm thick 25 mm width M.S. spacer with G.I. Earth wire 6 sq mm, complete erected on wall / on pole with 25 X 3 mm M.S. clamps or in provided trench in an approved manner.		
	4 Core 6 sq mm	50	m
	MJP MECH/ ELECT/ SSR/ 2021-22 SECTION 12 - CB [L.T. CABLE] Item no. CB 6 Page no. 35		
12	Control Cables		
	Copper conductor PVC insulated, Unarmoured control cable		

MEASUREMENT SHEET - ELECTROMECHANICAL WORKS

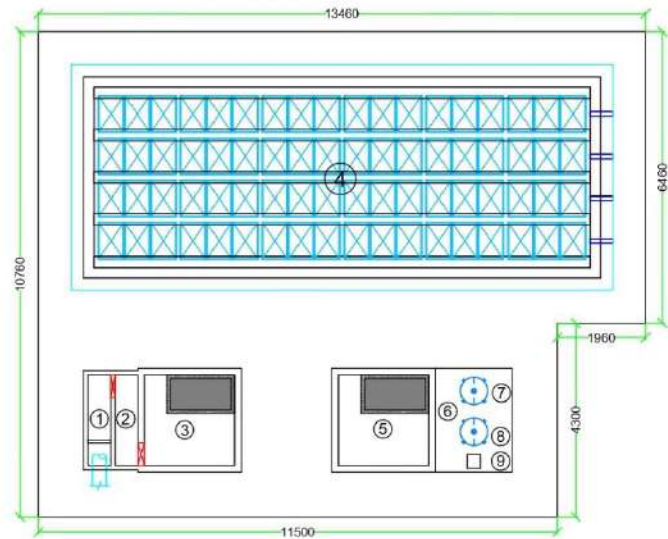
Sr. No.	Item Description	Nos.	Unit
	Supplying and erecting Un-armoured control cable with ISI mark stranded / solid copper conductor 1.1 kV grade complete erected on wall / panel or in provided trench in an approved manner.		
	4 core 2.5 sq mm	50	m
	MJP MECH/ ELECT/ SSR/ 2021-22/ SECTION 12 - CB [L.T. CABLE] Item no. CB 8-2 Page no. 36		

MEASUREMENT SHEET - PLUMBING

Sr. No.	Item Description	Nos.	L (m)	B (m)	Quantity	Unit
	Providing and supplying in standard lengths ISI mark rigid unplasticised PVC pipes suitable for potable water with solvent cement joints including cost of couplers, as per IS specification no. 4985 / 1988 excluding GST levied by GOI and GOM in all respect, including transportation, freight charges, inspection charges, loading, unloading, conveyance to the departmental stores and stacking the same in closed shed duly protected from sun rays and rains including cost of jointing material i.e. solvent cement, etc. complete (selffit type to be jointed with cement solvent).					
	1) 10% of cost of pipes shall be considered for cost of PVC specials for estimate purpose only. 2) One coupler and required cement solvent shall be provided with each full length pipe cost of which is included in rates below.					
	MJP/ SSR/ 2021-22 / SECTION – I(II) P.V.C. PIPES, Page no.77					
1	Raw Sewage pump to TBF Distribution					
a	Main header	Dia	63			
	63 mm.	1	15		15	m
	PVC Specials- 10%					
b	Distribution					
	63 mm.	1	10		10	m
	PVC Specials- 10%					
2	TBF collection to FFT (gravity)					
a	Main header					
	63 mm.	1	30		30	m
	PVC Specials- 10%					
b	collection tributary					
	63 mm.	1	5		5	m
	PVC Specials- 10%					
3	TTU Plumbing	Dia	63			
	63 mm.	1	20		20	m
	PVC Specials- 10%					
4	TBF distribution			No. of beds		
	63 mm.	1	5	1	5	m
	PVC Specials- 10%					
5	Labour	Nos	Days			
	Plumber	1	4		4	days
	Helper	1	4		4	days
6	Sluice valves					

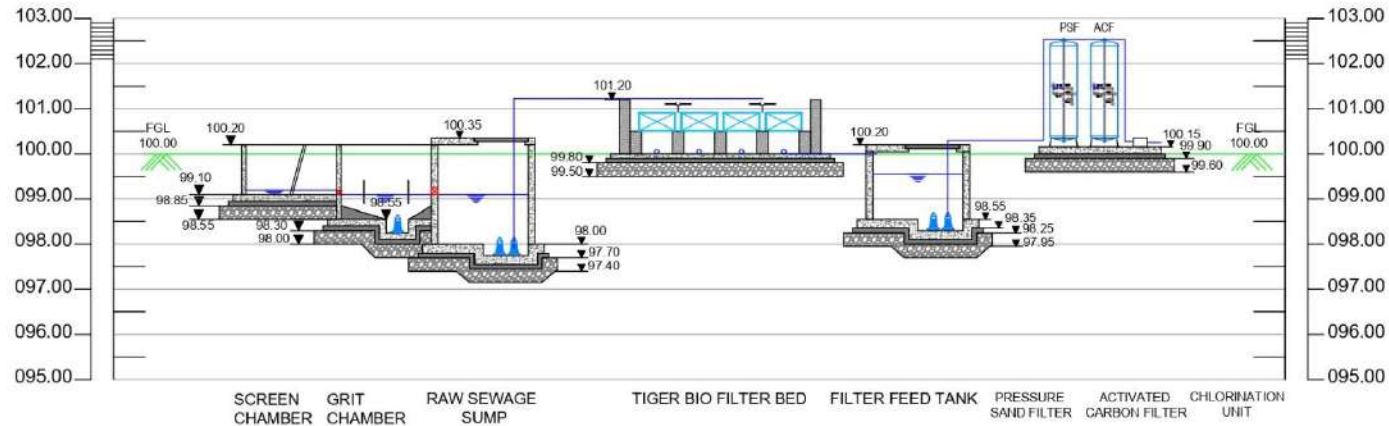
MEASUREMENT SHEET - PLUMBING

Sr. No.	Item Description	Nos.	L (m)	B (m)	Quantity	Unit
	Providing double flange sluice valve confirming for IS- 14846 including worn gear arrangements as per test pressure, stainless steel spindle, caps, including inspection charges, transportation upto departmental store, unloading, stacking excluding GST levied by GOI & GOM in all respect etc. complete.					
	MJP/ SSR/ 2021-22 / SECTION - I(XII) : PIPES APPURTENANCES , Page no. 132					
	Raw Sewage pump					
	65 mm.	2			2	Nos
	Filter Feed Pump					
	65 mm.	2			2	Nos
7	Reflux valves (non-return valves)					
	Providing and supplying ISI mark CI D/F reflux valves (non-return valves) of following dia including railway freight, inspection charges, unloading from railway wagon, loading into truck, transportation upto departmental stores, unloading, stacking excluding GST levied by GOI & GOM in all respect etc. complete. Reflux valves as per I.S.5312 Part I (1984)					
	MJP/ SSR/ 2021-22 / SECTION - I(XII) : PIPES APPURTENANCES , Page no. 131					
	Raw Sewage pump					
	65 mm.	2			2	Nos
	Filter Feed Pump					
	65 mm.	2			2	Nos



Process Unit Details								
Sr. No	Description	No	L/D	B	H	FB	Total H	MOC
			m.	m.	m.	m.	m.	
1	Screen Chamber	1	2.00	0.50	0.10	1.00	1.10	RCC
2	Grit Chamber	1	2.00	0.50	0.55	1.10	1.65	RCC
3	Raw Sewage Sump	1	2.00	2.00	1.10	1.10	2.20	RCC
4	Tiger Bio Filter	1	11.00	4.00	-	-	1.20	BRICK
5	Filter Feed Tank	1	2.00	2.00	1.00	0.50	1.50	RCC
6	Filter Platform	1	1.70	2.30	-	-	-	RCC
7	Pressure Sand Filter	DIA	0.60	-	-	-	2.00	MSEF
8	Activated Carbon Filter	DIA	0.60	-	-	-	2.00	MSEF
9	Chlorination Unit	1	-	-	-	-	-	-

PLANT LAYOUT
AREA = 136 SQM.



HYDRAULIC FLOW DIAGRAM

PROJECT NAME :
50 KLD SEWAGE TREATMENT PLANT
BASED ON TIGER BIO FILTER
TECHNOLOGY.

NOTES

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- All inner dimensions are including plastering in structural drawings unless otherwise mentioned.
- The structural component and BOQ prepared considering Finished Ground Level (+00.00) and Existing Ground Level (+00.00). Temporary Bench Mark 1 (ax. 397) Kept on the Top level of Road on North East side of the site.
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REVISION		
DATE	REMARKS	SIGNATURE

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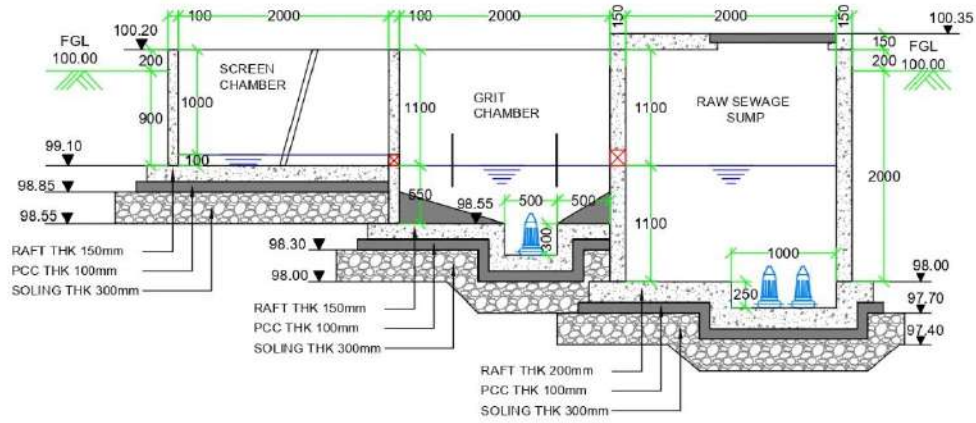
DRAWING NAME:

PLANT LAYOUT &
HYDRAULIC FLOW DIAGRAM

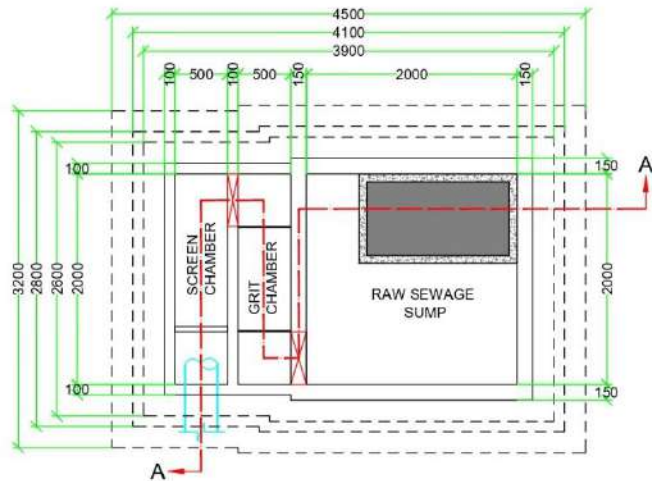
PROJECT CODE: TBF-	DRAWING NO: D-01/PL & HFD/01	DATE: JUNE-2021
DRAWN BY: L.D.B.	CHECKED BY: S.B.	SCALE: NTS.

TBF ENVIRONMENTAL SOLUTIONS PVT. LTD.
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SECTION A-A



PLAN

SCREEN CHAMBER, GRIT CHAMBER & RAW SEWAGE SUMP

PROJECT NAME
50 KLD SEWAGE TREATMENT PLANT
BASED ON TIGER BIO FILTER
TECHNOLOGY.

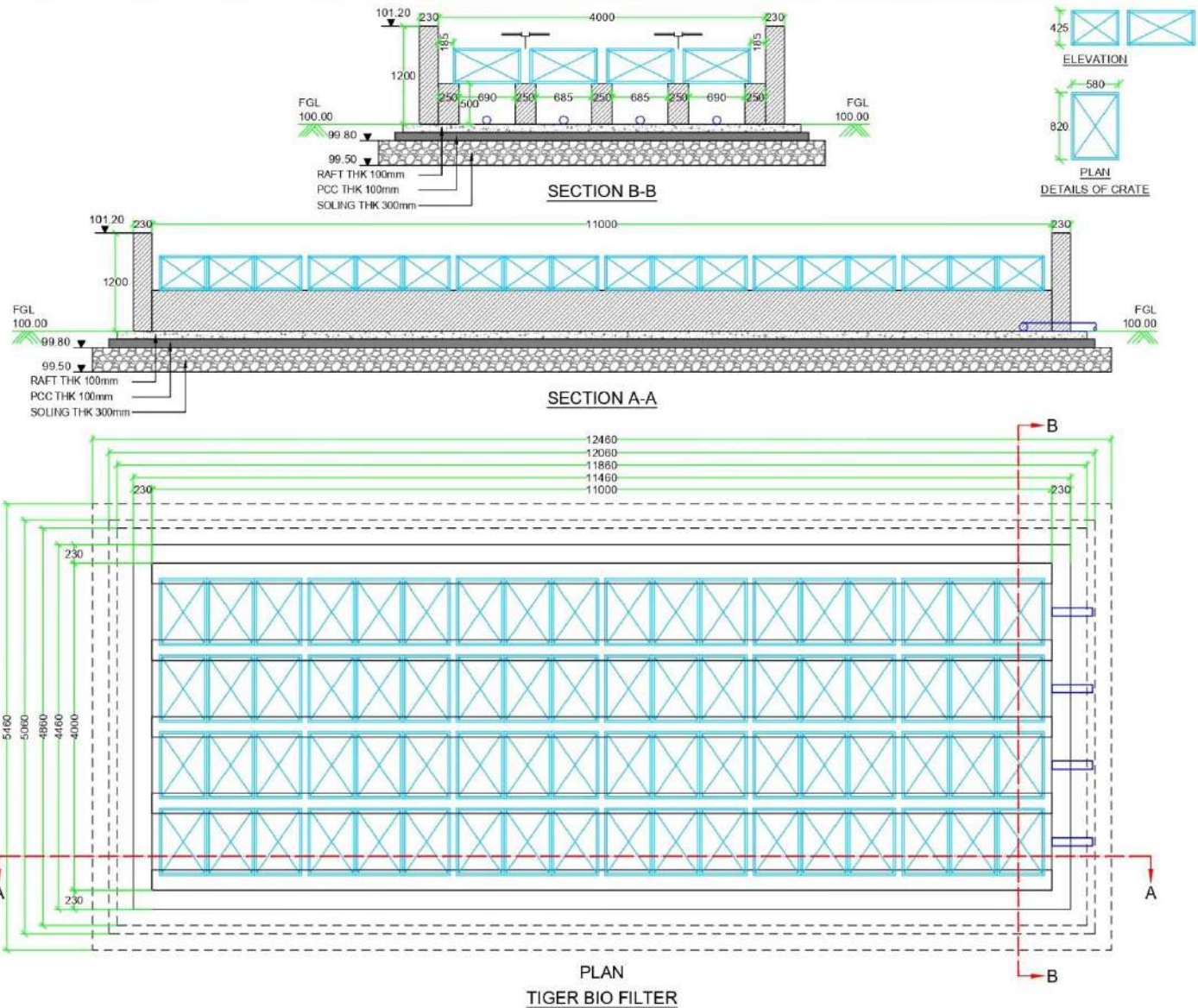
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REVISION		
DATE	REMARKS	SIGNATURE

CLIENT : SWSM
DRAWING NAME:
SCREEN CHAMBER, GRIT CHAMBER
& RAW SEWAGE SUMP

PROJECT CODE : TBF-	DRAWING NO : D.02/SC.GC&RS/01	DATE : JUNE-2021
DRAWN BY : L.D.B.	CHECKED BY : S.B.	SCALE : NTS.

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PROJECT NAME
 50 KLD SEWAGE TREATMENT PLANT
 BASED ON TIGER BIO FILTER
 TECHNOLOGY.

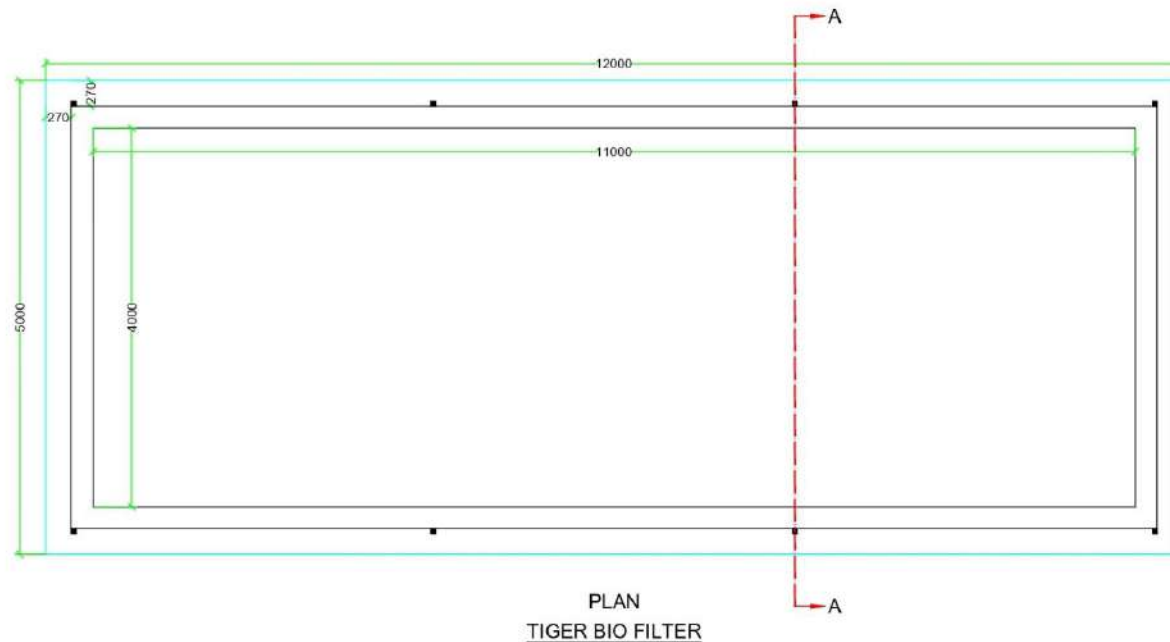
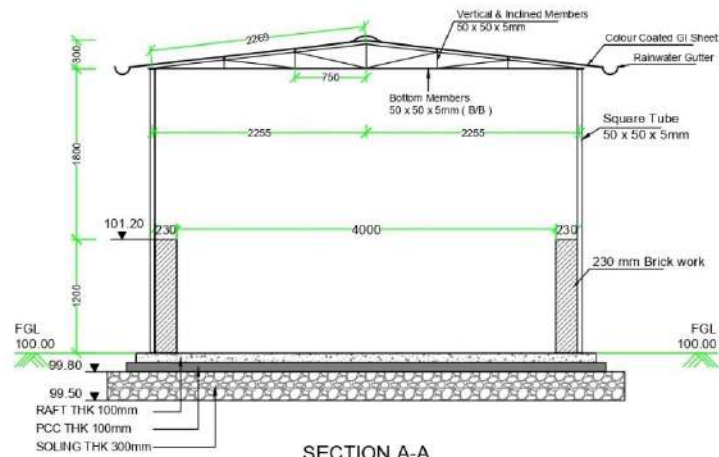
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REVISION		
DATE	REMARKS	SIGNATURE

CLIENT : SWSM
 DRAWING NAME:
 TIGER BIO FILTER

PROJECT CODE : TBF-	DRAWING NO : D-03/TBF/01	DATE : JUNE 2021
DRAWN BY : L.D.B.	CHECKED BY : S.B.	SCALE : NTS.

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PROJECT NAME
50 KLD SEWAGE TREATMENT PLANT
BASED ON TIGER BIO FILTER
TECHNOLOGY.

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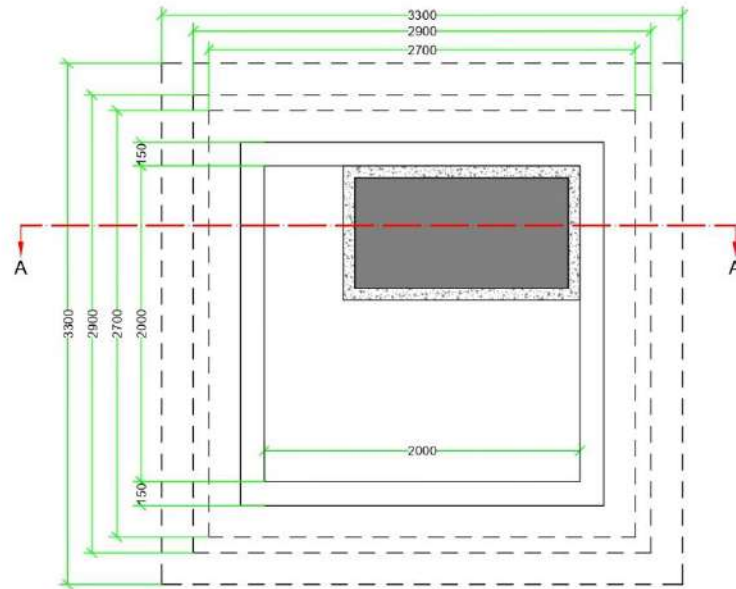
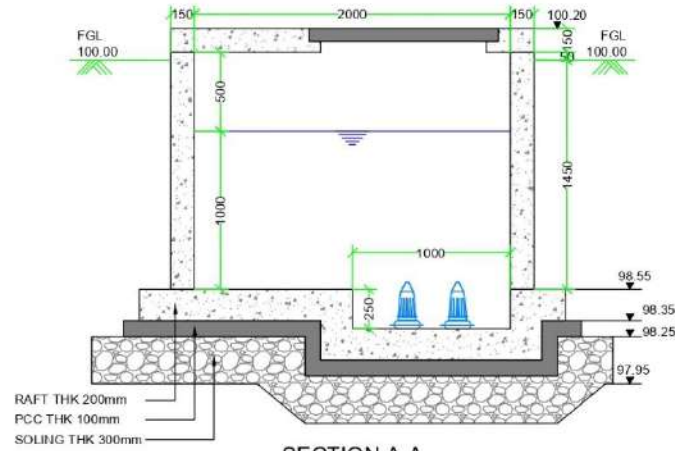
CLIENT : SWSM

DRAWING NAME:
TIGER BIO FILTER

PROJECT CODE : TBF-	DRAWING NO : D-03/TBF/02	DATE : JUNE 2021
DRAWN BY : L.D.B.	CHECKED BY : S.B.	SCALE : NTS.

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PROJECT NAME
50 KLD SEWAGE TREATMENT PLANT
BASED ON TIGER BIO FILTER
TECHNOLOGY.

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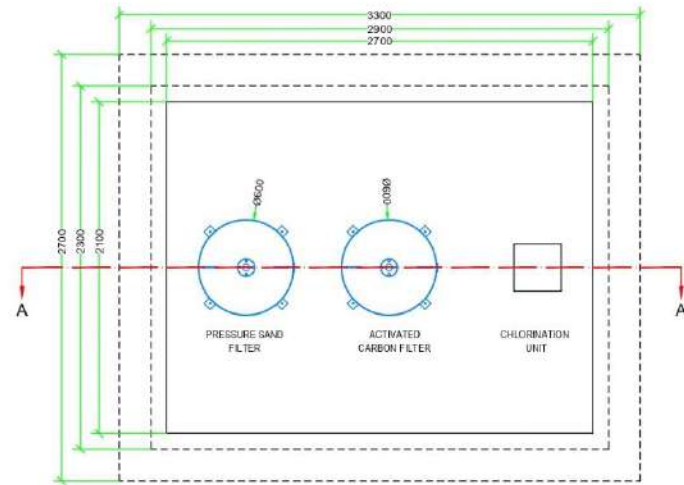
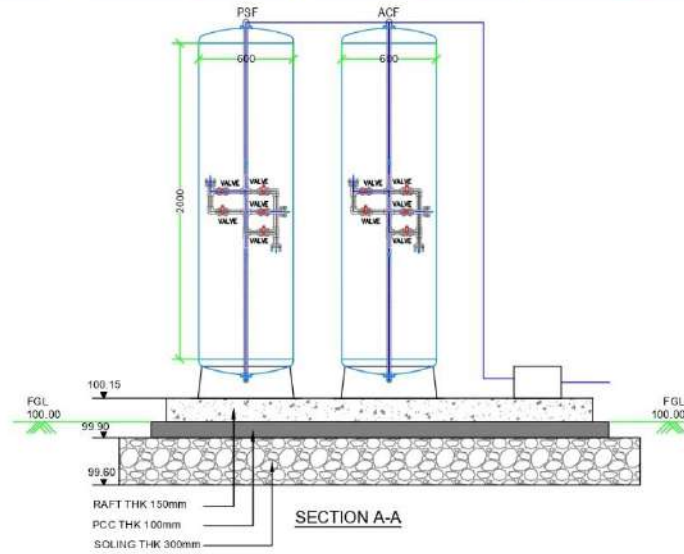
REVISION		
DATE	REMARKS	SIGNATURE

CLIENT : SWSM
DRAWING NAME:
FILTER FEED TANK

PROJECT CODE : TBF-	DRAWING NO : D-04/FFT/01	DATE : JUNE 2021
DRAWN BY : L.D.B.	CHECKED BY : S.B.	SCALE : NTS.

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PLAN
PRESSURE SAND FILTER,
ACTIVATED CARBON FILTER & CHLORINATION UNIT

PROJECT NAME
50 KLD SEWAGE TREATMENT PLANT
BASED ON TIGER BIO FILTER
TECHNOLOGY.

- NOTES**
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REVISION		
DATE	REMARKS	SIGNATURE

CLIENT : SWSM

DRAWING NAME
PRESSURE SAND FILTER,
ACTIVATED CARBON FILTER
& CHLORINATION UNIT

PROJECT CODE : TBF-	DRAWING NO : D-05/PSF,ACF&CLU01	DATE : JUNE-2021
DRAWN BY : L.D.B.	CHECKED BY : S.B.	SCALE : NTS.

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**100 KLD STP
BASED ON TBF TECHNOLOGY**

PROCESS CALCULATIONS
TIGER BIO FILTER OF 100 KLD CAPACITY

Design flow	=	100.00	KLD
	=	0.100	MLD
Peak flow factor	=	3.00	
1 SCREEN CHANNELS: MANUAL			
No. of Manual Screen	=	1	No.
Average Flow	=	0.10	MLD
Peak Flow Factor	=	3.00	
Design Flow	= Peak Flow		
	=	0.30	MLD
	=	12.50	m ³ /hr
	=	0.003	m ³ /sec
Average Flow	=	0.10	MLD
	=	4.167	m ³ /hr
	=	0.001	m ³ /sec
Design Flow in each Screen	=	0.003	m ³ /sec
		1	No.
	=	0.003	m ³ /sec
Average Flow in each Screen	=	0.001	m ³ /sec
		1	No.
	=	0.001	m ³ /sec
Maximum Velocity through Screen at Peak Flow	=	1.2	m/sec
Minimum Velocity through Screen at Average Flow	=	0.6	m/sec
Clear Area of Opening through Screen for Peak Flow	=	0.003	m ³ /sec
		1.2	m/sec
	=	0.003	m ²
Clear Area of Opening through Screen for Average Flow	=	0.001	m ³ /sec
		0.6	m/sec
	=	0.002	m ²

Head Loss across screen at 50% Clogged Condition at Peak Flow	=	0.103	m
	>	0.300	m/sec

2 CONVENTIONAL GRIT CHAMBER: MANUAL

No. of Grit Chamber	=	1	
Average Flow	=	0.10	MLD
Peak Flow Factor	=	3.00	
Design Flow	=	Peak Flow	
Peak Flow	=	0.30	MLD
	=	300	m ³ /day
	=	13	m ³ /hr
	=	0.003	m ³ /sec

Design Flow to each Grit Chamber	=	300/1	
	=	300	m ³ /day
	=	13	m ³ /hr
	=	0.003	m ³ /sec

According to CPHEEO
Manual

Particle Size	=	0.15	mm
Specific Gravity	=	2.65	

Surface Overflow Rate for
100% removal efficiency in an
ideal Grit Chamber = Settling Velocity of the minimum size of Particles to be removed

	=	1.5	m/s
	=	1296	m ³ /m ² /day

Considering Efficiency of
removal of desired Particles, η
= 75%

and Measure of Settling Basin
Performance,
 $n = 1/8$ for very good
performance

Design Overflow Rate	=	857	m ³ /m ² /day
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Surface Overflow Rate for
0.15 mm dia. Particle Size
with Specific Gravity $S_s > 2.65$
Table 5.6

Considering Design Overflow Rate	=	960	m ³ /m ² /day
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Area of Grit Chamber required =

	=	300	m ³ /day
	=	960	m ³ /m ² /day

L:B ratio =

	=	0.31	m ²
	=	2	

Length of Chamber provided	=	2.00	m
Width of Chamber provided	=	0.50	m
Hydraulic Retention Time (HRT) in Grit Chamber at Peak Flow	=	60	sec
Volume of Grit Chamber required	=	0.003x60	
	=	0.18	m ³
Depth required in Grit Chamber	=	0.18 / (2x0.5)	
	=	0.18	m
Say	=	0.30	m
Grit Storage Depth	=	0.25	m
Total Liquid Depth required	=	0.55	m
Length of Grit Pit	=	0.50	m
Width of Grit Pit	=	0.50	m
Depth of Grit Pit	=	0.30	m
Free Board	=	1.15	m

3 RAW SEWAGE SUMP (WET WELL)

No. of Units	=	1	No.
Average Flow	=	0.10	MLD
	=	4.167	m ³ /hr
	=	0.0012	m ³ /sec
Peak Flow Factor	=	3.00	
Design Flow	=	Peak Flow	
	=	0.30	MLD
	=	13	m ³ /hr
	=	0.003	m ³ /sec
Hydraulic Retention Time (HRT) at Average Flow	=	120	min
Volume required	=	0.0012 x 120 x 60	
	=	9	m ³
Hydraulic Retention Time (HRT) at Peak Flow	=	Volume / Average Flow	
	=	48	min
	<	30	min
Total Volume of Wet Well	=	9	m ³
Side Water Depth (SWD) provided	=	1.50	m
Plan Area of Wet Well	=	5.76	m ²
Length/width of Sump required	=	2.40	m

Length/width of Sump provided	=	2.40	m
Volume of Sump provided	=	8.64	m ³
Length of Pump Pit	=	1.00	m
Width of Pump Pit	=	0.50	m
Depth of Pump Pit	=	0.30	m
Free Board	=	1.15	m

1 DESIGN STATEMENT-RSS E&M

Design Considerations

Design flow	=	0.10	MLD
	=	100.00	Cum/Day
Peak flow factor	=	3.00	

Pumping machinery

Friction factor for Fittings in Pressure Mains

Elbow 90 degrees	=	10
Friction Factor for each	=	1
Friction factor for all	=	10
Elbow 45 degrees	=	0
Friction Factor for each	=	0.75
Friction factor for all	=	0
Elbow 22 degrees	=	0
Friction Factor for each	=	0.5
Friction factor for all	=	0
Tee 90 degrees	=	0
Friction Factor for each	=	1.5
Friction factor for all	=	0
Tee in straight pipe	=	6
Friction Factor for each	=	0.3
Friction factor for all	=	1.8
Gate valve open	=	1
Friction Factor for each	=	0.4
Friction factor for all	=	0.4
Swing check	=	1
Friction Factor for each	=	2.5
Friction factor for all	=	2.5
Total friction factor	=	14.7

Stage	low	ave	peak
Average flow, cum / day	=	100.00	
Proportion	=	0.6	2
Design flow, cum / day	=	60	200
Hazen Williams C	=	140	140
Desired velocity, m/s	=	0.6	1.5
Number of Pumping hours	=	16.0	16.0
Area needed, sqm	=	0.0017	0.0023
Dia needed, m	=	0.047	0.054
Dia needed, mm	=	47	54

Dia provided, mm (User)	=	63	63	63
Radius, m	=	0.032	0.032	0.032
Radius power 0.63	=	0.113	0.113	0.113
S power 0.54	=	0.045	0.074	0.112
S	=	0.003	0.008	0.017
Slope 1 in	=	316.6	123.0	58.0
length, m	=	30	30	30
Friction in pipeline, m	=	0.1	0.2	0.5
Velocity head, m	=	0.018	0.051	0.115
Friction factor in fittings	=	14.7	14.7	14.7
Friction in fittings, m	=	0.3	0.7	1.7
Static lift, m	=	3.0	3.0	3.0
Total head, m	=	3.3	3.7	4.7
Efficiency of pumpset	=	0.8	0.8	0.8
Discharge, lps	=	1.0	1.7	3.5
Discharge, Cum/Hr	=	3.8	6.3	12.5
Kw required	=	0.163	0.271	0.538
HP required	=	0.5	0.5	1.0
Number of Pumps	=	2	2	2

4 TIGER BIO FILTER DESIGN STATEMENT-TBF1- 50 KLD

Number of pumping hours	=	16	Hrs	
Number of BMF tanks provided	=	2	Nos	
Design flow to each tank	=	50.00	Cum/day	
	=	3.13	Cum/ Hr for 16 Hr	
	=	0.87	lps	
Inlet BOD	=	250.00	mg/l	
Inlet TSS	=	400.00	mg/l	
BOD load applied	=	12.5	kg/day	
BOD uptake rate	=	0.1	Kg of BOD / Kg of worms	(0.5 - 1.0)
Worms required	=	125	Kg worms	
Sewage application rate	=	1.85	Cum/Sqm/day	(1 - 2 Cum/Sqm/d)
Area required	=	27.03	Sqm	
Area Provided	=	28	Sqm	
Area of each crate	=	0.4	Sqm	
Number of crates	=	70	Nos	
say	=	72	Nos	
Crate in longitudinal direction	=	18	Nos	
Crate in travers direction	=	4	Nos	
crates provided	=	72	Nos	OK
Width provided	=	4.00	m	
Length required	=	11.00	m	
Depth provided	=	1.2	m	

5 TERTIARY TREATMENT UNIT

Design Considerations

Design flow	=	0.10	MLD
	=	100.00	Cum/Day
Peak flow factor	=	3.00	

5.1 FILTER FEED TANK

Number of FFT provided	=	1	Nos
Number of operating hours	=	16	Hrs
Design flow	=	100.00	Cum/Day
	=	6.25	Cum/Hr
	=	0.00174	Cum/Sec
Hydraulic Retention time	=	60	min
Volume required	=	6.25	Cum
Depth	=	1.50	m
Civil Tanks			
Area	=	4.17	Sqm
Length/Width required	=	2.04	m
Length/Width provided	=	2.50	m
Freeboard provided	=	0.50	m
Volume Provided		9.38	Cum

DESIGN STATEMENT-TTU E&M

Design Considerations

Design flow	=	0.10	MLD
	=	100.00	Cum/Day
Peak flow factor	=	3.00	

Pumping machinery

Friction factor for Fittings in Pressure Mains

Elbow 90 degrees	=	5	
Friction Factor for each	=	1	
Friction factor for all	=	5	
Elbow 45 degrees	=	0	
Friction Factor for each	=	0.75	
Friction factor for all	=	0	
Elbow 22 degrees	=	0	
Friction Factor for each	=	0.5	
Friction factor for all	=	0	
Tee 90 degrees	=	0	
Friction Factor for each	=	1.5	
Friction factor for all	=	0	
Tee in straight pipe	=	5	
Friction Factor for each	=	0.3	
Friction factor for all	=	1.5	
Gate valve open	=	1	
Friction Factor for each	=	0.4	

Friction factor for all	=	0.4		
Swing check	=	1		
Friction Factor for each	=	2.5		
Friction factor for all	=	2.5		
Total friction factor	=	9.4		
Stage		low	ave	peak
Average flow, cum / day	=		100.00	
Proportion	=	0.6	1	2
Design flow, cum / day	=	60	100	200
Hazen Williams C	=	140	140	140
Desired velocity, m/s	=	0.8	1.0	1.5
Number of Pumping hours	=	16.0	16.0	16.0
Area needed, sqm	=	0.0013	0.0017	0.0023
Dia needed, m	=	0.041	0.047	0.054
Dia needed, mm	=	41	47	54
Dia provided, mm (User)	=	63	63	63
Radius, m	=	0.032	0.032	0.032
Radius power 0.63	=	0.113	0.113	0.113
S power 0.54	=	0.060	0.074	0.112
S	=	0.005	0.008	0.017
Slope 1 in	=	185.9	123.0	58.0
length, m	=	20	20	20
Friction in pipeline, m	=	0.1	0.2	0.3
Velocity head, m	=	0.033	0.051	0.115
Frction factor in fittings	=	9.4	9.4	9.4
Friction in fittings, m	=	0.3	0.5	1.1
Static lift, m	=	8.0	8.0	8.0
Total head, m	=	8.3	8.5	9.1
Efficiency of pumpset	=	0.8	0.8	0.8
Discharge, lps	=	1.0	1.7	3.5
Discharge, Cum/Hr	=	3.8	6.3	12.5
Kw required	=	0.280	0.464	0.922
HP provided	=	0.5	1.0	1.5
Number of Pumps	=	2	2	2

5.2 PRESSURE SAND FILTER

Number of unit provided	=	1	Nos.
Designed @ 16 hrs working for flow of	=	6.25	m3/h
Loading rate	=	12.00	m3/m2/h
Area of DMF	=	0.52	m2
Dia of DMF	=	0.81	m
Provided	=	0.900	m
Backwash water			
Backwash velocity	=	15.00	m/hr
backwash flowrate	=	8.63	m3/h
Backwash volume for 20 mins	=	2.88	m3

5.3 ACTIVATED CARBON FILTER

Number of unit provided	=	1	Nos.
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Designed @ 16 hrs working for flow of	=	6.25	m ³ /h
Loading rate	=	12.00	m ³ /m ² /h
Area of ACF	=	0.52	m ²
Dia of ACF	=	0.81	m
Provided	=	0.900	m
Backwash water			
Backwash velocity	=	15.00	m/hr
backwash flowrate	=	8.63	m ³ /h
Backwash volume for 20 mins	=	2.88	m ³

5.4 CHLORINE DOSING SYSTEM NaOCl DOSING SYSTEM

Average Flow	=	6.25	m ³ /hr
Design Chlorine Dosage (Max)	=	3	mg/l
Concentration of Chlorine in commercially available NaOCl	=	10%	
Design NaOCl Dosage	=	30	mg/l
Operating hours	=	16.0	hr
Quantity of NaOCl required	=	$6.25 \times 30 \times 16 / 1000$	
	=	3.00	Kg/day
Design Strength of NaOCl Solution	=	100%	
Volume of NaOCl Solution	=	$3 / (1 \times 1000)$	
	=	0.010	m ³
No. of Dosing Tanks provided	=	1	Nos.
Volume of each Dosing Tank	=	$0.01 / 1$	
	=	0.01	m ³
	=	100	Litres
No. of Working NaOCl Dosing Pump provided	=	1	No.
Capacity of each NaOCl Dosing Pump required	=	$\frac{\text{Total Volume of NaOCl Solution}}{\text{(No. of Dosing pumps)}}$	
	=	$0.01 / (1 \times 16)$	
	=	0.001	m ³ /hr
	=	1.00	LPH

Capacity of each NaOCl Dosing Pump provided	=	1.00	LPH
No. of Standby NaOCl Dosing Pump provided	=	1	No.

SIZING DETAILS (CIVIL)
TIGER BIO FILTER OF 100 KLD CAPACITY

S I. N o	Unit name	N o s	Leng th	Widt h	Height			Soling		PCC		Raft		RCC Wall thk	Bric k Wall thk	Slab Thk	Steel - HCR M/ Kg/C
					SW	FB	Tota	offs	Thk	offs	Thk	offs	Thk				
		N	m	m	m	m	m	m	m	m	m	m	m	m	m	m	
1	Screen Chamber	1	2.0	0.5	0.1	1.0	1.1	0.2	0.3	0.1	0.1	0.2	0.1	0.1			80
2	Grit Chamber	1	2.0	0.5	0.5	1.1	1.7	0.2	0.3	0.1	0.1	0.2	0.1	0.1			80
3	Raw Sewage Sump	1	2.4	2.4	1.5	1.1	2.6	0.2	0.3	0.1	0.1	0.2	0.2	0.1		0.1	100
4	TBF Bed 50 KLD	2	11.0	4.0			1.2	0.2	0.3	0.1	0.1	0.2	0.1		0.2		60
5	Filter Feed tank	1	2.5	2.5	1.5	0.5	2.0	0.2	0.3	0.1	0.1	0.2	0.2	0.1		0.1	100
6	Filter Platform	1	2.0	2.9				0.2	0.3	0.1	0.1	0.2	0.1				60

Assumptions

Incoming Sewer Invert 1.0 m Below Ground level

Method of excavation Mechanical means

Underground strata		soil	Muru m	Soft roc	har d	Tota l
0.0 to 1.5 m	=	25	25	25	25	100
1.5 m to 3.0 m	=	25	25	25	25	100
3.0 to 4.5 m	=	25	25	25	25	100
4.5 to 6.0	=	25	25	25	25	100

**TIGER BIO FILTER OF 100 KLD CAPACITY
BILL OF QUANTITIES**

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
1	Excavation for foundation / pipe trenches in earth, soils of all types, sand, gravel and soft murum, including removing the excavated material upto a distance of 50 metres and lifts as below, stacking and spreading as directed, normal dewatering, preparing the bed for foundation and excluding backfilling, etc. complete. (Bd-A-				
	0.0 to 1.5 m	50.83	Cum	150.00	7,624.50
	1.5 to 3.0 m	19.79	Cum	164.00	3,245.60
	3.0 to 4.5 m	1.76	Cum	178.00	313.30
	4.5 to 6.0 m	0.00	Cum	192.00	0.00
	MJP/ SSR/ 2021-22 / Section E / Excavation Item No.1/ Page no. 42				
2	Excavation for foundation / pipe trenches in hard murum and boulders, W.B.M. road including removing the excavated material upto a distance of 50 M beyond the area and lifts as below, stacking and spreading as directed by Engineer-in-charge, normal dewatering, preparing the bed for foundation and excluding backfilling, etc. complete. (Bd-A-3/259)			8.00	
	0.0 to 1.5 m	50.83	Cum	192.00	9,759.40
	1.5 to 3.0 m	19.79	Cum	206.00	4,076.80
	3.0 to 4.5 m	1.76	Cum	220.00	387.20
	4.5 to 6.0 m	0.00	Cum	234.00	0.00
	MJP/ SSR/ 2021-22/ Section E/ Excavation Item No.3, Page no. 42				
3	Excavation for foundation / pipe trenches in soft rock and old cement and lime masonry foundation asphalt road including removing the excavated material upto a distance of 50 M beyond the area and lifts as below, stacking as directed by Engineer-in-charge, normal dewatering, preparing the bed for foundation and excluding backfilling, etc. complete. (Bd-A- 4/259)				
	0.0 to 1.5 m	50.83	Cum	572.00	29,074.80
	1.5 to 3.0 m	19.79	Cum	597.00	11,814.70
	3.0 to 4.5 m	1.76	Cum	622.00	1,094.80
	4.5 to 6.0 m	0.00	Cum	647.00	0.00
	MJP/ SSR/ 2021-22 / Section E/ Excavation Item No.5, Page no. 42				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
4	Excavation for foundation / pipe trenches in hard rock and concrete road by chiselling, wedging, line drilling by mechanical means or by all means other than blasting including trimming and levelling the bed, removing the excavated material upto a distance of 50 metres beyond the area and lifts as below, stacking as directed by Engineer-in-charge, normal dewatering, excluding backfilling, etc. complete by all means.				
	0.0 to 1.5 m	50.83	Cum	1,017.00	51,694.20
	1.5 to 3.0 m	19.79	Cum	1,042.00	20,621.20
	3.0 to 4.5 m	1.76	Cum	1,067.00	1,878.00
	4.5 to 6.0 m	0.00	Cum	1,092.00	0.00
	MJP/ SSR/ 2021-22 / Section E/ Excavation Item No.7, Page no. 43				
5	Providing dry trap/ granite/ quartzite/ gneiss, rubble stone soling in 15 cm to 20 cm thick layers including hand packing and compacting, etc. complete. (Bd-A-12/264)	54.42	Cum	1,175.00	63,943.50
	MJP/ SSR/ 2021-22 / Section E/ Excavati				
6	Providing and laying in situ Cement Concrete M- 15 of trap/ granite / quartzite / gneiss metal for foundation and bedding including bailing out water, form work, compaction, curing, etc. complete. (Cement 5.90 bags / cum) Spec. No. - Bd E /1 Page No. 287 and B- 7, Page No. 38	15.89	Cum	5,640.00	89,619.60
	MJP/ SSR/ 2021-22 / SECTION - G: PLAIN REINFORCED CEMENT CONCRETE, READY				
7	Providing and laying in situ Cement Concrete of trap/ granite / quartzite / gneiss metal for RCC work in foundation like raft, grillage, strip foundation and footing of RCC columns and steel stanchions including normal dewatering, form work, compaction, finishing and curing, etc. complete. (By weigh batching and mix design for M250 and M-300 only. Use of L&T, A.C.C., Ambuja, Birla Gold, Manikgad, Rajashree, etc. cement is				
	MJP/ SSR/ 2021-22 / SECTION - G: PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE/ Item No.2, Page no. 49				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
8	Providing and casting in situ C.C. of trap / granite/ quartzite / gneiss metal of approved quality for RCC works as per detailed drawings and designs or as directed by Engineer-in- charge including normal dewatering, centering, form work, compaction, finishing the formed surfaces with C.M. 1:3 of sufficient minimum thickness to give a smooth and even surface wherever necessary or roughening if special finish is to be provided and curing, etc. complete. (By weigh batching and mix design for M-250 and M-300 only. Use of L&T, A.C.C., Ambuja, Birla Gold, Manikgad, Rajashree, etc. cement is permitted.) (Excluding M.S. or Tor	0.30	Cum	8,624.00	2,587.20
	For Beams / Braces / Lintels In RCC M-300				
	MJP/ SSR/ 2021-22 / SECTION - G: PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.4, Page no. 50				
9	Providing and casting in situ C.C. of trap / granite/ quartzite / gneiss metal of approved quality for RCC works as per detailed drawings and designs or as directed by Engineer-in- charge including normal dewatering, centering, form work, compaction, finishing the formed surfaces with C.M. 1:3 of sufficient minimum thickness to give a smooth and even surface wherever necessary or roughening if special finish is to be provided and curing, etc. complete. (By weigh batching and mix design for M-250 and M-300 only. Use of L&T, A.C.C., Ambuja, Birla Gold, Manikgad, Rajashree, etc. cement is permitted.) (Excluding M.S. or Tor	2.02	Cum	9,247.00	18,679.00
	Slabs / Landings / Vertical Walls / Waist Slabs / Steps for Staircase In RCC M-300				
	MJP/ SSR/ 2021-22 / SECTION - G: PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.5, / Page no. 50				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
10	Providing and casting in situ C.C. of trap / granite/ quartzite / gneiss metal of approved quality for RCC works as per detailed drawings and designs or as directed by Engineer-in- charge including normal dewatering, centering, form work, compaction, finishing the formed surfaces with C.M. 1:3 of sufficient minimum thickness to give a smooth and even surface wherever necessary or roughening if special finish is to be provided and curing, etc. complete. (By weigh batching and mix design for M-250 and M-300 only. Use of L&T, A.C.C., Ambuja, Birla Gold, Manikgad, Rajashree, etc. cement is permitted.) (Excluding M.S. or Tor reinforcement)	8.85	Cum	9,218.00	81,579.30
	Chajjas / Parapets / Curtain Walls /Partition Walls / Pardies In RCC M-300				
	MJP/ SSR/ 2021-22 / SECTION - G: PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.6 / Page no. 51				
11	Providing and fixing in position steel bar reinforcement of various diameters for RCC piles, caps, footings, foundations, slabs, beams, columns, canopies, staircases, newels, chajjas, lintels, pardies, copings, fins, arches, etc. as per detailed designs, drawings and schedules; including cutting, bending, hooking the bars, binding with wires or tack welding and supporting as required, etc. complete (including cost of binding wire). (Bd-F-17/306)				
	c) Corrosion Resistant Steel (Fe 500)	2.34	MT	70,658.00	165,339.80
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.8 / Page no. 52				
12	Providing and fixing mild steel grill work for windows/ ventilators of 20 Kg/Sqm. As per drawings including necessary welding and painting with one coat of anticorrosive paint and two coats of oil painting, etc. complete. (Bd-U- 1/537)	4.54	Sqm	1,895.00	8,603.30
	MJP/ SSR/ 2021-22 / SECTION - F: IRON AND STRUCTURAL STEEL WORK Item No.1 / Page				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
13	Providing structural steel work in rolled stanchions fixed with connecting plates or angle cleats as in main and cross beams, hip and jack rafters, purlins connecting to truss members and like as per detailed designs and drawings or as directed by Engineer-in-charge including cutting, fabricating, hoisting, erecting, fixing in position, making riveted / bolted / welded connections and one coat of anticorrosive paint and over it two coats of oil painting, etc. complete. (Bd-C- 3/275)	1.49	MT	71,286.00	106,507.00
	MJP/ SSR/ 2021-22 / SECTION - F: IRON AND STRUCTURAL STEEL WORK Item No.3,				
14	Providing and fixing corrugated galvanised iron sheets of 0.63 mm thick (24 B.W.G.) for roofing without wind tiles including fastening with galvanised iron screws and bolts, lead and bitumen washers as per drawing etc. complete. (Weight of 5.5 kg/sq.m.).	150.80	Sqm	777.00	117,171.60
	PWD / SSR 2020-21 / Roofing and Ceiling SSR Item No.38.04 Reference No. Bd.R.5, Page No. 453 Item No.1133, Page no. 224				
15	Providing fly ash brick masonry with conventional / I.S. type bricks in cement mortar 1:6 in superstructure including striking joints, raking out joints, watering and scaffolding etc. Complete	29.74	Cum	6,305.00	187,510.70
	PWD / SSR 2020-21 / Brick Masonry SSR Item No.27.13 Reference No. As director by engineer incharge and BDG- 2 and 5 Item No.893, Page no. 190				
16	Providing internal cement plaster 12 mm thick in single coat in cement mortar 1:5 without neeru finish to concrete or brick surfaces, in all positions including scaffolding and curing etc. complete.	163.30	Sqm	257.00	41,968.10
	PWD / SSR 2020-21 / Plastering and Pointing SSR Item No. 32.03 Reference No. Bd. L.2 Page No. 368 Item No.950,				

Sr. No	Item Description	Qty	Unit	Rate	Amount (Rs.)
17	Providing rough cast cement plaster externally in two coats to concrete, brick or stone masonry surfaces in all positions with base coat of 12 to 15 mm thick in C.M. 1:4 and rough cast treatment 12 mm thick in proportion 1:11 / 2:3 including scaffolding and fourteen days curing	95.	Sqm	529.	50,255.
	PWD / SSR 2020-21 / Plastering and Pointing SSR Item No. 32.12 Reference No. Bd.L.8 Page No. 370 Item No.957,				
18	Providing and applying white-wash in two coats on old / new plastered or masonry surfaces and asbestos cement sheets including scaffolding and preparing the surface by brushing and brooming down etc. complete.	95.	Sqm	10.00	950.00
	PWD / SSR 2020-21 / Colouring SSR Item No. 36.03 Reference No. Bd. P. I Page No. 411 Item No.1091, Page no. 218				
19	Providing and applying colour-wash of approved colour and shade in one coat to new surface including scaffolding, brushing and brooming down (excluding base coats of white wash) etc. complete.	95.	Sqm	8.00	760.00
	PWD / SSR 2020-21 / Colouring SSR Item No. 36.04 Reference No. Bd. P.2 Page No.				
20	Dewatering the excavated trenches and pools of water in the building trenches / pipeline trenches, well works by using pumps and other devices including disposing off water to safe distance as directed by Engineer-in-charge (including cost of machinery, labour, fuel), etc.		HP/		
	MJP/ SSR/ 2021-22 / Section E/ Excava				
21	Refilling the trenches with available excavated stuff with soft material first over pipeline and then hard material in 15 cm layers with all leads and lifts including consolidation, surcharging, etc. complete.	164.	Cum	84.00	13,808.
	MJP/ SSR/ 2021-22 / Section E/ Excava				
22	Transportation as per STATEMENT VI Including loading, unloading and stacking	174.	Cum	604.45	105,760.
	Earth (4.8 Cum) lead 15 Km				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
	Electromechanical Items				
23	Screen (Manual) of size 1.65 m length x 0.5 m width of SS 304 MOC and Manual hand rake for cleaning screen of SS handle 1 m in length and cleaning area of 6 nos 5 mm SS rod of total length 200 mm straight and 50 mm of 90 degree	0.83	Sqm	35,000.0	28,875.00
24	Grit pump				
	Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below				
	MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION - Pumps, Page no. 6, 7 of size 1.65 m				
	1 HP (Up to 9000 LPH)	1.00	No	68,654.0	68,654.00
25	Raw Sewage Pumps				
	Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below				
	MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION -				
	1 HP (Up to 9000 LPH)	2.00	Nos	68,654.0	137,308.00
26	TTU Feed pumps				
	Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below				
	MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION -				
	1 HP (Up to 9000 LPH)	2.00	Nos	68,654.0	137,308.00
27	Pressure Sand Filter of FRP / MSEP vessel with suitable thickness to withstand a water pressure including MPV or 5 Valve system and PVC / UPVC / MSEP interconnecting and underdrain piping including fittings, with standard filter media layer with minimum depth of filter sand 1.0 m supported by gravels. The piping arrangement should provide sufficient pressure for backwash operations and avoid loss of sand during backwash operation. Suitable openings to be provided to ease addition and				
	Dia 0.9 m x 2 m minimum height	1.00	Nos	55,400.0	55,400.00

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
28	Activated Carbon Filter of FRP / MSEP vessel with suitable thickness to withstand a water pressure including MPV or 5 Valve system and PVC / UPVC / MSEP interconnecting and underdrain piping including fittings, with standard filter media layer with minimum depth of Activated Carbon 1.0 m supported by gravels. The piping arrangement should provide sufficient pressure for backwash operations and avoid loss of Activated carbon during backwash operation. Suitable openings to be provided to ease				
	Dia 0.9 m x 2 m minimum height	1.00	Nos	55,400.00	55,400.00
29	NaOCl Chlorinator Pump Diaphragm Type / peristaltic type / Solenoid Max Flow Rate Upto 10LPH Power Source Electric Phase Single Material PP / PTFE(Teflon) Voltage 230 Volt Frequency				
	Mixing Tank of 100 Ltrs capacity	100.00	Ltrs	8.00	800.00
	Dosing Pump	2.00	Nos	15,000.00	30,000.00
30	Control Panel				
	Designing, Supplying, Installing, commissioning & testing of PLC Panel. Including PLC with CPU & Power supply unit, power supply cables interfacing cards, interfacing cables, wireless modules with 25% extra	1.00	No	32,272.00	32,272.00
	MJP/ MECH/ ELECT / SSR/ 2021-22/ SECTION 19 - SA [SCADA & AUTOMATION]				
31	Supplying and erecting Fully Automatic Star Delta starter to operate squirrel cage induction motor working on 380- 440 Volt, 3 phase, 50 Hz with no volt coil, over load element, and ON - OFF push buttons, with necessary material and connected to supply, etc complete. Starter with original sheet steel encloser.				
	> 7.5 HP & Up to 12.5 HP	6.00	nos	7,150.00	42,900.00
	MJP /MECH/ ELECT/ SSR/ 2021-22 SECTION 10 - LG [L.T. SWITCHGEAR AND PROTECTION] Item no. LG 3 Page no. 27				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
32	Main power supply cable				
	3 core PVC insulated, PVC sheathed copper conductor flat submersible cable				
	Supplying and erecting, Flat flexible submersible cable with, Copper Conductor, PVC insulated, and PVC				
	3 core 16 sq mm	25.00	m	549.00	13,725.
33	Power cables				
	Aluminium conductor 4 Core, XLPE / PVC insulated & armoured cable				
	Supplying and erecting, XLPE / PVC insulated, armoured cable 1100 V grade with ISI mark Four core, solid / stranded aluminium conductor with 6 mm thick 25 mm width M.S. spacer with G.I. Earth wire 6 sq mm, complete erected on wall / on pole with 25 X 3 mm M.S. clamps or in provided trench in an approved				
	4 Core 6 sq mm	75.00	m	137.00	10,275.
	MJP MECH/ ELECT/ SSR/ 2021-22 SECTION 12 - CB [L.T. CABLE] Item no. CB 6				
34	Control Cables				
	Copper conductor PVC insulated, Unarmoured control cable				
	Supplying and erecting Un-armoured control cable with ISI mark stranded / solid copper conductor 1.1 kV grade complete erected on wall / panel or in provided trench in an approved manner.				
	4 core 2.5 sq mm	75.00	m	137.00	10,275.
	MJP MECH/ ELECT/ SSR/ 2021-22/ SECTION 12 - CB [L.T. CABLE] Item no. CB 8-				
	Plumbing Items				
35	Providing and supplying in standard lengths ISI mark rigid unplasticised PVC pipes suitable for potable water with solvent cement joints including cost of couplers, as per IS specification no. 4985 / 1988 excluding GST levied by GOI and GOM in all respect, including transportation, freight charges, inspection charges, loading, unloading, conveyance to the departmental stores and stacking the same in closed shed duly protected from sun rays and rains including cost of jointing material i.e. solvent cement, etc. complete (selffit				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
	1) 10% of cost of pipes shall be considered for cost of PVC specials for estimate purpose only. One coupler and required cement solvent shall be provided with each full length pipe cost of which is included in rates below.				
	MJP/ SSR/ 2021-22 / SECTION – I(II) P.V.C. PIPES, Page no.77				
1	Raw Sewage pump to TBF Distribution				
a	Main header				
	63 mm.	30.00	m	149.00	4,470.00
	PVC Specials- 10%				447.00
b	Distribution				
	63 mm.	15.00	m	149.00	2,235.00
	PVC Specials- 10%				223.50
2	TBF collection to FFT (gravity)				
a	Main header				
	75 mm.	45.00	m	211.00	9,495.00
	PVC Specials- 10%				949.50
b	collection tributary				
	63 mm.	10.00	m	149.00	1,490.00
	PVC Specials- 10%				149.00
3	TTU Plumbing				
	63 mm.	20.00	m	149.00	2,980.00
	PVC Specials- 10%				298.00
4	TBF distribution				
	63 mm.	10.00	m	149.00	1,490.00
	PVC Specials- 10%				149.00
36	Labour				
	Plumber	6.00	days	641.00	3,846.00
	Helper	12.00	days	579.00	6,948.00
	MJP/ SSR/ 2021-22 / SECTION - B LABOUR & MACHINERY , Page no. 14				
37	Providing double flange sluice valve confirming for IS- 14846 including worn gear arrangements as per test pressure, stainless steel spindle, caps, including inspection charges, transportation upto departmental store, unloading, stacking excluding GST levied by GOI & GOM in all respect etc. complete.				
	Sluice valves - PN -1 (Without by pass)				
	Raw Sewage pump				
	65 mm.	2.00	Nos	4,966.00	9,932.00
	Filter Feed Pump				
	65 mm.	2.00	Nos	4,966.00	9,932.00

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
	MJP/ SSR/ 2021-22 / SECTION - I(XII) : PIPES APPURTENANCES , Page no. 132				
38	Providing and supplying ISI mark CI D/F reflux valves (non-return valves) of following dia including railway freight, inspection charges, unloading from railway wagon, loading into truck, transportation upto departmental stores, unloading, stacking excluding GST levied by GOI & GOM in all respect etc. complete. Reflux valves as per I.S.5312 Part I (1984)				
	Without by pass arrangement -PN -1				
	Raw Sewage pump				
	65 mm.	2.00	Nos	3,885.00	7,770.00
	Filter Feed Pump				
	65 mm.	2.00	Nos	3,885.00	7,770.00
	MJP/ SSR/ 2021-22 / SECTION - I(XII) : PIPES APPURTENANCES , Page no. 131				
	Bio media Items				
39	Supplying of Specially designed container for holding Filter media including Lightweight Expanded Clay Aggregates size (8-30 mm) and Bio media including mixture of woodchips Vermicompost, cocopeat and bacterial culture with special worms per designed quantity including transportation & fixing in position as	144.00	Nos	4,750.00	684,000.00
	Market rate				
40	Rapid sand Gravity filter sand At Source (Godhara, Gokak, Kanhan, Yesagi sand)	13.70	Cum	1,730.00	23,701.00
	MJP/ SSR/ 2021-22 / SECTION- A MATERIALS				
41	Trasnsportation Godhara to Pune distance by Road 660 Km.	13.70	Cum	11,031.37	151,129.80
	MJP/ SSR/ 2021-22 / SECTION - C : TRANSPORTATION Page no. 23				
42	Stone Aggregate 20 mm	13.70	Cum	900.00	12,330.00
	MJP/ SSR/ 2021-22 / SECTION- A MATERIALS				
43	Transportation as per STATEMENT VI Including loading, unloading and stacking				
	Manure or sludge (5.52 Cum) lead 25 Km	52.90	Cum	747.48	39,541.70
	MJP/ SSR/ 2021-22 / SECTION - C : TRANSPORTATION Page no. 23				
NET TOTAL Rs.					2,932,802.80

MEASUREMENT SHEET - SCREEN CHAMBER, GRIT CHAMBER AND RAW SEWAGE SUMP

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	Screen And Grit chamber						
1	Excavation				2.25		
A	0.0 to 1.5 m	1	5.20	2.70	1.5	21.06	Cum
	soil					5.27	Cum
	Murum					5.27	Cum
	Soft rock					5.27	Cum
	hard rock					5.27	Cum
B	1.5 to 3.0 m	1	5.2	2.70	0.75	10.53	Cum
	soil					2.64	Cum
	Murum					2.64	Cum
	Soft rock					2.64	Cum
	hard rock					2.64	Cum
C	3.0 to 4.5 m	1	4.2	2.20	0	0	Cum
	soil					0	Cum
	Murum					0	Cum
	Soft rock					0	Cum
	hard rock					0	Cum
D	4.5 to 6.0 m	1	4.2	2.20	0	0	Cum
	soil					0	Cum
	Murum					0	Cum
	Soft rock					0	Cum
	hard rock					0	Cum
2	Soling						
	Screen	1	3.20	1.20	0.30	1.16	Cum
	Grit	1	3.20	0.50	0.30	0.48	Cum
	extra for grit chamber	1	0.00	0.60	0.30	0	Cum
					Total for grit	0.48	Cum
3	PCC M20						
	Screen	1	2.80	1.00	0.10	0.28	Cum
	Grit	1	2.80	0.50	0.10	0.14	Cum
		1	0.00	0.40	0.20	0	Cum
	Internal slope	1	Area	0.09	0.50	0.05	Cum
	Internal slope	1	Area	0.05	0.50	0.03	Cum
					Total for grit	0.22	Cum
4	Raft M30						
	Screen	1	2.60	0.90	0.15	0.36	Cum
	Grit	1	2.60	0.50	0.15	0.2	Cum
		1	0.00	0.30	0.15	0	Cum
					Total for grit	0.2	Cum
5	RCC Wall						
	Screen						
	Long Wall	2	2.20	0.10	1.35	0.6	Cum

MEASUREMENT SHEET - SCREEN CHAMBER, GRIT CHAMBER AND RAW SEWAGE SUMP

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	Short Wall	2	0.70	0.10	1.35	0.19	Cum
				Total for screen		0.79	Cum
	Grit						
	Long Wall (extra than screen chamber)	1	0.00	0.10	1.90	0	Cum
	Short Wall	2	0.50	0.10	1.90	0.19	Cum
				Total for grit		0.19	Cum
6	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	80	Cum	1.54	0.13	MT
7	Fabrication work in Frame and Grating for Access						
	Screen	1	2.20	0.70		1.54	Sqm
	Grit	1	2.20	0.60		1.32	Sqm
					Total	2.86	Sqm
8	Removing excess excavated material out of site						
	Screen chamber	1	2.20	0.70	1.15	1.78	Cum
	Grit Chamber	1	2.20	0.50	1.70	1.87	Cum
	soling, PCC, Raft volume					2.62	Cum
	Total Volume					6.27	Cum
	bulkage @ 40%					8.78	Cum
9	Refilling and compaction						
	Total Excavation					31.59	Cum
	Deduction for tank volume, soling, PCC, Raft					6.27	Cum
	Refilling and compaction volume					25.32	Cum

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	Raw Sewage Sump						
1	Excavation				3.25		
A	0.0 to 1.5 m	1	6.3	6.30	1.5	59.54	Cum
	soil					14.89	Cum
	Murum					14.89	Cum
	Soft rock					14.89	Cum
	hard rock					14.89	Cum
B	1.5 to 3.0 m	1	5.30	5.30	1.5	42.14	Cum
	soil					10.54	Cum
	Murum					10.54	Cum
	Soft rock					10.54	Cum
	hard rock					10.54	Cum
C	3.0 to 4.5 m	1	5.30	5.30	0.25	7.03	Cum

MEASUREMENT SHEET - SCREEN CHAMBER, GRIT CHAMBER AND RAW SEWAGE SUMP

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	soil					1.76	Cum
	Murum					1.76	Cum
	Soft rock					1.76	Cum
	hard rock					1.76	Cum
D	4.5 to 6.0 m	1	4.30	4.30	0	0	Cum
	soil					0	Cum
	Murum					0	Cum
	Soft rock					0	Cum
	hard rock					0	Cum
2	Soling						
	RSS	1	3.70	3.70	0.30	4.11	Cum
3	PCC M20						
	RSS	1	3.30	3.30	0.10	1.09	Cum
4	Raft M30						
	RSS	1	3.10	3.10	0.20	1.93	Cum
5	RCC Wall						
	Long Wall	2	2.70	0.15	2.85	2.31	Cum
	Short Wall	2	2.40	0.15	2.85	2.06	Cum
					Total	4.37	Cum
6	Beams						
	Beam 1	1	2.40	0.2	0.3	0.15	Cum
	Beam 2	0	2.40	0.2	0.3	0	Cum
					Total	0.15	Cum
7	Slab	1	2.70	2.70	0.15	1.1	Cum
	Deduction for manhole	-1	1.20	0.70	0.15	-0.13	Cum
					Total	0.97	Cum
8	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	100	Cum	7.42	0.75	MT
9	Fabrication work in Frame and Grating for Access						
	RSS	1	1.20	0.70		0.84	Sqm
10	Removing excess excavated material out of site						
	RSS	1	2.70	2.70	2.65	19.32	Cum
	soling, PCC, Raft volume					7.13	Cum
	Total Volume					26.45	Cum
	bulkage @ 40%					37.03	Cum
11	Refilling and compaction						

MEASUREMENT SHEET - SCREEN CHAMBER, GRIT CHAMBER AND RAW SEWAGE SUMP

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	Total Excavation					108.71	Cum
	Deduction for tank volume, soling, PCC, Raft					26.45	Cum
	Refilling and compaction volume					82.26	Cum
12	Dewatering						
	5 Days x 4 hours/day	days	5	hours / day	4	20	Hrs

MEASUREMENT SHEET - TIGER BIO FILTER

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	TIGER BIO FILTER						
1	Excavation				0.50		
A	0.0 to 1.5 m	1	12.66	5.66	0.5	35.83	Cum
	soil					8.96	Cum
	Murum					8.96	Cum
	Soft rock					8.96	Cum
	hard rock					8.96	Cum
2	Soling						
	TBF	1	12.46	5.46	0.30	20.41	Cum
3	PCC M20						
	TBF	1	12.06	5.06	0.10	6.11	Cum
4	Raft M30						
	TBF	1	11.86	4.86	0.10	5.77	Cum
5	Brick Wall						
	TBF						
	Long Wall	2	11.46	0.23	1.20	6.33	Cum
	Short Wall	2	4.00	0.23	1.20	2.21	Cum
	Crate Support Wall	5	11.00	0.23	0.50	6.33	Cum
					Total for	14.87	Cum
6	Plaster						
	Internal						
	Crate Support Wall						
	Long Wall	6	11.00		0.50	33	Sqm
	Wall top	5	11.00		0.23	12.65	Sqm
	Long Wall	2	11.00		1.20	26.4	Sqm
	Short Wall	2	4.00		1.20	9.6	Sqm
					Total	81.65	Sqm
	External						
	Long Wall	2	11.46		1.20	27.51	Sqm
	Short Wall	2	4.46		1.20	10.71	Sqm
	Wall Top	1	30.92	0.3		9.28	Sqm
					Total	47.50	Sqm
7	External-white-wash	1				47.50	Sqm
8	External-colour-wash	1				47.50	Sqm
9	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	60	Cum	5.77	0.35	MT
10	Removing excess excavated material out of site						
	soling, PCC, Raft volume					32.29	Cum
	Total Volume					32.29	Cum
	bulkage @ 40%					45.21	Cum

MEASUREMENT SHEET - TIGER BIO FILTER

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
11	Refilling and compaction						
	Total Excavation					35.83	Cum
	Deduction for tank volume, soling, PCC, Raft					32.29	Cum
	Refilling and compaction volume					3.54	Cum
12	MS Fabricated Shed						
	TBF-II Shed in Fabrication work Shed Size-12 m X 5 m		12.00	5.00	3.00		
	for column 50*50*5 Unit Weight 6.97 kg/m	10	3.00	6.97	kg/m	209.10	KG
	for truss 50*50*3 Unit Weight 3.71 kg/m	5	5.00	3.71	kg/m	92.75	KG
	for principle rafter 50*50*3 Unit Weight	10	2.90	3.71	kg/m	107.59	KG
	for strut rafter 50*50*3 Unit Weight 3.71 kg/m	10	0.20	3.71	kg/m	7.42	KG
	for central strut rafter 50*50*3 Unit Weight	5	0.30	3.71	kg/m	5.57	KG
	for bottom frame below truss 50*50*3 Unit Weight 3.71 kg/m	1	34.00	3.71	kg/m	126.14	KG
	for perlin 30*30*3 Unit Weight 2.51 kg/m	5	13.00	2.51	kg/m	163.15	KG
	for Base Plate 150*150*10 mm	20	0.15	0.15	0.010	35.33	KG
					Total Wei	747.04	Kg
						0.75	MT
13	corrugated galvanised iron sheets	2	13.00	2.90		75.4	Sqm

MEASUREMENT SHEET - FILTER FEED TANK

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
8	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	100	Cum	6.75	0.68	MT
9	Fabrication work in Frame and Grating for Access						
	FFT	1	1.20	0.70		0.84	Sqm
10	Removing excess excavated material out of site						
	FFT	1	2.80	2.80	2.00	15.68	Cum
	soling, PCC, Raft volume					7.55	Cum
	Total Volume					23.23	Cum
	bulkage @ 40%					32.53	Cum
11	Refilling and compaction						
	Total Excavation					70.16	Cum
	Deduction for tank volume, soling, PCC, Raft					23.23	Cum
	Refilling and compaction volume					46.93	Cum
12	Dewatering						
	5 Days x 4 hours/day	days	5	hours/day	4	20	Hrs

MEASUREMENT SHEET - FILTER PLATFORM

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	FILTER PLATFORM						
1	Excavation				0.55		
A	0.0 to 1.5 m	1	3.2	4.10	0.55	7.22	Cum
	soil					1.81	Cum
	Murum					1.81	Cum
	Soft rock					1.81	Cum
	hard rock					1.81	Cum
2	Soling						
	Filter Platform	1	3.00	3.90	0.30	3.51	Cum
3	PCC M20						
	Filter Platform	1	2.60	3.50	0.10	0.92	Cum
4	Raft M30						
	Filter Platform	1	2.40	3.30	0.15	1.19	Cum
5	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	60	Cum	1.19	0.08	MT
6	Removing excess excavated material out of site						
	soling and PCC volume					4.43	Cum
	Total Volume					4.43	Cum
	bulkage @ 40%					6.21	Cum
7	Refilling and compaction						
	Total Excavation					7.22	Cum
	Deduction for tank volume, soling, PCC, Raft					4.43	Cum
	Refilling and compaction volume					2.79	Cum

MEASUREMENT SHEET - BIO MEDIA

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
1	Supplying of Specially designed container for holding Filter media including Lightweight Expanded Clay Aggregates size (8-30 mm) and Bio media including mixture of woodchips Vermicompost, cocopeat and bacterial culture with special worms per designed quantity including transportation &	144				144	Nos
2	Rapid sand Gravity filter sand At Source (Godhara, Gokak,	144	0.82	0.58	0.2	13.7	Cum
3	Trasnsportation Godhara to					13.7	Cum
4	Stone Aggregate 20 mm	144	0.82	0.58	0.2	13.7	Cum
5	Transportation as per STATEMENT VI Including						
	Manure or sludge (5.52 Cum) lead	144	0.82	0.56	0.8	52.9	Cum

MEASUREMENT SHEET - ELECTROMECHANICAL WORKS

Sr. No.	Item Description	Nos.	Unit
1	Screen (Manual) of size 1.65 m length x 0.5 m width of SS 304 MOC and Manual hand rake for cleaning screen of SS handle 1 m in length and cleaning area of 6 nos 5 mm SS rod of total length 200 mm straight and 50 mm of 90 degree bend.	1	No
2	Grit pump Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION - Pumps, Page no. 6, 7 of size 1.65 m length x0.5 m width of SS304 MOC 1 HP (Up to 9000 LPH)	1	No
3	Raw Sewage Pumps Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION - Pumps, Page no. 6, 7 1 HP (Up to 9000 LPH)	2	Nos
4	TTU Feed pumps Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION - Pumps, Page no. 6, 7 1 HP (Up to 9000 LPH)	2	Nos
5	Pressure Sand Filter of FRP / MSEP vessel with suitable thickness to withstand a water pressure including MPV or 5 Valve system and PVC / UPVC / MSEP interconnecting and underdrain piping including fittings, with standard filter media layer with minimum depth of filter sand 1.0 m supported by gravels. The piping arrangement should provide sufficient pressure for backwash operations and avoid loss of sand during backwash operation. Suitable openings to be provided to ease addition and removal the media. Dia 0.9 m x 2 m minimum height	1	Nos
6	Activated Carbon Filter of FRP / MSEP vessel with suitable thickness to withstand a water pressure including MPV or 5 Valve system and PVC / UPVC / MSEP interconnecting and underdrain piping including fittings, with standard filter media layer with minimum depth of Activated Carbon 1.0 m supported by gravels. The piping arrangement should provide sufficient pressure for backwash operations and avoid loss of Activated carbon during backwash operation. Suitable openings to be provided to ease addition and removal the media. Dia 0.9 m x 2 m minimum height	1	Nos
7	PurAll Tablet Chlorinator + cartridge	0	nos

MEASUREMENT SHEET - ELECTROMECHANICAL WORKS

Sr. No.	Item Description	Nos.	Unit
7	NaOCl Chlorinator Pump Diaphragm Type / peristaltic type / Solenoid Max Flow Rate Upto 10LPH Power Source Electric Phase Single Material PP / PTFE(Teflon) Voltage 230 Volt Frequency 50Hz		
a	Mixing Tank of 100 Ltrs capacity	1	Nos
b	Dosing Pump	2	Nos
8	Control Panel		
	Designing, Supplying, Installing, commissioning & testing of PLC Panel. Including PLC with CPU & Power supply unit, power supply cables interfacing cards, interfacing cables, wireless modules with 25% extra quantity of all accessories.		
	PLC Panel	1	No
	MJP/ MECH/ ELECT / SSR/ 2021-22/ SECTION 19 - SA [SCADA & AUTOMATION] Item no. 1.4 Page no. 69		
9	Supplying and erecting Fully Automatic Star Delta starter to operate squirrel cage induction motor working on 380- 440 Volt, 3 phase, 50 Hz with no volt coil, over load element, and ON - OFF push buttons, with necessary material and connected to supply, etc complete. Starter with original sheet steel encloser.		
	> 7.5 HP & Up to 12.5 HP 1 nos extra starter considered as spare.	6	nos
	MJP/MECH/ ELECT/ SSR/ 2021-22 SECTION 10 - LG [L.T. SWITCHGEAR AND PROTECTION] Item no. LG 3 Page no. 27		
10	Main power supply cable		
	3 core PVC insulated, PVC sheathed copper conductor flat submersible cable		
	Supplying and erecting, Flat flexible submersible cable with, Copper Conductor, PVC insulated, and PVC sheathed.		
	3 core 16 sq mm	25	m
11	Power cables		
	Aluminium conductor 4 Core, XLPE / PVC insulated & armoured cable		
	Supplying and erecting, XLPE / PVC insulated, armoured cable 1100 V grade with ISI mark Four core, solid / stranded aluminium conductor with 6 mm thick 25 mm width M.S. spacer with G.I. Earth wire 6 sq mm, complete erected on wall / on pole with 25 X 3 mm M.S. clamps or in provided trench in an approved manner.		
	4 Core 6 sq mm	75	m
	MJP MECH/ ELECT/ SSR/ 2021-22 SECTION 12 - CB [L.T. CABLE] Item no. CB 6 Page no. 35		
12	Control Cables		
	Copper conductor PVC insulated, Unarmoured control cable		

MEASUREMENT SHEET - ELECTROMECHANICAL WORKS

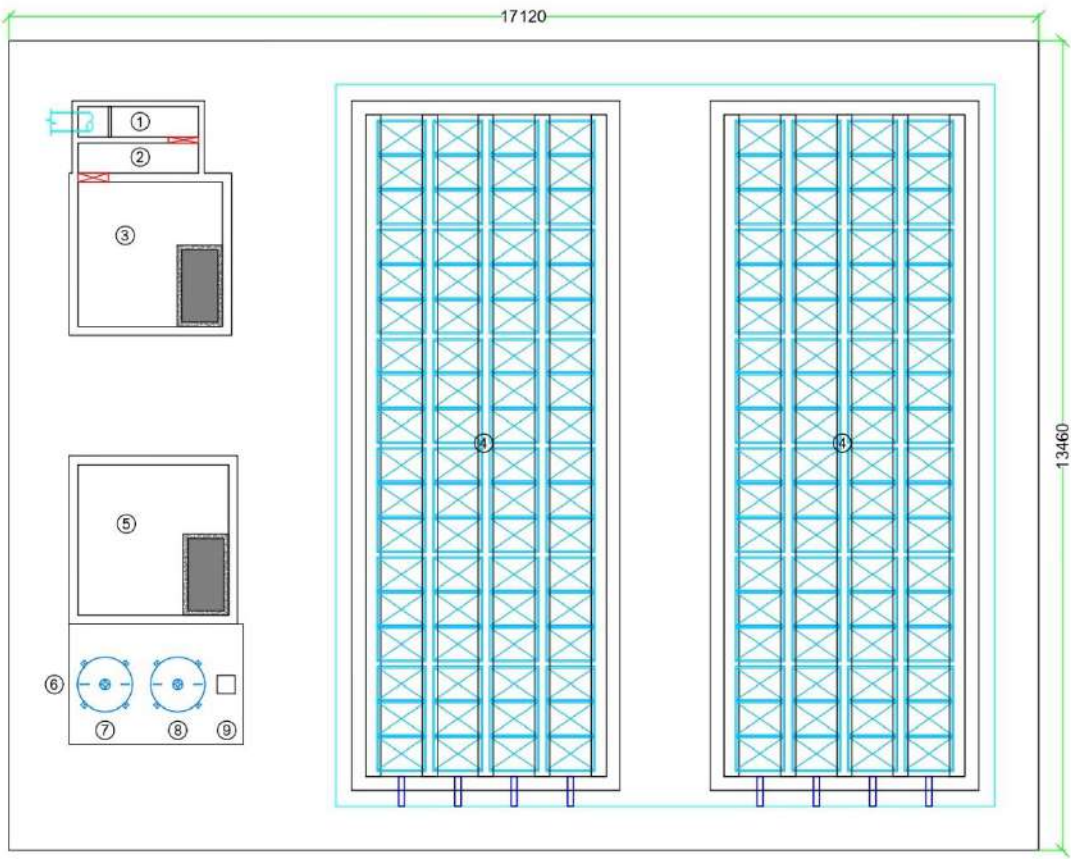
Sr. No.	Item Description	Nos.	Unit
	Supplying and erecting Un-armoured control cable with ISI mark stranded / solid copper conductor 1.1 kV grade complete erected on wall / panel or in provided trench in an approved manner.		
	4 core 2.5 sq mm	75	m
	MJP MECH/ ELECT/ SSR/ 2021-22/ SECTION 12 - CB [L.T. CABLE] Item no. CB 8-2 Page no. 36		

MEASUREMENT SHEET - PLUMBING

Sr. No.	Item Description	Nos.	L (m)	B (m)	Quantity	Unit
	Providing and supplying in standard lengths ISI mark rigid unplasticised PVC pipes suitable for potable water with solvent cement joints including cost of couplers, as per IS specification no. 4985 / 1988 excluding GST levied by GOI and GOM in all respect, including transportation, freight charges, inspection charges, loading, unloading, conveyance to the departmental stores and stacking the same in closed shed duly protected from sun rays and rains including cost of jointing material i.e. solvent cement, etc. complete (selffit type to be jointed with cement solvent).					
	1) 10% of cost of pipes shall be considered for cost of PVC specials for estimate purpose only. 2) One coupler and required cement solvent shall be provided with each full length pipe cost of which is included in rates below.					
	MJP/ SSR/ 2021-22 / SECTION – I(II) P.V.C. PIPES,					
1	Raw Sewage pump to TBF Distribution					
a	Main header	Dia	63			
	63 mm.	1	30		30	m
	PVC Specials- 10%					
b	Distribution					
	63 mm.	1	15		15	m
	PVC Specials- 10%					
2	TBF collection to FFT (gravity)					
a	Main header					
	75 mm.	1	45		45	m
	PVC Specials- 10%					
b	collection tributary					
	63 mm.	1	10		10	m
	PVC Specials- 10%					
3	TTU Plumbing	Dia	63			
	63 mm.	1	20		20	m
	PVC Specials- 10%					
4	TBF distribution			No. of beds		
	63 mm.	1	5	2	10	m
	PVC Specials- 10%					
5	Labour	Nos	Days			
	Plumber	1	6		6	days
	Helper	2	6		12	days
6	Sluice valves					

MEASUREMENT SHEET - PLUMBING

Sr. No.	Item Description	Nos.	L (m)	B (m)	Quantity	Unit
	Providing double flange sluice valve confirming for IS- 14846 including worn gear arrangements as per test pressure, stainless steel spindle, caps, including inspection charges, transportation upto departmental store, unloading, stacking excluding GST levied by GOI & GOM in all respect etc. complete.					
	MJP/ SSR/ 2021-22 / SECTION - I(XII) : PIPES APPURTENANCES , Page no. 132					
	Raw Sewage pump					
	65 mm.	2			2	Nos
	Filter Feed Pump					
	65 mm.	2			2	Nos
7	Reflux valves (non-return valves)					
	Providing and supplying ISI mark CI D/F reflux valves (non-return valves) of following dia including railway freight, inspection charges, unloading from railway wagon, loading into truck, transportation upto departmental stores, unloading, stacking excluding GST levied by GOI & GOM in all respect etc. complete. Reflux valves as per I.S.5312 Part I (1984)					
	MJP/ SSR/ 2021-22 / SECTION - I(XII) : PIPES APPURTENANCES , Page no. 131					
	Raw Sewage pump					
	65 mm.	2			2	Nos
	Filter Feed Pump					
	65 mm.	2			2	Nos



PLANT LAYOUT
AREA = 236 SQM.

Process Unit Details								
Sr No	Description	No	L/D	B	H	FB	Total H	MOC
			m	m	m	m	m	
1	Screen Chamber	1	2.00	0.50	0.15	1.00	1.15	RCC
2	Grit Chamber	1	2.00	0.50	0.55	1.15	1.70	RCC
3	Raw Sewage Sump	1	2.40	2.40	1.50	1.15	2.65	RCC
4	Tiger Bio Filter	2	11.00	4.00	-	-	1.20	BRICK
5	Filter Feed Tank	1	2.50	2.50	1.50	0.50	2.00	RCC
6	Filter Platform	1	2.00	2.90	-	-	-	RCC
7	Pressure Sand Filter	DIA	0.90	-	-	-	2.00	MSEP
8	Activated Carbon Filter	DIA	0.90	-	-	-	2.00	MSEP
9	Chlorination Unit	1	-	-	-	-	-	-

PROJECT NAME
100 KLD SEWAGE TREATMENT PLANT
BASED ON TIGER BIO FILTER
TECHNOLOGY.

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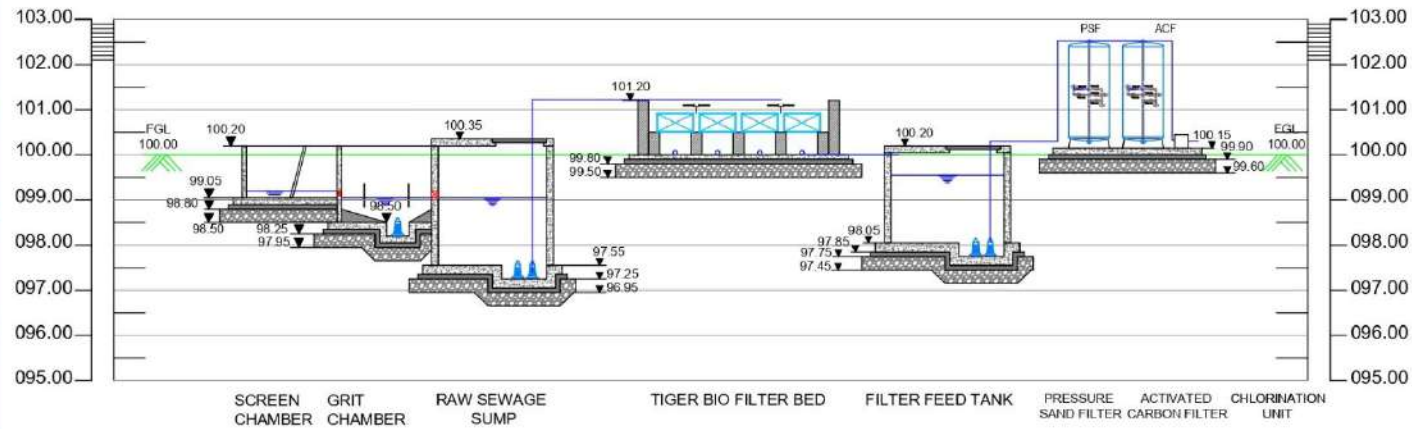
CLIENT : SWSM, MAHARASHTRA

DRAWING NAME:

PLANT LAYOUT

PROJECT CODE : TBF-	DRAWING NO : D-01/PL/01	DATE : JUNE-2021
DRAWN BY : L.D.B.	CHECKED BY : S.B.	SCALE : NTS.

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HYDRAULIC FLOW DIAGRAM

PROJECT NAME
100 KLD SEWAGE TREATMENT PLANT
BASED ON TIGER BIO FILTER
TECHNOLOGY.

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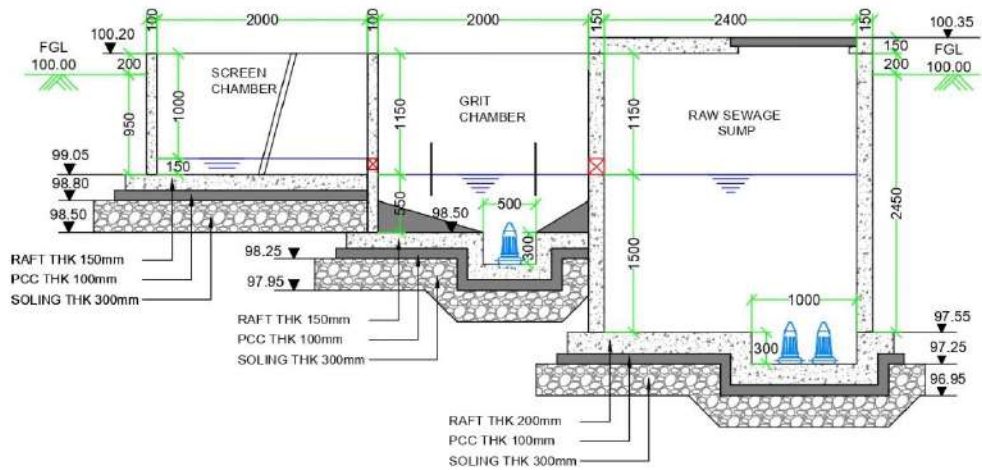
DRAWING NAME:

HYDRAULIC FLOW DIAGRAM

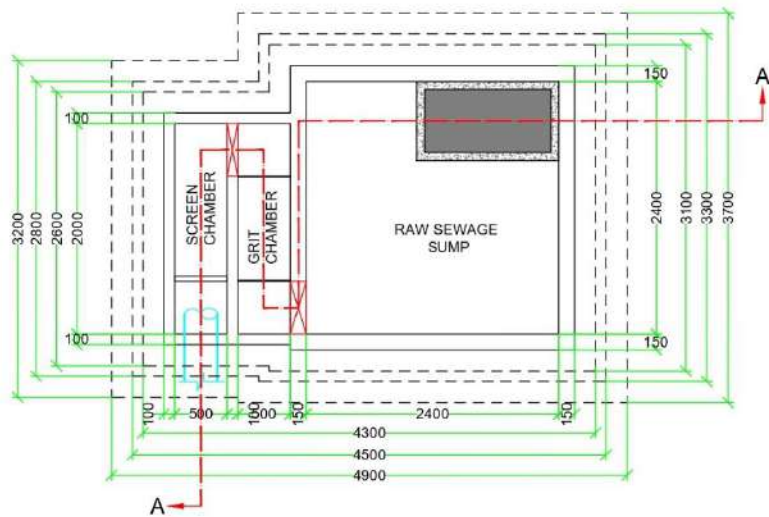
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SECTION A-A



PLAN

SCREEN CHAMBER, GRIT CHAMBER & RAW SEWAGE SUMP

PROJECT NAME
100 KLD SEWAGE TREATMENT PLANT
BASED ON TIGER BIO FILTER
TECHNOLOGY.

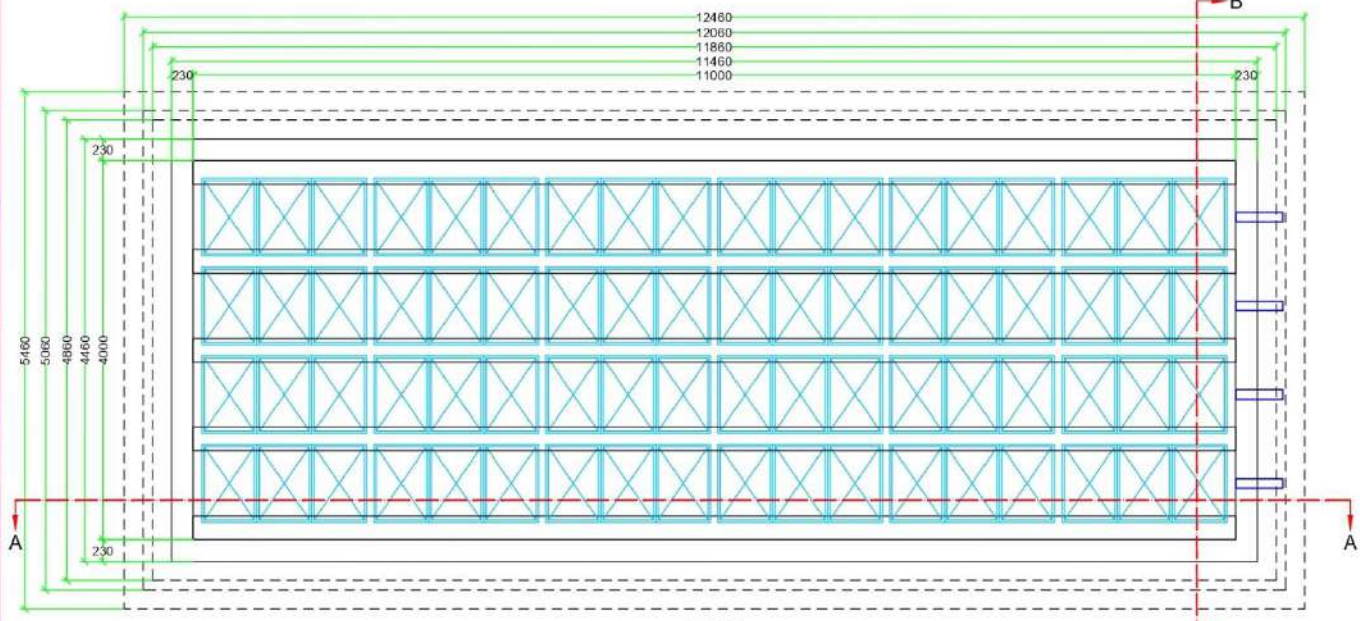
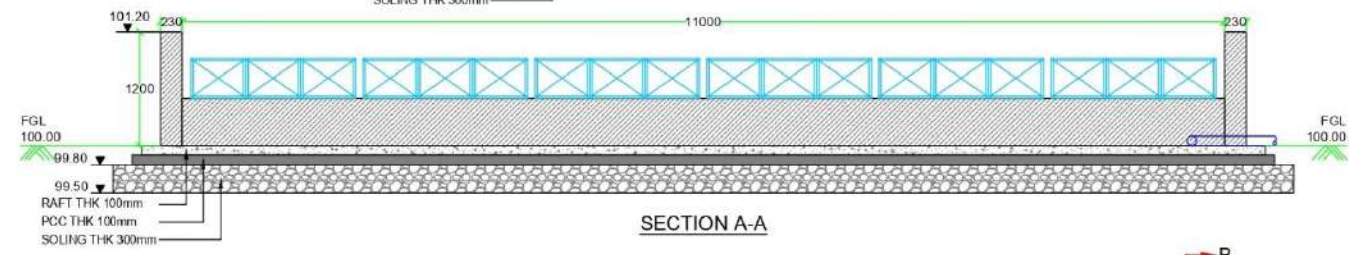
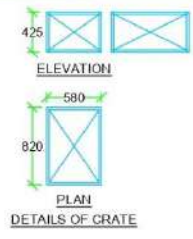
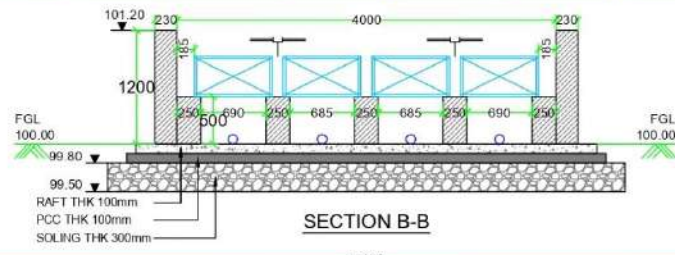
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REVISION		
DATE	REMARKS	SIGNATURE

CLIENT : SWSM, MAHARASHTRA
DRAWING NAME:
SCREEN CHAMBER, GRIT CHAMBER
& RAW SEWAGE SUMP

PROJECT CODE : TBF-	DRAWING NO : D.03/SC.GC&RS/01	DATE : JUNE-2021
DRAWN BY : L.D.B.	CHECKED BY : S.B.	SCALE : NTS.

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PLAN
TIGER BIO FILTER

PROJECT NAME
100 KLD SEWAGE TREATMENT PLANT
BASED ON TIGER BIO FILTER
TECHNOLOGY.

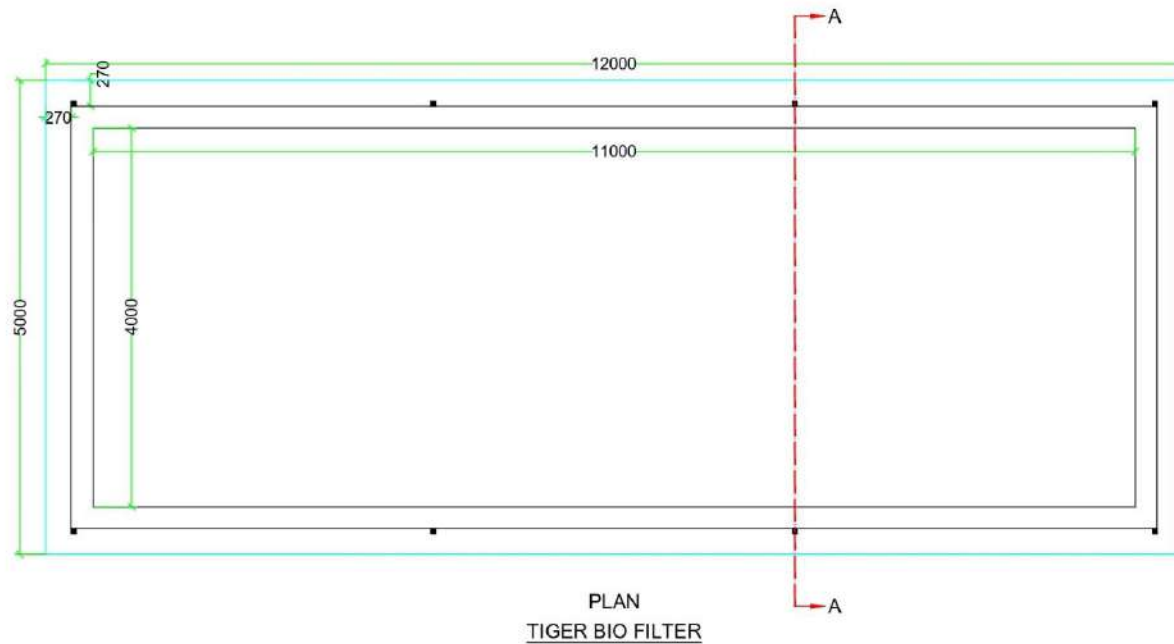
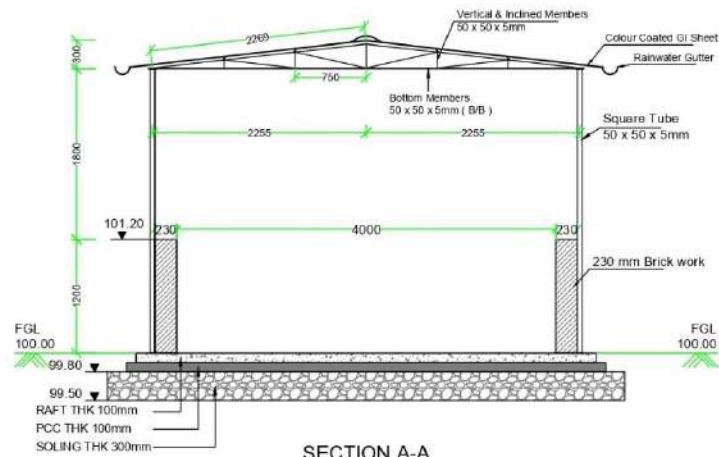
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CLIENT : SWSM, MAHARASHTRA
DRAWING NAME:
TIGER BIO FILTER

PROJECT CODE : TBF-	DRAWING NO : D-04/TBF/01	DATE : JUNE 2021
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PROJECT NAME
100 KLD SEWAGE TREATMENT PLANT
BASED ON TIGER BIO FILTER
TECHNOLOGY.

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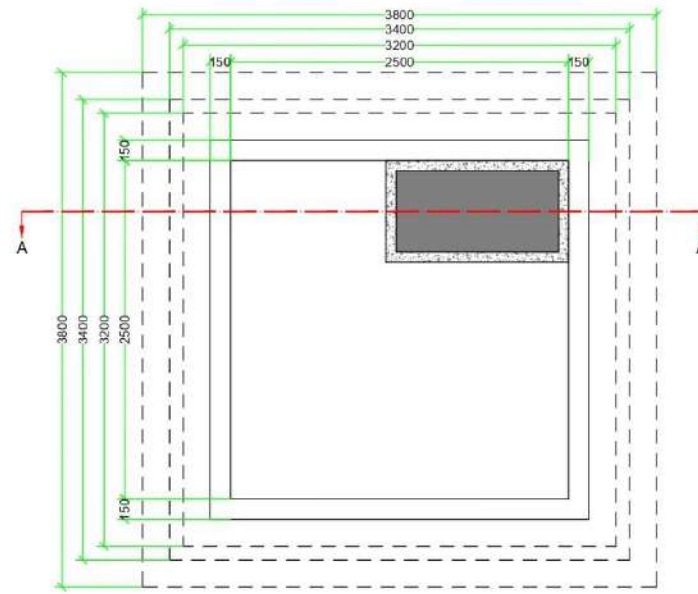
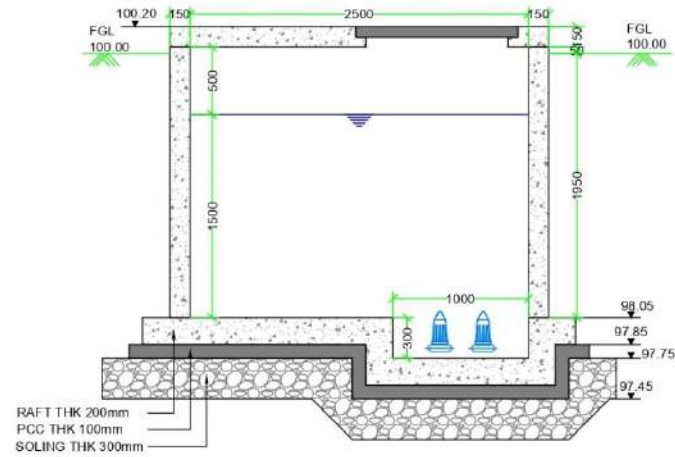
CLIENT : SWSM, MAHARASHTRA

DRAWING NAME:
TIGER BIO FILTER

PROJECT CODE : TBF-	DRAWING NO : D-04/TBF/02	DATE : JUNE 2021
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PLAN
FILTER FEED TANK

PROJECT NAME
100 KLD SEWAGE TREATMENT PLANT
BASED ON TIGER BIO FILTER
TECHNOLOGY.

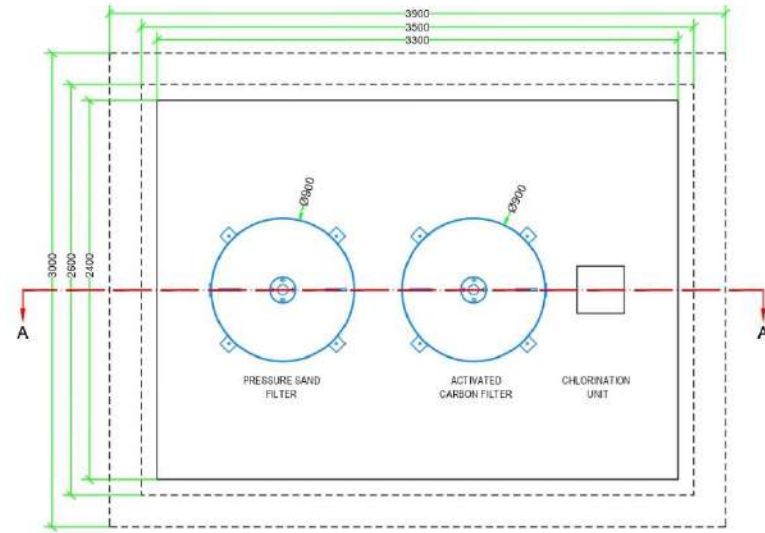
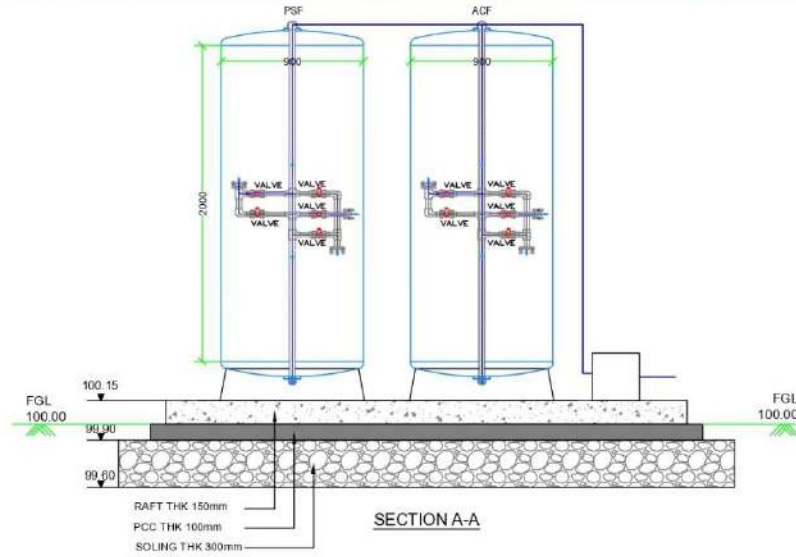
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REVISION		
DATE	REMARKS	SIGNATURE

CLIENT : SWSM, MAHARASHTRA
DRAWING NAME:
FILTER FEED TANK

PROJECT CODE : TBF-	DRAWING NO : D-05/FF T/01	DATE: JUNE-2021
DRAWN BY : L.D.B.	CHECKED BY : S.B.	SCALE : NTS.

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PLAN
PRESSURE SAND FILTER,
ACTIVATED CARBON FILTER & CHLORINATION UNIT

PROJECT NAME
 100 KLD SEWAGE TREATMENT PLANT
 BASED ON TIGER BIO FILTER
 TECHNOLOGY.

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REVISION		
DATE	REMARKS	SIGNATURE

CLIENT : SWSM, MAHARASHTRA
 DRAWING NAME :
 PRESSURE SAND FILTER,
 ACTIVATED CARBON FILTER
 & CHLORINATION UNIT

PROJECT CODE : TBF-	DRAWING NO : D-06/PSF,ACF&CLU01	DATE : JUNE-2021
DRAWN BY : L.D.B.	CHECKED BY : S.B.	SCALE : NTS.



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**200 KLD STP
BASED ON TBF TECHNOLOGY**

PROCESS CALCULATIONS
TIGER BIO FILTER OF 200 KLD CAPACITY

Design flow	=	200.00	KLD
	=	0.200	MLD
Peak flow factor	=	3.00	
1 SCREEN CHANNELS: MANUAL			
No. of Manual Screen	=	1	No.
Average Flow	=	0.20	MLD
Peak Flow Factor	=	3.00	
Design Flow	=	Peak Flow	
	=	0.60	MLD
	=	25.00	m ³ /hr
	=	0.007	m ³ /sec
Average Flow	=	0.20	MLD
	=	8.333	m ³ /hr
	=	0.002	m ³ /sec
Design Flow in each Screen	=	0.007	m ³ /sec
		1	No.
	=	0.007	m ³ /sec
Average Flow in each Screen	=	0.002	m ³ /sec
		1	No.
	=	0.002	m ³ /sec
Maximum Velocity through Screen at Peak Flow	=	1.2	m/sec
Minimum Velocity through Screen at Average Flow	=	0.6	m/sec
Clear Area of Opening through Screen for Peak Flow	=	0.007	m ³ /sec
		1.2	m/sec
	=	0.006	m ²
Clear Area of Opening through Screen for Average Flow	=	0.002	m ³ /sec
		0.6	m/sec
	=	0.003	m ²
Considering maximum Area of Opening through Screen	=	0.006	m ²
Clear Spacing of Bars	=	10	mm

Thickness of Bars	=	5	mm	
Gross Area of Screen	=	$0.006 \times (10+5) / 10$		
	=	0.009	m ²	
Assuming Depth of Screen Channel	=	200.00	mm	
Gross Width of Screen	=	$0.009 / 0.2$		
	=	0.045	m	
No. of Bars	=	(Gross Width of Screen / Center to Center Spacing of Bars) - 1		
	=	$0.045 / ((10+5) / 1000)$		
	=	-1		
	=	2.0	Nos.	
Say	=	2	Nos.	
Width of Screen provided	=	(Number of Bars+1) x Clear Spacing + (Number of Bars x Bar Thickness)		
	=	$(2+1) \times 10 + (2 \times 5)$		
	=	40	mm	
Width Say	=	0.50	m	
Liquid Depth of Screen Channel provided	=	0.20	m	
L:B	=	4.00		
Length of Screen Channel provided	=	2.00	m	
Freeboard provided	=	1.00	m	Invert Depth of incoming sewer
Total Depth of Screen Chamber	=	1.20	m	
Velocity in Channel at Average Flow	=	Average Flow / Cross Sectional Area of Screen Channel		
	=	$0.002 / ((0.5 \times 0.2) / 1000 \times 1000)$		
	=	0.020	m/sec	
	>	0.300	m/sec	
Head Loss across Screen				
Head Loss across Screen	=	$0.0728 (V^2 - v^2)$		
V = Velocity through Screen at Peak Flow	=	Peak Flow through Screen Channel / Clear Area of Opening through Screen		
	=	1.167	m/sec	
v = Velocity in approach Channel at Peak Flow	=	Peak Flow through Screen Channel / Cross Sectional Area of Screen Channel		
	=	0.8	m/sec	
Head Loss across Screen at Peak Flow	=	0.055	m	
Head Loss across Screen at 50% Clogged Condition				
Velocity through Screen at 50% Clogged Condition at Peak Flow	=	2.333	m/sec	
Head Loss across screen at 50% Clogged Condition at Peak Flow	=	0.352	m	
	>	0.300	m/sec	

2 CONVENTIONAL GRIT CHAMBER: MANUAL

No. of Grit Chamber	=	1	
Average Flow	=	0.20	MLD
Peak Flow Factor	=	3.00	
Design Flow	=	Peak Flow	
Peak Flow	=	0.60	MLD
	=	600	m ³ /day
	=	25	m ³ /hr
	=	0.007	m ³ /sec
Design Flow to each Grit Chamber	=	600/1	
	=	600	m ³ /day
	=	25	m ³ /hr
	=	0.007	m ³ /sec
According to CPHEEO Manual			
Particle Size	=	0.15	mm
Specific Gravity	=	2.65	
Surface Overflow Rate for 100% removal efficiency in an ideal Grit Chamber	=	Settling Velocity of the minimum size of Particles to be removed	
	=	1.5	m/s
	=	1296	m ³ /m ² /day
Considering Efficiency of removal of desired Particles, $\eta = 75\%$ and Measure of Settling Basin Performance, $n = 1/8$ for very good performance	=	75%	
	=	0.125	
Design Overflow Rate	=	857	m ³ /m ² /day
Surface Overflow Rate for 0.15 mm dia. Particle Size with Specific Gravity $S_s > 2.65$ Table 5.6	=	1555	m ³ /m ² /day
Considering Design Overflow Rate	=	960	m ³ /m ² /day
Area of Grit Chamber required	=	600	m ³ /day
		960	m ³ /m ² /day
	=	0.63	m ²
L:B ratio	=	2	
Length of Chamber provided	=	2.50	m
Width of Chamber provided	=	0.60	m
Hydraulic Retention Time (HRT) in Grit Chamber at Peak Flow	=	60	sec
Volume of Grit Chamber required	=	0.007x60	

	=	0.42	m ³
Depth required in Grit Chamber	=	0.42 / (2.5x0.6)	
	=	0.28	m
Say	=	0.30	m
Grit Storage Depth	=	0.25	m
Total Liquid Depth required	=	0.55	m
Length of Grit Pit	=	0.50	m
Width of Grit Pit	=	0.50	m
Depth of Grit Pit	=	0.30	m
Free Board	=	1.20	m

3 RAW SEWAGE SUMP (WET WELL)

No. of Units	=	1	No.
Average Flow	=	0.20	MLD
	=	8.333	m ³ /hr
	=	0.0023	m ³ /sec

Peak Flow Factor = 3.00

Design Flow	=	Peak Flow	
	=	0.60	MLD
	=	25	m ³ /hr
	=	0.007	m ³ /sec

Hydraulic Retention Time (HRT) at Average Flow	=	120	min
Volume required	=	0.0023 x 120 x 60	
	=	17	m ³

Hydraulic Retention Time (HRT) at Peak Flow	=	Volume / Average Flow	
	=	39	min
	<	30	min

Total Volume of Wet Well = 17 m³

Side Water Depth (SWD) provided	=	1.50	m
Plan Area of Wet Well	=	11.04	m ²
Length/width of Sump required	=	3.32	m
Length/width of Sump provided	=	3.40	m
Volume of Sump provided	=	17.34	m ³
Length of Pump Pit	=	1.00	m
Width of Pump Pit	=	0.50	m
Depth of Pump Pit	=	0.30	m
Free Board	=	1.20	m

3.

1 DESIGN STATEMENT-RSS E&M

Design Considerations

Design flow	=	0.20	MLD
	=	200.00	Cum/Day
Peak flow factor	=	3.00	

Pumping machinery

Friction factor for Fittings in Pressure Mains

Elbow 90 degrees	=	10
Friction Factor for each	=	1
Friction factor for all	=	10
Elbow 45 degrees	=	0
Friction Factor for each	=	0.75
Friction factor for all	=	0
Elbow 22 degrees	=	0
Friction Factor for each	=	0.5
Friction factor for all	=	0
Tee 90 degrees	=	0
Friction Factor for each	=	1.5
Friction factor for all	=	0
Tee in straight pipe	=	6
Friction Factor for each	=	0.3
Friction factor for all	=	1.8
Gate valve open	=	1
Friction Factor for each	=	0.4
Friction factor for all	=	0.4
Swing check	=	1
Friction Factor for each	=	2.5
Friction factor for all	=	2.5
Total friction factor	=	14.7

Stage	low	ave	peak	
Average flow, cum / day	=	200.00		
Proportion	=	0.6	2	
Design flow, cum / day	=	120	400	
Hazen Williams C	=	140	140	
Desired velocity, m/s	=	0.6	1.5	
Number of Pumping hours	=	16.0	16.0	
Area needed, sqm	=	0.0035	0.0035	0.0046
Dia needed, m	=	0.066	0.066	0.077
Dia needed, mm	=	66	66	77
Dia provided, mm (User)	=	75	75	75
Radius, m	=	0.038	0.038	0.038
Radius power 0.63	=	0.126	0.126	0.126
S power 0.54	=	0.040	0.067	0.100
S	=	0.003	0.007	0.014
Slope 1 in	=	388.1	150.7	71.1
length, m	=	35	35	35
Friction in pipeline, m	=	0.1	0.2	0.5
Velocity head, m	=	0.018	0.051	0.115
Friction factor in fittings	=	14.7	14.7	14.7
Friction in fittings, m	=	0.3	0.7	1.7

Static lift, m	=	3.5	3.5	3.5
Total head, m	=	3.8	4.2	5.2
Efficiency of pumpset	=	0.8	0.8	0.8
Discharge, lps	=	2.1	3.5	6.9
Discharge, Cum/Hr	=	7.5	12.5	25.0
Kw required	=	0.323	0.538	1.075
HP required	=	0.5	1.0	1.5
Number of Pumps	=	2	2	2

4 TIGER BIO FILTER DESIGN STATEMENT-TBF1- 50 KLD

Number of pumping hours	=	16	Hrs	
Number of BMF tanks provided	=	4	Nos	
Design flow to each tank	=	50.00	Cum/day	
	=	3.13	Cum/ Hr for 16 Hr	
	=	0.87	lps	
Inlet BOD	=	250.00	mg/l	
Inlet TSS	=	400.00	mg/l	
BOD load applied	=	12.5	kg/day	
BOD uptake rate	=	0.1	Kg of BOD / Kg of worms	(0.5 - 1.0)
Worms required	=	125	Kg worms	
Sewage application rate	=	1.85	Cum/Sqm/day	(1 - 2 Cum/Sqm/day)
Area required	=	27.03	Sqm	
Area Provided	=	28	Sqm	
Area of each crate	=	0.4	Sqm	
Number of crates	=	70	Nos	
say	=	72	Nos	
Crate in longitudinal direction	=	18	Nos	
Crate in travers direction	=	4	Nos	
crates provided	=	72	Nos	OK
Width provided	=	4.00	m	
Length required	=	11.00	m	
Depth provided	=	1.2	m	

5 TERTIARY TREATMENT UNIT

Design Considerations

Design flow	=	0.20	MLD
	=	200.00	Cum/Day
Peak flow factor	=	3.00	

1 FILTER FEED TANK

Number of FFT provided	=	1	Nos
Number of operating hours	=	16	Hrs
Design flow	=	200.00	Cum/Day
	=	12.50	Cum/Hr

	=	0.00347	Cum/Sec
Hydraulic Retention time	=	60	min
Volume required	=	12.50	Cum
Depth	=	1.50	m
Civil Tanks			
Area	=	8.34	Sqm
Length/Width required	=	2.89	m
Length/Width provided	=	3.00	m
Freeboard provided	=	0.50	m
Volume Provided	=	13.50	Cum

DESIGN STATEMENT-TTU E&M

Design Considerations

Design flow	=	0.20	MLD
	=	200.00	Cum/Day
Peak flow factor	=	3.00	

Pumping machinery

Friction factor for Fittings in Pressure Mains

Elbow 90 degrees	=	5
Friction Factor for each	=	1
Friction factor for all	=	5
Elbow 45 degrees	=	0
Friction Factor for each	=	0.75
Friction factor for all	=	0
Elbow 22 degrees	=	0
Friction Factor for each	=	0.5
Friction factor for all	=	0
Tee 90 degrees	=	0
Friction Factor for each	=	1.5
Friction factor for all	=	0
Tee in straight pipe	=	5
Friction Factor for each	=	0.3
Friction factor for all	=	1.5
Gate valve open	=	1
Friction Factor for each	=	0.4
Friction factor for all	=	0.4
Swing check	=	1
Friction Factor for each	=	2.5
Friction factor for all	=	2.5
Total friction factor	=	9.4

Stage	low	ave	peak
Average flow, cum / day	=	200.00	
Proportion	=	0.6	1 2
Design flow, cum / day	=	120	200 400
Hazen Williams C	=	140	140 140
Desired velocity, m/s	=	0.8	1.0 1.5
Number of Pumping hours	=	16.0	16.0 16.0
Area needed, sqm	=	0.0026	0.0035 0.0046

Dia needed, m	=	0.058	0.066	0.077
Dia needed, mm	=	58	66	77
Dia provided, mm (User)	=	75	75	75
Radius, m	=	0.038	0.038	0.038
Radius power 0.63	=	0.126	0.126	0.126
S power 0.54	=	0.053	0.067	0.100
S	=	0.004	0.007	0.014
Slope 1 in length, m	=	227.8	150.7	71.1
Friction in pipeline, m	=	0.1	0.1	0.3
Velocity head, m	=	0.033	0.051	0.115
Friction factor in fittings	=	9.4	9.4	9.4
Friction in fittings, m	=	0.3	0.5	1.1
Static lift, m	=	8.0	8.0	8.0
Total head, m	=	8.3	8.5	9.1
Efficiency of pumpset	=	0.8	0.8	0.8
Discharge, lps	=	2.1	3.5	6.9
Discharge, Cum/Hr	=	7.5	12.5	25.0
Kw required	=	0.553	0.922	1.843
HP provided	=	1.0	1.5	2.5
Number of Pumps	=	2	2	2

2 PRESSURE SAND FILTER

Number of unit provided	=	1	Nos.
Designed @ 16 hrs working for flow of	=	12.50	m3/h
Loading rate	=	12.00	m3/m2/h
Area of DMF	=	1.04	m2
Dia of DMF	=	1.15	m
Provided	=	1.200	m
Backwash water			
Backwash velocity	=	15.00	m/hr
backwash flowrate	=	16.27	m3/h
Backwash volume for 20 mins	=	5.42	m3

3 ACTIVATED CARBON FILTER

Number of unit provided	=	1	Nos.
Designed @ 16 hrs working for flow of	=	12.50	m3/h
Loading rate	=	12.00	m3/m2/h
Area of ACF	=	1.04	m2
Dia of ACF	=	1.15	m
Provided	=	1.200	m
Backwash water			
Backwash velocity	=	15.00	m/hr
backwash flowrate	=	16.27	m3/h
Backwash volume for 20 mins	=	5.42	m3

4 CHLORINE DOSING SYSTEM NaOCI DOSING SYSTEM

Average Flow	=	12.50	m3/hr
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Design Chlorine Dosage (Max)	=	3	mg/l
Concentration of Chlorine in commercially available NaOCl	=	10%	
Design NaOCl Dosage	=	30	mg/l
Operating hours	=	16.0	hr
Quantity of NaOCl required	=	$12.5 \times 30 \times 16 / 1000$	
	=	6.00	Kg/day
Design Strength of NaOCl Solution	=	100%	
Volume of NaOCl Solution	=	$6 / (1 \times 1000)$	
	=	0.010	m ³
No. of Dosing Tanks provided	=	1	Nos.
Volume of each Dosing Tank	=	$0.01 / 1$	
	=	0.01	m ³
	=	100	Litres
No. of Working NaOCl Dosing Pump provided	=	1	No.
Capacity of each NaOCl Dosing Pump required	=	Total Volume of NaOCl Solution / (No. of Dosing pumps)	
	=	$0.01 / (1 \times 16)$	
	=	1.00	LPH
Capacity of each NaOCl Dosing Pump provided	=	1.00	LPH
No. of Standby NaOCl Dosing Pump provided	=	1	No.

SIZING DETAILS (CIVIL)
TIGER BIO FILTER OF 200 KLD CAPACITY

S I. N o	Unit name	N o s	Leng th	Widt h	Height			Soling		PCC		Raft		RCC Wall thk	Bric k Wall thk	Slab Thk	Steel - HCR M/ Kg/C
					SW M	FB m	Tota m	offs m	Thk m	offs m	Thk m	offs m	Thk m				
1	Screen Chamber	1	2.0	0.5	0.2	1.0	1.2	0.2	0.3	0.1	0.1	0.2	0.1	0.1			80
2	Grit Chamber	1	2.5	0.6	0.5	1.2	1.7	0.2	0.3	0.1	0.1	0.2	0.1	0.1			80
3	Raw Sewage Sump	1	3.4	3.4	1.5	1.2	2.7	0.2	0.3	0.1	0.1	0.2	0.3	0.2		0.2	100
4	TBF Bed 50 KLD	4	11.0	4.0			1.2	0.2	0.3	0.1	0.1	0.2	0.1		0.2		60
5	Filter Feed tank	1	3.0	3.0	1.5	0.5	2.0	0.2	0.3	0.1	0.1	0.2	0.2	0.2		0.2	100
6	Filter Platform	1	2.3	3.5				0.2	0.3	0.1	0.1	0.2	0.1				60

Assumptions

Incoming Sewer Invert 1.0 m Below Ground level
Method of excavation Mechanical means

Underground strata		soil	Muru m	Soft roc	har d	Tota l
0.0 to 1.5 m	=	25	25	25	25	100
1.5 m to 3.0 m	=	25	25	25	25	100
3.0 to 4.5 m	=	25	25	25	25	100
4.5 to 6.0	=	25	25	25	25	100

**TIGER BIO FILTER OF 200 KLD CAPACITY
BILL OF QUANTITIES**

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
1	Excavation for foundation / pipe trenches in earth, soils of all types, sand, gravel and soft murum, including removing the excavated material upto a distance of 50 metres and lifts as below, stacking and spreading as directed, normal dewatering, preparing the bed for foundation and excluding backfilling, etc. complete. (Bd-A-1/259)				
	0.0 to 1.5 m	78.14	Cum	150.00	11,721.00
	1.5 to 3.0 m	26.88	Cum	164.00	4,408.40
	3.0 to 4.5 m	4.10	Cum	178.00	729.80
	4.5 to 6.0 m	0.00	Cum	192.00	0.00
	MJP/ SSR/ 2021-22 / Section E / Excavation Item No.1/ Page no. 42				
2	Excavation for foundation / pipe trenches in hard murum and boulders, W.B.M. road including removing the excavated material upto a distance of 50 M beyond the area and lifts as below, stacking and spreading as directed by Engineer-in-charge, normal dewatering, preparing the bed for foundation and excluding backfilling, etc. complete. (Bd-A-3/259)				
	0.0 to 1.5 m	78.14	Cum	192.00	15,002.90
	1.5 to 3.0 m	26.88	Cum	206.00	5,537.30
	3.0 to 4.5 m	4.10	Cum	220.00	902.00
	4.5 to 6.0 m	0.00	Cum	234.00	0.00
	MJP/ SSR/ 2021-22/ Section E/ Excavation Item No.3, Page no. 42				
3	Excavation for foundation / pipe trenches in soft rock and old cement and lime masonry foundation asphalt road including removing the excavated material upto a distance of 50 M beyond the area and lifts as below, stacking as directed by Engineer-in-charge, normal dewatering, preparing the bed for foundation and excluding backfilling, etc. complete. (Bd-A- 4/259)				
	0.0 to 1.5 m	78.14	Cum	572.00	44,696.10
	1.5 to 3.0 m	26.88	Cum	597.00	16,047.40
	3.0 to 4.5 m	4.10	Cum	622.00	2,550.20
	4.5 to 6.0 m	0.00	Cum	647.00	0.00
	MJP/ SSR/ 2021-22 / Section E/ Excavation Item No.5, Page no. 42				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
4	Excavation for foundation / pipe trenches in hard rock and concrete road by chiselling, wedging, line drilling by mechanical means or by all means other than blasting including trimming and levelling the bed, removing the excavated material upto a distance of 50 metres beyond the area and lifts as below, stacking as directed by Engineer-in-charge, normal dewatering, excluding backfilling, etc. complete by all means. (Bd-A-6/259)				
	0.0 to 1.5 m	78.14	Cum	1,017.00	79,468.40
	1.5 to 3.0 m	26.88	Cum	1,042.00	28,009.00
	3.0 to 4.5 m	4.10	Cum	1,067.00	4,374.70
	4.5 to 6.0 m	0.00	Cum	1,092.00	0.00
	MJP/ SSR/ 2021-22 / Section E/ Excavation Item No.7, Page no. 43				
5	Providing dry trap/ granite/ quartzite/ gneiss, rubble stone soling in 15 cm to 20 cm thick layers including hand packing and compacting, etc. complete. (Bd-A-12/264)	100.75	Cum	1,175.00	118,381.30
	MJP/ SSR/ 2021-22 / Section E/ Excavati				
6	Providing and laying in situ Cement Concrete M- 15 of trap/ granite / quartzite / gneiss metal for foundation and bedding including bailing out water, form work, compaction, curing, etc. complete. (Cement 5.90 bags / cum) Spec. No. - Bd E /1 Page No. 287 and B- 7, Page No. 38	29.81	Cum	5,640.00	168,128.40
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.1, Page no.49				
7	Providing and laying in situ Cement Concrete of trap/ granite / quartzite / gneiss metal for RCC work in foundation like raft, grillage, strip foundation and footing of RCC columns and steel stanchions including normal dewatering, form work, compaction, finishing and curing, etc. complete. (By weigh batching and mix design for M250 and M-300 only. Use of L&T, A.C.C., Ambuja, Birla Gold, Manikgad, Rajashree, etc. cement is permitted.) (Excluding M.S. or Tor reinforcement)	33.52	Cum	7,448.00	249,657.00
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE/ Item No.2, Page no. 49				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
8	Providing and casting in situ C.C. of trap / granite/ quartzite / gneiss metal of approved quality for RCC works as per detailed drawings and designs or as directed by Engineer-in- charge including normal dewatering, centering, form work, compaction, finishing the formed surfaces with C.M. 1:3 of sufficient minimum thickness to give a smooth and even surface wherever necessary or roughening if special finish is to be provided and curing, etc. complete. (By weigh batching and mix design for M-250 and M-300 only. Use of L&T, A.C.C., Ambuja, Birla Gold, Manikgad, Rajashree, etc. cement is permitted.) (Excluding M.S. or Tor reinforcement)	0.78	Cum	8,624.00	6,726.80
	For Beams / Braces / Lintels In RCC M-300				
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.4, Page no. 50				
9	Providing and casting in situ C.C. of trap / granite/ quartzite / gneiss metal of approved quality for RCC works as per detailed drawings and designs or as directed by Engineer-in- charge including normal dewatering, centering, form work, compaction, finishing the formed surfaces with C.M. 1:3 of sufficient minimum thickness to give a smooth and even surface wherever necessary or roughening if special finish is to be provided and curing, etc. complete. (By weigh batching and mix design for M-250 and M-300 only. Use of L&T, A.C.C., Ambuja, Birla Gold, Manikgad, Rajashree, etc. cement is permitted.) (Excluding M.S. or Tor reinforcement)	4.53	Cum	9,247.00	41,889.00
	Slabs / Landings / Vertical Walls / Waist Slabs / Steps for Staircase In RCC M-300				
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.5, / Page no. 50				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
10	Providing and casting in situ C.C. of trap / granite/ quartzite / gneiss metal of approved quality for RCC works as per detailed drawings and designs or as directed by Engineer-in- charge including normal dewatering, centering, form work, compaction, finishing the formed surfaces with C.M. 1:3 of sufficient minimum thickness to give a smooth and even surface wherever necessary or roughening if special finish is to be provided and curing, etc. complete. (By weigh batching and mix design for M-250 and M-300 only. Use of L&T, A.C.C., Ambuja, Birla Gold, Manikgad, Rajashree, etc. cement is permitted.) (Excluding M.S. or Tor reinforcement)	15.16	Cum	9,218.00	139,744.90
	Chajjas / Parapets / Curtain Walls /Partition Walls / Pardies In RCC M-300				
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.6 / Page no. 51				
11	Providing and fixing in position steel bar reinforcement of various diameters for RCC piles, caps, footings, foundations, slabs, beams, columns, canopies, staircases, newels, chajjas, lintels, pardies, copings, fins, arches, etc. as per detailed designs, drawings and schedules; including cutting, bending, hooking the bars, binding with wires or tack welding and supporting as required, etc. complete (including cost of binding wire). (Bd-F-17/306)				
	c) Corrosion Resistant Steel (Fe 500)	4.41	MT	70,658.00	311,601.80
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.8 / Page no. 52				
12	Providing and fixing mild steel grill work for windows/ ventilators of 20 Kg/Sqm. As per drawings including necessary welding and painting with one coat of anticorrosive paint and two coats of oil painting, etc. complete. (Bd-U- 1/537)	6.79	Sqm	1,895.00	12,867.10
	MJP/ SSR/ 2021-22 / SECTION - F : IRON AND STRUCTURAL STEEL WORK Item No.1 / Page				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
13	Providing structural steel work in rolled stanchions fixed with connecting plates or angle cleats as in main and cross beams, hip and jack rafters, purlins connecting to truss members and like as per detailed designs and drawings or as directed by Engineer-in-charge including cutting, fabricating, hoisting, erecting, fixing in position, making riveted / bolted / welded connections and one coat of anticorrosive paint and over it two coats of oil painting, etc. complete. (Bd-C- 3/275)	2.99	MT	71,286.00	213,014.00
	MJP/ SSR/ 2021-22 / SECTION - F :: IRON AND STRUCTURAL STEEL WORK Item No.3,				
14	Providing and fixing corrugated galvanised iron sheets of 0.63 mm thick (24B .W .G.) for roofing without wind tiles including fastening with galvanised iron screws and bolts , lead and bitumen washers as per drawing etc. complete. (Weight of 5.5 kg/sq.m.).	301.60	Sqm	777.00	234,343.20
	PWD / SSR 2020-21 / Roofing and Ceiling SSR Item No.38.04 Reference No. Bd.R.5, Page No. 453 Item No.1133, Page no. 224				
15	Providing fly ash brick masonry with conventional / I.S. type bricks in cement mortar 1:6 in superstructure including striking joints, raking out joints, watering and scaffolding etc. Complete	59.48	Cum	6,305.00	375,021.40
	PWD / SSR 2020-21 / Brick Masonry SSR Item No.27.13 Reference No. As director by engineer incharge and BDG- 2 and 5 Item No.893, Page no. 190				
16	Providing internal cement plaster 12 mm thick in single coat in cement mortar 1:5 without neeru finish to concrete or brick surfaces, in all positions including scaffolding and curing etc. complete.	326.60	Sqm	257.00	83,936.20
	PWD / SSR 2020-21 / Plastering and Pointing SSR Item No. 32.03 Reference No. Bd. L.2 Page No. 368 Item No.950, Page no. 201				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
17	Providing rough cast cement plaster externally in two coats to concrete, brick or stone masonry surfaces in all positions with base coat of 12 to 15 mm thick in C.M. 1:4 and rough cast treatment 12 mm thick in proportion 1:11 / 2:3 including scaffolding and fourteen days curing complete.	190.00	Sqm	529.00	100,510.00
	PWD / SSR 2020-21 / Plastering and Pointing SSR Item No. 32.12 Reference No. Bd.L.8 Page No. 370 Item No.957, Page no. 201				
18	Providing and applying white-wash in two coats on old / new plastered or masonry surfaces and asbestos cement sheets including scaffolding and preparing the surface by brushing and brooming down etc. complete.	190.00	Sqm	10.00	1,900.00
	PWD / SSR 2020-21 / Colouring SSR Item No. 36.03 Reference No. Bd. P. I Page No. 411				
19	Providing and applying colour-wash of approved colour and shade in one coat to new surface including scaffolding, brushing and brooming down (excluding base coats of white wash) etc. complete.	190.00	Sqm	8.00	1,520.00
	PWD / SSR 2020-21 / Colouring SSR Item No. 36.04 Reference No. Bd. P.2 Page No. 412				
20	Dewatering the excavated trenches and pools of water in the building trenches / pipeline trenches, well works by using pumps and other devices including disposing off water to safe distance as directed by Engineer-in-charge (including cost of machinery, labour, fuel), etc. complete. (Bd-A-9/261)	56.00	HP/ Hr.	77.00	4,312.00
	MJP/ SSR/ 2021-22 / Section E/ Excavat				
21	Refilling the trenches with available excavated stuff with soft material first over pipeline and then hard material in 15 cm layers with all leads and lifts including consolidation, surcharging, etc. complete.	207.15	Cum	84.00	17,400.60
	MJP/ SSR/ 2021-22 / Section E/ Excavat				
22	Transportation as per STATEMENT VI Including loading, unloading and stacking Earth (4.8 Cum) lead 15 Km	320.87	Cum	604.45	193,949.90

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
	Electromechanical Items				
23	Screen (Manual) of size 1.7 m length x 0.5 m width of SS 304 MOC and Manual hand rake for cleaning screen of SS handle 1 m in length and cleaning area of 6 nos 5 mm SS rod of total length 200 mm straight and 50 mm of 90 degree bend.	0.85	Sqm	35,000.00	29,750.00
24	Grit pump				
	Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below				
	MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION - Pumps, Page no. 6, 7 of size 1.7 m length				
	1 HP (Up to 9000 LPH)	1.00	No	68,654.00	68,654.00
25	Raw Sewage Pumps				
	Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below				
	MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION -				
	2 HP (Up to 12000 LPH)	2.00	Nos	69,113.00	138,226.00
26	TTU Feed pumps				
	Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below				
	MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION -				
	2 HP (Up to 12000 LPH)	2.00	Nos	69,113.00	138,226.00
27	Pressure Sand Filter of FRP / MSEP vessel with suitable thickness to withstand a water pressure including MPV or 5 Valve system and PVC / UPVC / MSEP interconnecting and underdrain piping including fittings, with standard filter media layer with minimum depth of filter sand 1.0 m supported by gravels. The piping arrangement should provide sufficient pressure for backwash operations and avoid loss of sand during backwash operation. Suitable openings to be provided to ease addition and removal the media.				
	Dia 1.2 m x 2 m minimum height	1.00	Nos	236,000.00	236,000.00

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
28	Activated Carbon Filter of FRP / MSEP vessel with suitable thickness to withstand a water pressure including MPV or 5 Valve system and PVC / UPVC / MSEP interconnecting and underdrain piping including fittings, with standard filter media layer with minimum depth of Activated Carbon 1.0 m supported by gravels. The piping arrangement should provide sufficient pressure for backwash operations and avoid loss of Activated carbon during backwash operation. Suitable openings to be provided to ease addition and removal the media.				
	Dia 1.2 m x 2 m minimum height	1.00	Nos	236,000.00	236,000.00
29	NaOCl Chlorinator Pump Diaphragm Type / peristaltic type / Solenoid Max Flow Rate Upto 10LPH Power Source Electric Phase Single Material PP / PTFE(Teflon) Voltage 230 Volt Frequency				
	Mixing Tank of 100 Ltrs capacity	100.00	Ltrs	8.00	800.00
	Dosing Pump	2.00	Nos	15,000.00	30,000.00
30	Control Panel				
	Designing, Supplying, Installing, commissioning & testing of PLC Panel. Including PLC with CPU & Power supply unit, power supply cables interfacing cards, interfacing cables,	1.00	No	32,272.00	32,272.00
	MJP/ MECH/ ELECT / SSR/ 2021-22/ SECTION 19 - SA [SCADA & AUTOMATION]				
31	Supplying and erecting Fully Automatic Star Delta starter to operate squirrel cage induction motor working on 380- 440 Volt, 3 phase, 50 Hz with no volt coil, over load element, and ON - OFF push buttons, with necessary material and connected to supply, etc complete. Starter with original sheet steel encloser.				
	> 7.5 HP & Up to 12.5 HP	6.00	nos	7,150.00	42,900.00
	MJP /MECH/ ELECT/ SSR/ 2021-22 SECTION 10 - LG [L.T. SWITCHGEAR AND PROTECTION] Item no. LG 3 Page no. 27				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
32	Main power supply cable				
	3 core PVC insulated, PVC sheathed copper conductor flat submersible cable				
	Supplying and erecting, Flat flexible submersible cable with, Copper Conductor, PVC insulated, and PVC sheathed.				
	3 core 16 sq mm	25.00	m	549.00	13,725.00
33	Power cables				
	Aluminium conductor 4 Core, XLPE / PVC insulated & armoured cable				
	Supplying and erecting, XLPE / PVC insulated, armoured cable 1100 V grade with ISI mark Four core, solid / stranded aluminium conductor with 6 mm thick 25 mm width M.S. spacer with G.I. Earth wire 6 sq mm, complete erected on wall / on pole with 25 X 3 mm M.S. clamps or in provided trench in an approved manner.				
	4 Core 6 sq mm	90.00	m	137.00	12,330.00
	MJP MECH/ ELECT/ SSR/ 2021-22 SECTION 12 - CB [L.T. CABLE] Item no. CB 6 Page				
34	Control Cables				
	Copper conductor PVC insulated, Unarmoured control cable				
	Supplying and erecting Un-armoured control cable with ISI mark stranded / solid copper conductor 1.1 kV grade complete erected on wall / panel or in provided trench in an approved manner.				
	4 core 2.5 sq mm	90.00	m	137.00	12,330.00
	MJP MECH/ ELECT/ SSR/ 2021-22/ SECTION 12 - CB [L.T. CABLE] Item no. CB 8-				
	Plumbing Items				
35	Providing and supplying in standard lengths ISI mark rigid unplasticised PVC pipes suitable for potable water with solvent cement joints including cost of couplers, as per IS specification no. 4985 / 1988 excluding GST levied by GOI and GOM in all respect, including transportation, freight charges, inspection charges, loading, unloading, conveyance to the departmental stores and stacking the same in closed shed duly protected from sun rays and rains including cost of jointing material i.e. solvent cement, etc. complete (selffit type to be jointed with cement solvent).				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
	1) 10% of cost of pipes shall be considered for cost of PVC specials for estimate purpose only. 2) One coupler and required cement solvent shall be provided with each full length pipe cost of which is included in rates below.				
	MJP/ SSR/ 2021-22 / SECTION – I(II) P.V.C. PIPES, Page no.77				
1	Raw Sewage pump to TBF Distribution				
a	Main header				
	75 mm.	35.00	m	211.00	7,385.00
	PVC Specials- 10%				738.50
b	Distribution				
	63 mm.	25.00	m	149.00	3,725.00
	PVC Specials- 10%				372.50
2	TBF collection to FFT (gravity)				
a	Main header				
	75 mm.	60.00	m	211.00	12,660.00
	PVC Specials- 10%				1,266.00
b	collection tributary				
	63 mm.	10.00	m	149.00	1,490.00
	PVC Specials- 10%				149.00
3	TTU Plumbing				
	75 mm.	20.00	m	211.00	4,220.00
	PVC Specials- 10%				422.00
4	TBF distribution				
	63 mm.	20.00	m	149.00	2,980.00
	PVC Specials- 10%				298.00
36	Labour				
	Plumber	12.00	days	641.00	7,692.00
	Helper	12.00	days	579.00	6,948.00
	MJP/ SSR/ 2021-22 / SECTION - B LABOUR & MACHINERY , Page no. 14				
37	Providing double flange sluice valve confirming for IS- 14846 including worn gear arrangements as per test pressure, stainless steel spindle, caps, including inspection charges, transportation upto departmental store, unloading, stacking excluding GST levied by GOI & GOM in all respect etc. complete.				
	Sluice valves - PN -1 (Without by pass)				
	Raw Sewage pump				
	80 mm.	2.00	Nos	5,132.00	10,264.00
	Filter Feed Pump				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
	80 mm.	2.00	Nos	5,132.00	10,264.00
	MJP/ SSR/ 2021-22 / SECTION - I(XII) : PIPES APPURTENANCES , Page no. 132				
38	Providing and supplying ISI mark CI D/F reflux valves (non-return valves) of following dia including railway freight, inspection charges, unloading from railway wagon, loading into truck, transportation upto departmental stores, unloading, stacking excluding GST levied by GOI & GOM in all respect etc. complete. Reflux valves as per I.S.5312 Part I (1984)				
	Without by pass arrangement -PN -1				
	Raw Sewage pump				
	80 mm.	2.00	Nos	4,092.00	8,184.00
	Filter Feed Pump				
	80 mm.	2.00	Nos	4,092.00	8,184.00
	MJP/ SSR/ 2021-22 / SECTION - I(XII) : PIPES APPURTENANCES , Page no. 131				
	Bio media Items				
39	Supplying of Specially designed container for holding Filter media including Lightweight Expanded Clay Aggregates size (8-30 mm) and Bio media including mixture of woodchips Vermicompost, cocopeat and bacterial culture with special worms per designed quantity including transportation & fixing in position as directed etc. complete.	288.00	Nos	4,750.00	1,368,000.00
	Market rate				
40	Rapid sand Gravity filter sand At Source (Godhara, Gokak, Kanhan,	27.40	Cum	1,730.00	47,402.00
	MJP/ SSR/ 2021-22 / SECTION- A MATERIALS				
41	Trasnsportation Godhara to Pune distance by Road 660 Km.	27.40	Cum	11,031.37	302,259.60
	MJP/ SSR/ 2021-22 / SECTION - C : TRANSPORTATION Page no.				
42	Stone Aggregate 20 mm	27.40	Cum	900.00	24,660.00
	MJP/ SSR/ 2021-22 / SECTION- A MATERIALS				
43	Transportation as per STATEMENT VI Including loading, unloading and stacking				
	Manure or sludge (5.52 Cum) lead 25 Km	105.80	Cum	747.48	79,083.40
	MJP/ SSR/ 2021-22 / SECTION - C : TRANSPORTATION Page no.				
NET TOTAL Rs.					5,388,210.80

MEASUREMENT SHEET - SCREEN CHAMBER, GRIT CHAMBER AND RAW SEWAGE SUMP

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	Screen And Grit chamber						
1	Excavation				2.30		
A	0.0 to 1.5 m	1	5.70	2.80	1.5	23.94	Cum
	Soil					5.99	Cum
	Murum					5.99	Cum
	Soft rock					5.99	Cum
	hard rock					5.99	Cum
B	1.5 to 3.0 m	1	5.7	2.80	0.8	12.77	Cum
	soil					3.2	Cum
	Murum					3.2	Cum
	Soft rock					3.2	Cum
	hard rock					3.2	Cum
C	3.0 to 4.5 m	1	4.7	2.30	0	0	Cum
	soil					0	Cum
	Murum					0	Cum
	Soft rock					0	Cum
	hard rock					0	Cum
D	4.5 to 6.0 m	1	4.7	2.30	0	0	Cum
	soil					0	Cum
	Murum					0	Cum
	Soft rock					0	Cum
	hard rock					0	Cum
2	Soling						
	Screen	1	3.20	1.20	0.30	1.16	Cum
	Grit	1	3.70	0.60	0.30	0.67	Cum
	extra for grit chamber	1	0.50	0.60	0.30	0.09	Cum
				Total for grit		0.76	Cum
3	PCC M20						
	Screen	1	2.80	1.00	0.10	0.28	Cum
	Grit	1	3.30	0.60	0.10	0.2	Cum
		1	0.50	0.40	0.20	0.04	Cum
	Internal slope	1	Area	0.12	0.60	0.08	Cum
	Internal slope	1	Area	0.06	0.60	0.04	Cum
				Total for grit		0.36	Cum
4	Raft M30						
	Screen	1	2.60	0.90	0.15	0.36	Cum
	Grit	1	3.10	0.60	0.15	0.28	Cum
		1	0.50	0.30	0.15	0.03	Cum
				Total for grit		0.31	Cum
5	RCC Wall						
	Screen						
	Long Wall	2	2.20	0.10	1.40	0.62	Cum

MEASUREMENT SHEET - SCREEN CHAMBER, GRIT CHAMBER AND RAW SEWAGE SUMP

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	Short Wall	2	0.70	0.10	1.40	0.2	Cum
				Total for screen		0.82	Cum
	Grit						
	Long Wall (extra than screen chamber)	1	0.50	0.10	1.95	0.1	Cum
	Short Wall	2	0.60	0.10	1.95	0.24	Cum
				Total for grit		0.34	Cum
6	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	80	Cum	1.83	0.15	MT
7	Fabrication work in Frame and Grating for Access						
	Screen	1	2.20	0.70		1.54	Sqm
	Grit	1	2.70	0.70		1.89	Sqm
					Total	3.43	Sqm
8	Removing excess excavated material out of site						
	Screen chamber	1	2.20	0.70	1.20	1.85	Cum
	Grit Chamber	1	2.70	0.60	1.75	2.84	Cum
	soling, PCC, Raft volume					3.11	Cum
	Total Volume					7.8	Cum
	bulkage @ 40%					10.92	Cum
9	Refilling and compaction						
	Total Excavation					36.71	Cum
	Deduction for tank volume, soling, PCC, Raft					7.8	Cum
	Refilling and compaction volume					28.91	Cum

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	Raw Sewage Sump						
1	Excavation				3.40		
A	0.0 to 1.5 m	1	7.4	7.40	1.5	82.14	Cum
	soil					20.54	Cum
	Murum					20.54	Cum
	Soft rock					20.54	Cum
	hard rock					20.54	Cum
B	1.5 to 3.0 m	1	6.40	6.40	1.5	61.44	Cum
	soil					15.36	Cum
	Murum					15.36	Cum
	Soft rock					15.36	Cum
	hard rock					15.36	Cum
C	3.0 to 4.5 m	1	6.40	6.40	0.4	16.39	Cum

MEASUREMENT SHEET - SCREEN CHAMBER, GRIT CHAMBER AND RAW SEWAGE SUMP

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	soil					4.1	Cum
	Murum					4.1	Cum
	Soft rock					4.1	Cum
	hard rock					4.1	Cum
D	4.5 to 6.0 m	1	5.40	5.40	0	0	Cum
	soil					0	Cum
	Murum					0	Cum
	Soft rock					0	Cum
	hard rock					0	Cum
2	Soling						
	RSS	1	4.80	4.80	0.30	6.92	Cum
3	PCC M20						
	RSS	1	4.40	4.40	0.10	1.94	Cum
4	Raft M30						
	RSS	1	4.20	4.20	0.30	5.3	Cum
5	RCC Wall						
	Long Wall	2	3.80	0.20	2.90	4.41	Cum
	Short Wall	2	3.40	0.20	2.90	3.95	Cum
					Total	8.36	Cum
6	Beams						
	Beam 1	1	3.40	0.2	0.3	0.21	Cum
	Beam 2	1	3.40	0.2	0.3	0.21	Cum
					Total	0.42	Cum
7	Slab	1	3.80	3.80	0.2	2.89	Cum
	Deduction for manhole	-2	1.20	0.70	0.2	-0.34	Cum
					Total	2.55	Cum
8	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	100	Cum	16.63	1.67	MT
9	Fabrication work in Frame and Grating for Access						
	RSS	2	1.20	0.70		1.68	Sqm
10	Removing excess excavated material out of site						
	RSS	1	3.80	3.80	2.70	38.99	Cum
	soling, PCC, Raft volume					14.16	Cum
	Total Volume					53.15	Cum
	bulkage @ 40%					74.41	Cum
11	Refilling and compaction						

MEASUREMENT SHEET - SCREEN CHAMBER, GRIT CHAMBER AND RAW SEWAGE SUMP

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	Total Excavation					159.97	Cum
	Deduction for tank volume, soling, PCC, Raft					53.15	Cum
	Refilling and compaction volume					106.82	Cum
12	Dewatering						
	7 Days x 4 hours/day	days	7	hours / day	4	28	Hrs

MEASUREMENT SHEET - TIGER BIO FILTER

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	TIGER BIO FILTER						
1	Excavation				0.50		
A	0.0 to 1.5 m	1	12.66	5.66	0.5	35.83	Cum
	soil					8.96	Cum
	Murum					8.96	Cum
	Soft rock					8.96	Cum
	hard rock					8.96	Cum
2	Soling						
	TBF	1	12.46	5.46	0.30	20.41	Cum
3	PCC M20						
	TBF	1	12.06	5.06	0.10	6.11	Cum
4	Raft M30						
	TBF	1	11.86	4.86	0.10	5.77	Cum
5	Brick Wall						
	TBF						
	Long Wall	2	11.46	0.23	1.20	6.33	Cum
	Short Wall	2	4.00	0.23	1.20	2.21	Cum
	Crate Support Wall	5	11.00	0.23	0.50	6.33	Cum
						Total for T	14.87
							Cum
6	Plaster						
	Internal						
	Crate Support Wall						
	Long Wall	6	11.00		0.50	33	Sqm
	Wall top	5	11.00		0.23	12.65	Sqm
	Long Wall	2	11.00		1.20	26.4	Sqm
	Short Wall	2	4.00		1.20	9.6	Sqm
						Total	81.65
							Sqm
	External						
	Long Wall	2	11.46		1.20	27.51	Sqm
	Short Wall	2	4.46		1.20	10.71	Sqm
	Wall Top	1	30.92	0.3		9.28	Sqm
						Total	47.50
							Sqm
7	External-white-wash	1				47.50	Sqm
8	External-colour-wash	1				47.50	Sqm
9	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	60	Cum	5.77	0.35	MT
10	Removing excess excavated material out of site						
	soling, PCC, Raft volume					32.29	Cum
	Total Volume					32.29	Cum
	bulkage @ 40%					45.21	Cum

MEASUREMENT SHEET - TIGER BIO FILTER

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
11	Refilling and compaction						
	Total Excavation					35.83	Cum
	Deduction for tank volume, soling, PCC, Raft					32.29	Cum
	Refilling and compaction volume					3.54	Cum
12	MS Fabricated Shed						
	TBF-II Shed in Fabrication work Shed Size-12 m X 5 m		12.00	5.00	3.00		
	for column 50*50*5 Unit Weight 6.97 kg/m	10	3.00	6.97	kg/m	209.10	KG
	for truss 50*50*3 Unit Weight 3.71 kg/m	5	5.00	3.71	kg/m	92.75	KG
	for principle rafter 50*50*3 Unit Weight	10	2.90	3.71	kg/m	107.59	KG
	for strut rafter 50*50*3 Unit Weight 3.71 kg/m	10	0.20	3.71	kg/m	7.42	KG
	for central strut rafter 50*50*3 Unit Weight	5	0.30	3.71	kg/m	5.57	KG
	for bottom frame below truss 50*50*3 Unit Weight 3.71 kg/m	1	34.00	3.71	kg/m	126.14	KG
	for perlin 30*30*3 Unit Weight 2.51 kg/m	5	13.00	2.51	kg/m	163.15	KG
	for Base Plate 150*150*10 mm	20	0.15	0.15	0.010	35.33	KG
					Total Wei	747.04	Kg
						0.75	MT
13	corrugated galvanised iron sheets	2	13.00	2.90		75.4	Sqm

MEASUREMENT SHEET - FILTER FEED TANK

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
8	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	100	Cum	10.87	1.09	MT
9	Fabrication work in Frame and Grating for Access						
	FFT	2	1.20	0.70		1.68	Sqm
10	Removing excess excavated material out of site						
	FFT	1	3.40	3.40	2.00	23.12	Cum
	soling, PCC, Raft volume					10.3	Cum
	Total Volume					33.42	Cum
	bulkage @ 40%					46.79	Cum
11	Refilling and compaction						
	Total Excavation					87.28	Cum
	Deduction for tank volume, soling, PCC, Raft					33.42	Cum
	Refilling and compaction volume					53.86	Cum
12	Dewatering						
	7 Days x 4 hours/day	days	7	hours/day	4	28	Hrs

MEASUREMENT SHEET - FILTER PLATFORM

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	FILTER PLATFORM						
1	Excavation				0.55		
A	0.0 to 1.5 m	1	3.5	4.70	0.55	9.05	Cum
	soil					2.27	Cum
	Murum					2.27	Cum
	Soft rock					2.27	Cum
	hard rock					2.27	Cum
2	Soling						
	Filter Platform	1	3.30	4.50	0.30	4.46	Cum
3	PCC M20						
	Filter Platform	1	2.90	4.10	0.10	1.19	Cum
4	Raft M30						
	Filter Platform	1	2.70	3.90	0.15	1.58	Cum
5	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	60	Cum	1.58	0.1	MT
6	Removing excess excavated material out of site						
	soling and PCC volume					5.65	Cum
	Total Volume					5.65	Cum
	bulkage @ 40%					7.91	Cum
7	Refilling and compaction						
	Total Excavation					9.05	Cum
	Deduction for tank volume, soling, PCC, Raft					5.65	Cum
	Refilling and compaction volume					3.4	Cum

MEASUREMENT SHEET - ELECTROMECHANICAL WORKS

Sr. No.	Item Description	Nos.	Unit
1	Screen (Manual) of size 1.7 m length x 0.5 m width of SS 304 MOC and Manual hand rake for cleaning screen of SS handle 1 m in length and cleaning area of 6 nos 5 mm SS rod of total length 200 mm straight and 50 mm of 90 degree bend.	1	No
2	Grit pump Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION - Pumps, Page no. 6, 7 of size 1.7 m length x 0.5 m width of SS304 MOC 1 HP (Up to 9000 LPH)	1	No
3	Raw Sewage Pumps Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION - Pumps, Page no. 6, 7 2 HP (Up to 12000 LPH)	2	Nos
4	TTU Feed pumps Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION - Pumps, Page no. 6, 7 2 HP (Up to 12000 LPH)	2	Nos
5	Pressure Sand Filter of FRP / MSEP vessel with suitable thickness to withstand a water pressure including MPV or 5 Valve system and PVC / UPVC / MSEP interconnecting and underdrain piping including fittings, with standard filter media layer with minimum depth of filter sand 1.0 m supported by gravels. The piping arrangement should provide sufficient pressure for backwash operations and avoid loss of sand during backwash operation. Suitable openings to be provided to ease addition and	1	Nos
	Dia 1.2 m x 2 m minimum height	1	Nos
6	Activated Carbon Filter of FRP / MSEP vessel with suitable thickness to withstand a water pressure including MPV or 5 Valve system and PVC / UPVC / MSEP interconnecting and underdrain piping including fittings, with standard filter media layer with minimum depth of Activated Carbon 1.0 m supported by gravels. The piping arrangement should provide sufficient pressure for backwash operations and avoid loss of Activated carbon during backwash operation. Suitable openings to be provided to ease addition and removal the media.	1	Nos
	Dia 1.2 m x 2 m minimum height	1	Nos
7	PurAll Tablet Chlorinator + cartridge	0	nos

MEASUREMENT SHEET - ELECTROMECHANICAL WORKS

Sr. No.	Item Description	Nos.	Unit
7	NaOCl Chlorinator Pump Diaphragm Type / peristaltic type / Solenoid Max Flow Rate Upto 10LPH Power Source Electric Phase Single Material PP / PTFE(Teflon) Voltage 230 Volt Frequency 50Hz		
a	Mixing Tank of 100 Ltrs capacity	1	Nos
b	Dosing Pump	2	Nos
8	Control Panel		
	Designing, Supplying, Installing, commissioning & testing of PLC Panel. Including PLC with CPU & Power supply unit, power supply cables interfacing cards, interfacing cables, wireless modules with 25% extra quantity of all accessories.		
	PLC Panel	1	No
	MJP/ MECH/ ELECT / SSR/ 2021-22/ SECTION 19 - SA [SCADA & AUTOMATION] Item no. 1.4 Page no. 69		
9	Supplying and erecting Fully Automatic Star Delta starter to operate squirrel cage induction motor working on 380- 440 Volt, 3 phase, 50 Hz with no volt coil, over load element, and ON - OFF push buttons, with necessary material and connected to supply, etc complete. Starter with original sheet steel encloser.		
	> 7.5 HP & Up to 12.5 HP	6	nos
	1 nos extra starter considered as spare.		
	MJP /MECH/ ELECT/ SSR/ 2021-22 SECTION 10 - LG [L.T. SWITCHGEAR AND PROTECTION] Item no. LG 3 Page no. 27		
10	Main power supply cable		
	3 core PVC insulated, PVC sheathed copper conductor flat submersible cable		
	Supplying and erecting, Flat flexible submersible cable with, Copper Conductor, PVC insulated, and PVC sheathed.		
	3 core 16 sq mm	25	m
11	Power cables		
	Aluminium conductor 4 Core, XLPE / PVC insulated & armoured cable		
	Supplying and erecting, XLPE / PVC insulated, armoured cable 1100 V grade with ISI mark Four core, solid / stranded aluminium conductor with 6 mm thick 25 mm width M.S. spacer with G.I. Earth wire 6 sq mm, complete erected on wall / on pole with 25 X 3 mm M.S. clamps or in provided trench in an approved manner.		
	4 Core 6 sq mm	90	m
	MJP MECH/ ELECT/ SSR/ 2021-22 SECTION 12 - CB [L.T. CABLE] Item no. CB 6 Page no. 35		
12	Control Cables		
	Copper conductor PVC insulated, Unarmoured control cable		

MEASUREMENT SHEET - ELECTROMECHANICAL WORKS

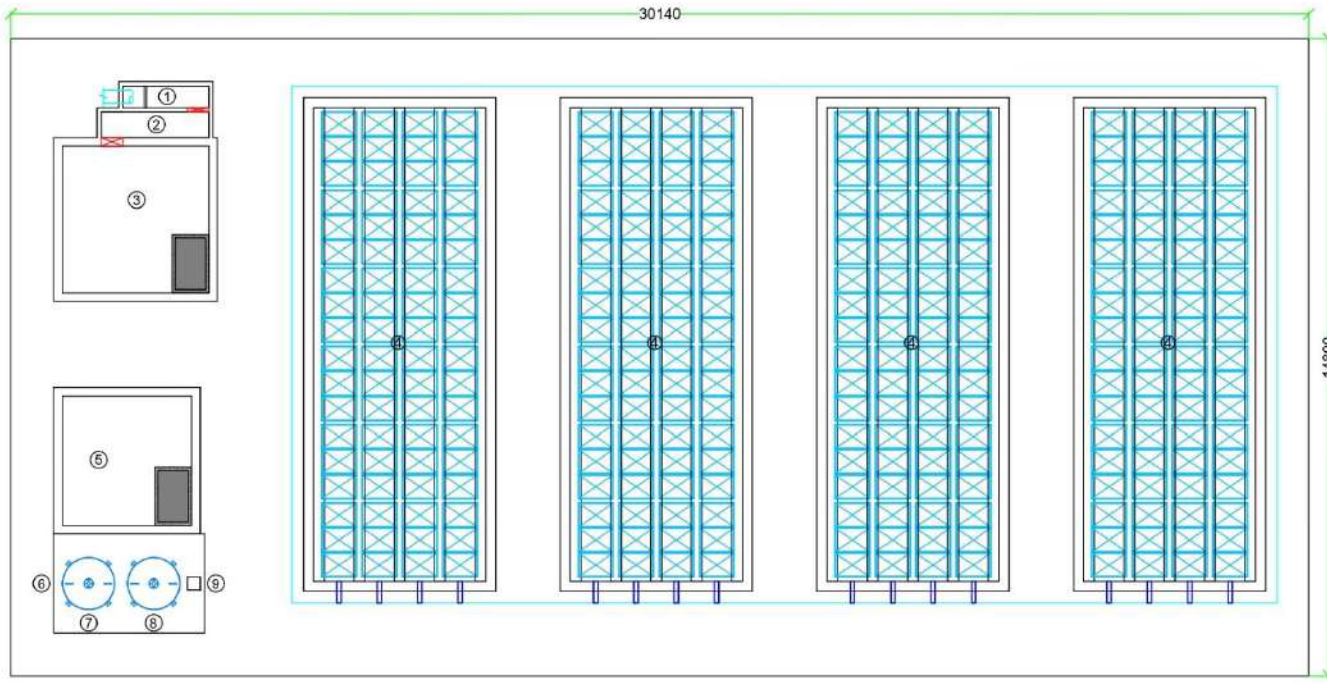
Sr. No.	Item Description	Nos.	Unit
	Supplying and erecting Un-armoured control cable with ISI mark stranded / solid copper conductor 1.1 kV grade complete erected on wall / panel or in provided trench in an approved manner.		
	4 core 2.5 sq mm	90	m
	MJP MECH/ ELECT/ SSR/ 2021-22/ SECTION 12 - CB [L.T. CABLE] Item no. CB 8-2 Page no. 36		

MEASUREMENT SHEET - PLUMBING

Sr. No.	Item Description	Nos.	L (m)	B (m)	Quantity	Unit
	Providing and supplying in standard lengths ISI mark rigid unplasticised PVC pipes suitable for potable water with solvent cement joints including cost of couplers, as per IS specification no. 4985 / 1988 excluding GST levied by GOI and GOM in all respect, including transportation, freight charges, inspection charges, loading, unloading, conveyance to the departmental stores and stacking the same in closed shed duly protected from sun rays and rains including cost of jointing material i.e. solvent cement, etc. complete (selffit type to be jointed with cement solvent).					
	1) 10% of cost of pipes shall be considered for cost of PVC specials for estimate purpose only. 2) One coupler and required cement solvent shall be provided with each full length pipe cost of which is included in rates below.					
	MJP/ SSR/ 2021-22 / SECTION – I(II) P.V.C. PIPES, Page no.77					
1	Raw Sewage pump to TBF Distribution					
a	Main header	Dia	75			
	75 mm.	1	35		35	m
	PVC Specials- 10%					
b	Distribution					
	63 mm.	1	25		25	m
	PVC Specials- 10%					
2	TBF collection to FFT (gravity)					
a	Main header					
	75 mm.	1	60		60	m
	PVC Specials- 10%					
b	collection tributary					
	63 mm.	1	10		10	m
	PVC Specials- 10%					
3	TTU Plumbing	Dia	75			
	75 mm.	1	20		20	m
	PVC Specials- 10%					
4	TBF distribution			No. of beds		
	63 mm.	1	5	4	20	m
	PVC Specials- 10%					
5	Labour	Nos	Days			
	Plumber	2	6		12	days
	Helper	2	6		12	days
6	Sluice valves					

MEASUREMENT SHEET - PLUMBING

Sr. No.	Item Description	Nos.	L (m)	B (m)	Quantity	Unit
	Providing double flange sluice valve confirming for IS- 14846 including worn gear arrangements as per test pressure, stainless steel spindle, caps, including inspection charges, transportation upto departmental store, unloading, stacking excluding GST levied by GOI & GOM in all respect etc. complete.					
	MJP/ SSR/ 2021-22 / SECTION - I(XII) : PIPES APPURTENANCES , Page no. 132					
	Raw Sewage pump					
	80 mm.	2			2	Nos
	Filter Feed Pump					
	80 mm.	2			2	Nos
7	Reflux valves (non-return valves)					
	Providing and supplying ISI mark CI D/F reflux valves (non-return valves) of following dia including railway freight, inspection charges, unloading from railway wagon, loading into truck, transportation upto departmental stores, unloading, stacking excluding GST levied by GOI & GOM in all respect etc. complete. Reflux valves as per I.S.5312 Part I (1984)					
	MJP/ SSR/ 2021-22 / SECTION - I(XII) : PIPES APPURTENANCES , Page no. 131					
	Raw Sewage pump					
	80 mm.	2			2	Nos
	Filter Feed Pump					
	80 mm.	2			2	Nos



PLANT LAYOUT
AREA = 446 SQM.

Process Unit Details								
Sr. No	Description	No	L/D	B	H	FB	Total H	MOC
			m.	m.	m.	m.	m.	
1	Screen Chamber	1	2.00	0.50	0.20	1.00	1.20	RCC
2	Grit Chamber	1	2.50	0.60	0.55	1.20	1.75	RCC
3	Raw Sewage Sump	1	3.40	3.40	1.50	1.20	2.70	RCC
4	Tiger Bio Filter	4	11.00	4.00	-	-	1.20	BRICK
5	Filter Feed Tank	1	3.00	3.00	1.50	0.50	2.00	RCC
6	Filter Platform	1	2.30	3.50	-	-	-	RCC
7	Pressure Sand Filter	DIA	1.20	-	-	-	2.00	MSEP
8	Activated Carbon Filter	DIA	1.20	-	-	-	2.00	MSEP
9	Chlorination Unit	1	-	-	-	-	-	-

PROJECT NAME :
200 KLD SEWAGE TREATMENT PLANT
BASED ON TIGER BIO FILTER
TECHNOLOGY.

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DRAWING NAME:
PLANT LAYOUT

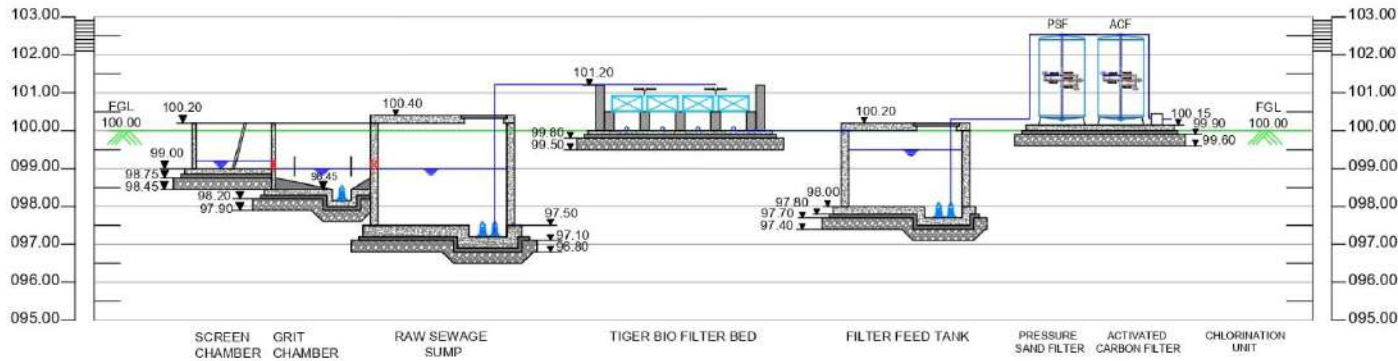
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HYDRAULIC FLOW DIAGRAM

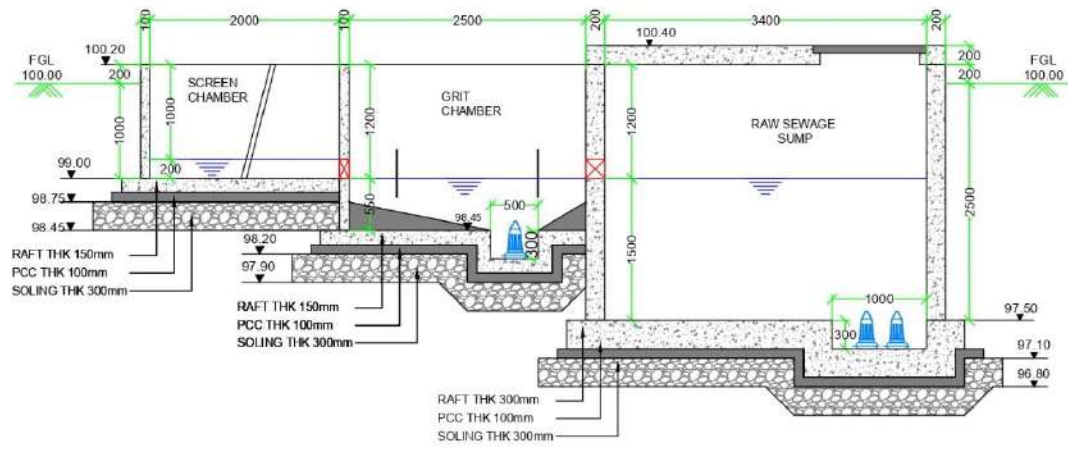
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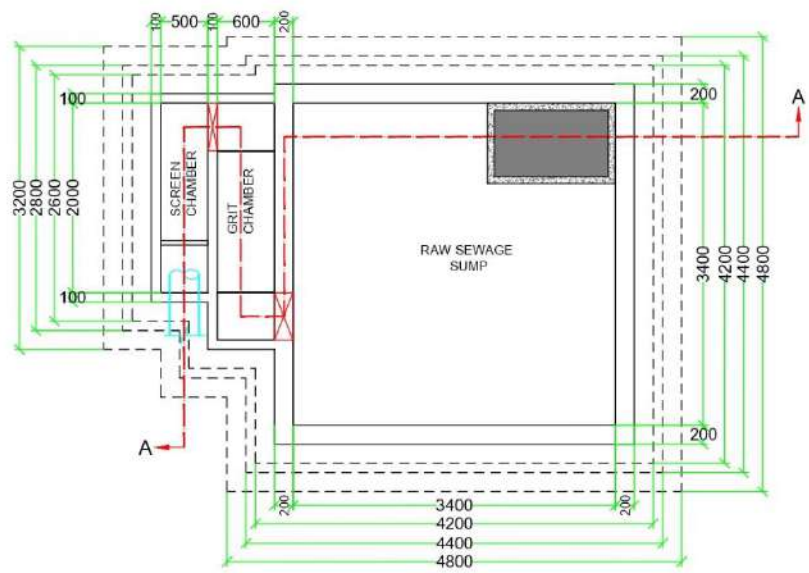
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HYDRAULIC FLOW DIAGRAM

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SECTION A-A



PLAN
SCREEN CHAMBER, GRIT CHAMBER & RAW SEWAGE SUMP

PROJECT NAME :
200 KLD SEWAGE TREATMENT PLANT
BASED ON TIGER BIO FILTER
TECHNOLOGY.

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DRAWING NAME :
SCREEN CHAMBER, GRIT CHAMBER
& RAW SEWAGE SUMP

PROJECT CODE : TBF-	DRAWING NO : D.03/SC,GC&RS/01	DATE : JUNE-2021
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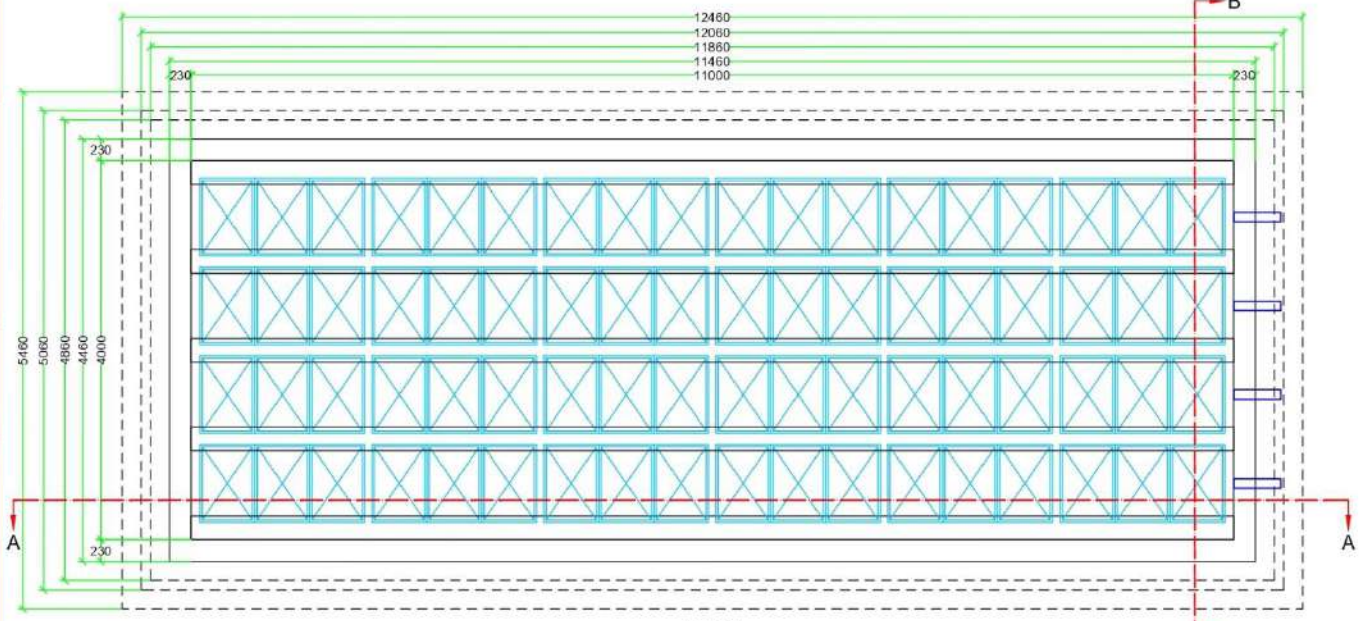
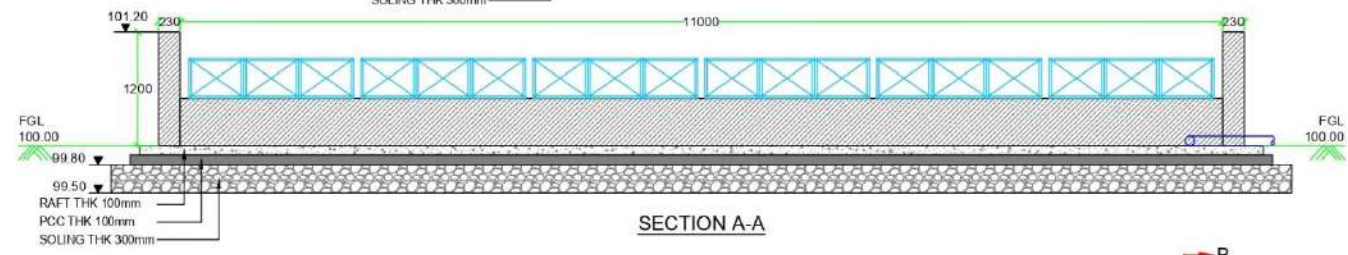
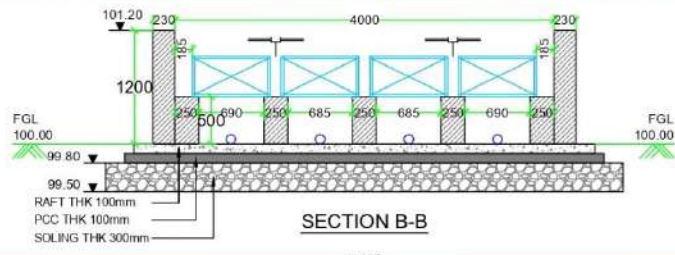
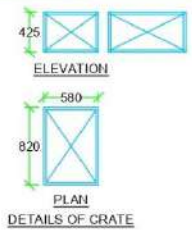
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PROJECT NAME :
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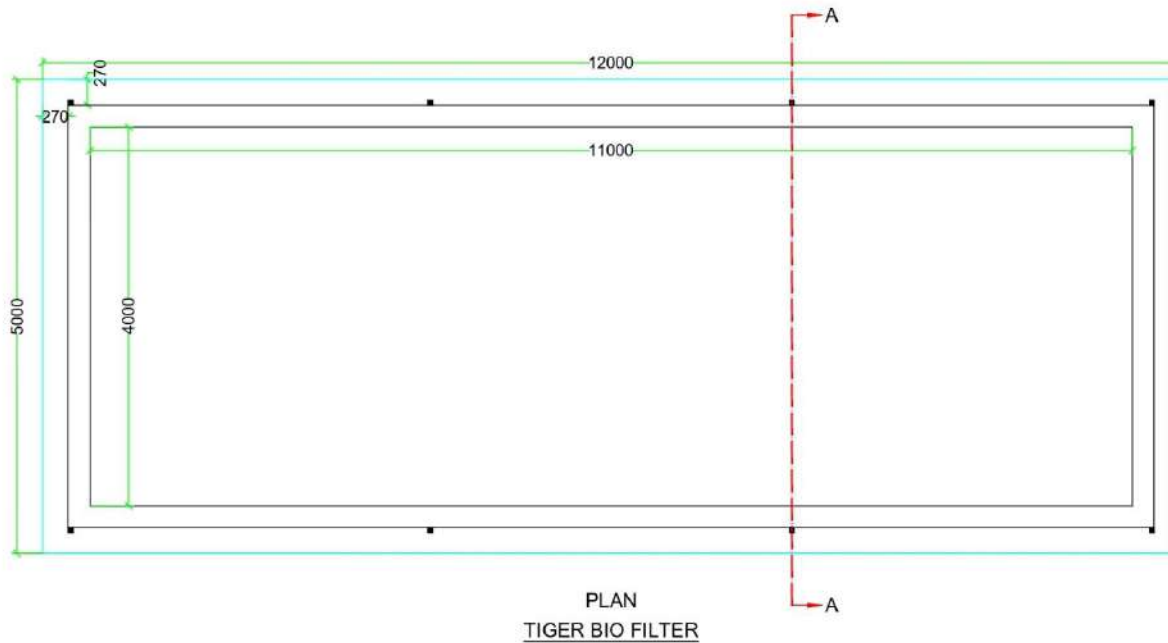
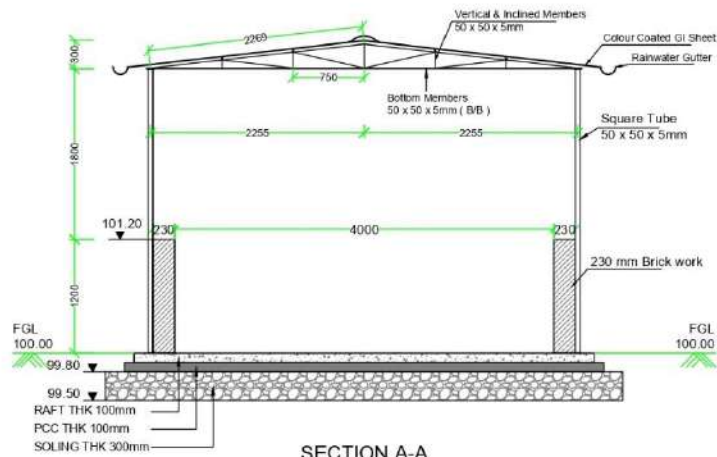


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CLIENT : SWSM, MAHARASHTRA
DRAWING NAME :
TIGER BIO FILTER

PROJECT CODE : TBF-	DRAWING NO : D-04/TBF/01	DATE : JUNE-2021
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200 KLD SEWAGE TREATMENT PLANT
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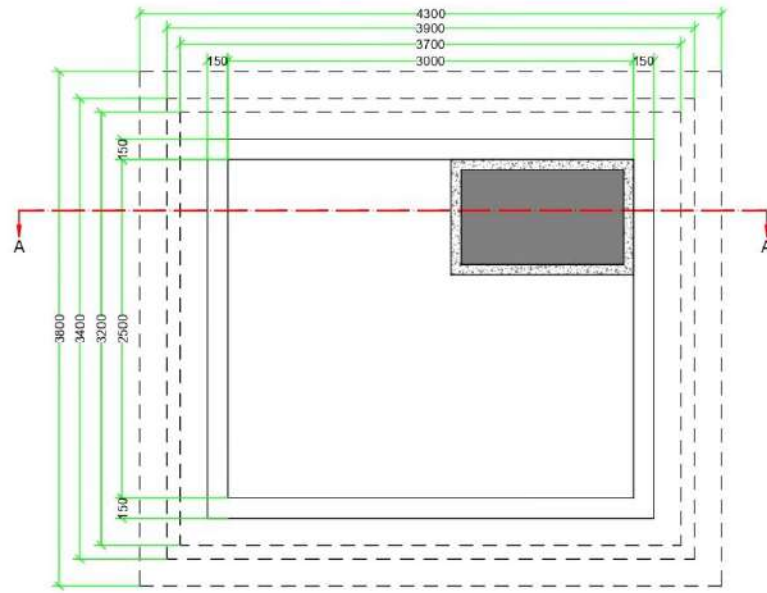
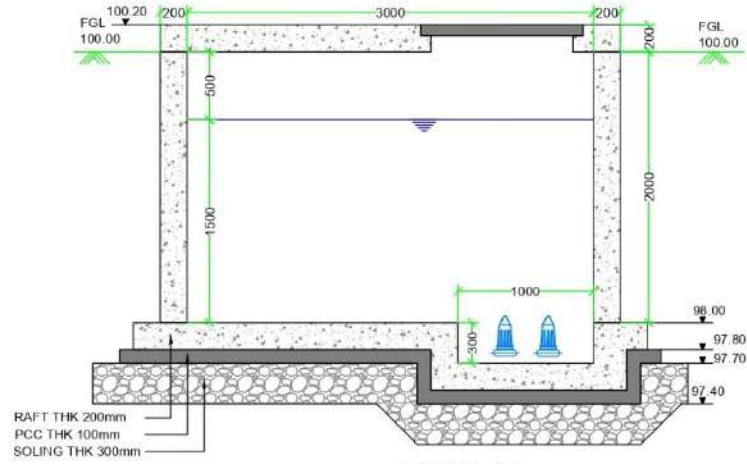
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DRAWING NAME:

TIGER BIO FILTER

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PLAN
FILTER FEED TANK

PROJECT NAME :

200 KLD SEWAGE TREATMENT PLANT
BASED ON TIGER BIO FILTER
TECHNOLOGY.

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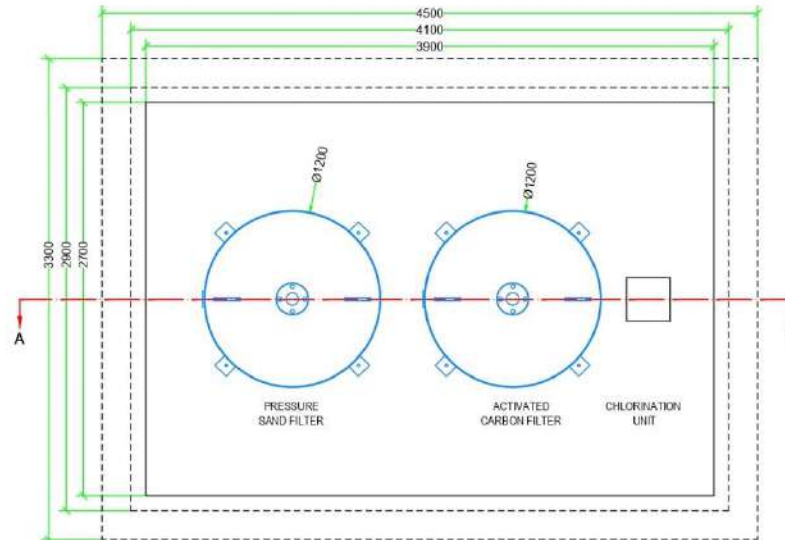
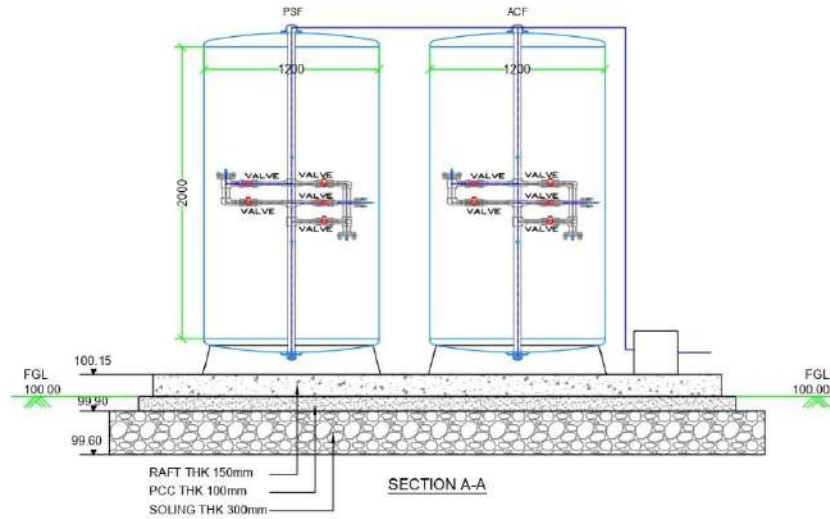
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DRAWING NAME:

FILTER FEED TANK

PROJECT CODE : TBF-	DRAWING NO : D-05/FF TAD1	DATE : JUNE-2021
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PROJECT NAME :

200 KLD SEWAGE TREATMENT PLANT
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CLIENT : SWSM, MAHARASHTRA

DRAWING NAME:
PRESSURE SAND FILTER,
ACTIVATED CARBON FILTER
& CHLORINATION UNIT

PROJECT CODE : TBF-	DRAWING NO : D-06PSF,ACF&CU01	DATE : JUNE-2021
DRAWN BY : L.D.B.	CHECKED BY : S.B.	SCALE : NTS.


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**300 KLD STP
BASED ON TBF TECHNOLOGY**

PROCESS CALCULATIONS
TIGER BIO FILTER OF 300 KLD CAPACITY

Design flow	=	300.00	KLD
	=	0.300	MLD
Peak flow factor	=	3.00	
1 SCREEN CHANNELS: MANUAL			
No. of Manual Screen	=	1	No.
Average Flow	=	0.30	MLD
Peak Flow Factor	=	3.00	
Design Flow	=	Peak Flow	
	=	0.90	MLD
	=	37.50	m ³ /hr
	=	0.010	m ³ /sec
Average Flow	=	0.30	MLD
	=	12.500	m ³ /hr
	=	0.003	m ³ /sec
Design Flow in each Screen	=	0.010	m ³ /sec
		1	No.
	=	0.010	m ³ /sec
Average Flow in each Screen	=	0.003	m ³ /sec
		1	No.
	=	0.003	m ³ /sec
Maximum Velocity through Screen at Peak Flow	=	1.2	m/sec
Minimum Velocity through Screen at Average Flow	=	0.6	m/sec
Clear Area of Opening through Screen for Peak Flow	=	0.010	m ³ /sec
		1.2	m/sec
	=	0.008	m ²
Clear Area of Opening through Screen for Average Flow	=	0.003	m ³ /sec
		0.6	m/sec
	=	0.005	m ²
Considering maximum Area of Opening through Screen	=	0.008	m ²
Clear Spacing of Bars	=	10	mm

Thickness of Bars	=	5	mm	
Gross Area of Screen	=	$0.008 \times (10+5) / 10$		
	=	0.012	m ²	
Assuming Depth of Screen Channel	=	200.00	mm	
Gross Width of Screen	=	$0.012 / 0.2$		
	=	0.060	m	
No. of Bars	=	(Gross Width of Screen / Center to Center Spacing of Bars) - 1		
	=	$0.06 / ((10+5) / 1000)$		
	=		-1	
	=	3.0	Nos.	
Say	=	3	Nos.	
Width of Screen provided	=	(Number of Bars+1) x Clear Spacing + (Number of Bars x Bar Thickness)		
	=	$(3+1) \times 10 + (3 \times 5)$		
	=	55	mm	
Width Say	=	0.50	m	
Liquid Depth of Screen Channel provided	=	0.20	m	
L:B	=	4.00		
Length of Screen Channel provided	=	2.00	m	
Freeboard provided	=	1.00	m	Invert Depth of incoming sewer
Total Depth of Screen Chamber	=	1.20	m	
Velocity in Channel at Average Flow	=	Average Flow / Cross Sectional Area of Screen Channel		
	=	$0.003 / ((0.5 \times 0.2) / 1000 \times 1000)$		
	=	0.030	m/sec	
	>	0.300	m/sec	

Head Loss across Screen

Head Loss across Screen	=	$0.0728 (V^2 - v^2)$		
V = Velocity through Screen at Peak Flow	=	Peak Flow through Screen Channel / Clear Area of Opening through Screen		
	=	1.250	m/sec	
v = Velocity in approach Channel at Peak Flow	=	Peak Flow through Screen Channel / Cross Sectional Area of Screen Channel		
	=	0.8	m/sec	
Head Loss across Screen at Peak Flow	=	0.063	m	

Head Loss across Screen at 50% Clogged Condition

Velocity through Screen at 50% Clogged Condition at Peak Flow	=	2.500	m/sec	
Head Loss across screen at 50% Clogged Condition at Peak Flow	=	0.404	m	
	>	0.300	m/sec	OK

2 CONVENTIONAL GRIT CHAMBER: MANUAL

No. of Grit Chamber	=	1	
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Average Flow	=	0.30	MLD
Peak Flow Factor	=	3.00	
Design Flow	=	Peak Flow	
Peak Flow	=	0.90	MLD
	=	900	m ³ /day
	=	38	m ³ /hr
	=	0.010	m ³ /sec
Design Flow to each Grit Chamber	=	900/1	
	=	900	m ³ /day
	=	38	m ³ /hr
	=	0.010	m ³ /sec
According to CPHEEO Manual			
Particle Size	=	0.15	mm
Specific Gravity	=	2.65	
Surface Overflow Rate for 100% removal efficiency in an ideal Grit Chamber	=	Settling Velocity of the minimum size of Particles to be removed	
	=	1.5	m/s
	=	1296	m ³ /m ² /day
Considering Efficiency of removal of desired Particles, $\eta = 75\%$	=	75%	
and Measure of Settling Basin Performance, $n = 1/8$ for very good performance	=	0.125	
Design Overflow Rate	=	857	m ³ /m ² /day
Surface Overflow Rate for 0.15 mm dia. Particle Size with Specific Gravity $S_s > 2.65$ Table 5.6	=	1555	m ³ /m ² /day
Considering Design Overflow Rate	=	960	m ³ /m ² /day
Area of Grit Chamber required	=	900	m ³ /day
	=	960	m ³ /m ² /day
	=	0.94	m ²
L:B ratio	=	2	
Length of Chamber provided	=	2.50	m
Width of Chamber provided	=	0.70	m
Hydraulic Retention Time (HRT) in Grit Chamber at Peak Flow	=	60	sec
Volume of Grit Chamber required	=	0.01x60	
	=	0.6	m ³
Depth required in Grit Chamber	=	0.6 / (2.5x0.7)	
	=	0.34	m
Say	=	0.40	m
Grit Storage Depth	=	0.25	m

Total Liquid Depth required	=	0.65	m
Length of Grit Pit	=	0.50	m
Width of Grit Pit	=	0.50	m
Depth of Grit Pit	=	0.30	m
Free Board	=	1.20	m

3 RAW SEWAGE SUMP (WET WELL)

No. of Units	=	1	No.
Average Flow	=	0.30	MLD
	=	12.500	m ³ /hr
	=	0.0035	m ³ /sec

Peak Flow Factor	=	3.00	
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Design Flow	=	Peak Flow	
	=	0.90	MLD
	=	38	m ³ /hr
	=	0.010	m ³ /sec

Hydraulic Retention Time (HRT) at Average Flow	=	120	min
Volume required	=	0.0035 x 120 x 60	
	=	25	m ³

Hydraulic Retention Time (HRT) at Peak Flow	=	Volume / Average Flow	
	=	42	min
	<	30	min

Total Volume of Wet Well	=	25	m ³
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Side Water Depth (SWD) provided	=	2.00	m
Plan Area of Wet Well	=	12.60	m ²
Length/width of Sump required	=	3.55	m
Length/width of Sump provided	=	3.60	m
Volume of Sump provided	=	25.92	m ³
Length of Pump Pit	=	1.00	m
Width of Pump Pit	=	0.50	m
Depth of Pump Pit	=	0.30	m
Free Board	=	1.20	m

3.

1 DESIGN STATEMENT-RSS E&M

Design Considerations

Design flow	=	0.30	MLD
	=	300.00	Cum/Day
Peak flow factor	=	3.00	

Pumping machinery

Friction factor for Fittings in Pressure Mains

Elbow 90 degrees	=	12
Friction Factor for each	=	1
Friction factor for all	=	12
Elbow 45 degrees	=	0
Friction Factor for each	=	0.75
Friction factor for all	=	0
Elbow 22 degrees	=	0
Friction Factor for each	=	0.5
Friction factor for all	=	0
Tee 90 degrees	=	0
Friction Factor for each	=	1.5
Friction factor for all	=	0
Tee in straight pipe	=	7
Friction Factor for each	=	0.3
Friction factor for all	=	2.1
Gate valve open	=	1
Friction Factor for each	=	0.4
Friction factor for all	=	0.4
Swing check	=	1
Friction Factor for each	=	2.5
Friction factor for all	=	2.5
Total friction factor	=	17

Stage	low	ave	peak
Average flow, cum / day	=	300.00	
Proportion	=	0.6	2
Design flow, cum / day	=	180	600
Hazen Williams C	=	140	140
Desired velocity, m/s	=	0.6	1.5
Number of Pumping hours	=	16.0	16.0
Area needed, sqm	=	0.0052	0.0052
Dia needed, m	=	0.081	0.081
Dia needed, mm	=	81	81
Dia provided, mm (User)	=	90	90
Radius, m	=	0.045	0.045
Radius power 0.63	=	0.142	0.142
S power 0.54	=	0.036	0.059
S	=	0.002	0.005
Slope 1 in	=	480.1	186.4
length, m	=	40	40
Friction in pipeline, m	=	0.1	0.2
Velocity head, m	=	0.018	0.051
Friction factor in fittings	=	17.0	17.0
Friction in fittings, m	=	0.3	0.9
Static lift, m	=	3.5	3.5
Total head, m	=	3.8	4.4
Efficiency of pumpset	=	0.8	0.8
Discharge, lps	=	3.1	5.2
Discharge, Cum/Hr	=	11.3	18.8
Kw required	=	0.486	0.808

HP required	=	1.0	1.5	2.5
Number of Pumps	=	2	2	2

4 TIGER BIO FILTER

DESIGN STATEMENT-TBF1- 50 KLD

Number of pumping hours	=	16	Hrs	
Number of BMF tanks provided	=	6	Nos	
Design flow to each tank	=	50.00	Cum/day	
	=	3.13	Cum/ Hr for 16 Hr	
	=	0.87	lps	
Inlet BOD	=	250.00	mg/l	
Inlet TSS	=	400.00	mg/l	
BOD load applied	=	12.5	kg/day	
BOD uptake rate	=	0.1	Kg of BOD / Kg of worms	(0.5 - 1.0)
Worms required	=	125	Kg worms	
Sewage application rate	=	1.85	Cum/Sqm/day	(1 - 2 Cum/Sqm/day)
Area required	=	27.03	Sqm	
Area Provided	=	28	Sqm	
Area of each crate	=	0.4	Sqm	
Number of crates	=	70	Nos	
say	=	72	Nos	
Crate in longitudinal direction	=	18	Nos	
Crate in travers direction	=	4	Nos	
crates provided	=	72	Nos	OK
Width provided	=	4.00	m	
Length required	=	11.00	m	
Depth provided	=	1.2	m	

5 TERTIARY TREATMENT UNIT

Design Considerations

Design flow	=	0.30	MLD
	=	300.00	Cum/Day
Peak flow factor	=	3.00	

1 FILTER FEED TANK

Number of FFT provided	=	1	Nos
Number of operating hours	=	16	Hrs
Design flow	=	300.00	Cum/Day
	=	18.75	Cum/Hr
	=	0.00521	Cum/Sec
Hydraulic Retention time	=	60	min
Volume required	=	18.75	Cum
Depth	=	2.00	m
Civil Tanks			
Area	=	9.38	Sqm
Length/Width required	=	3.06	m

Length/Width provided	=	3.50	m
Freeboard provided	=	0.50	m
Volume Provided		24.50	Cum

DESIGN STATEMENT-TTU E&M

Design Considerations

Design flow	=	0.30	MLD
	=	300.00	Cum/Day
Peak flow factor	=	3.00	

Pumping machinery

Friction factor for Fittings in Pressure Mains

Elbow 90 degrees	=	5
Friction Factor for each	=	1
Friction factor for all	=	5
Elbow 45 degrees	=	0
Friction Factor for each	=	0.75
Friction factor for all	=	0
Elbow 22 degrees	=	0
Friction Factor for each	=	0.5
Friction factor for all	=	0
Tee 90 degrees	=	0
Friction Factor for each	=	1.5
Friction factor for all	=	0
Tee in straight pipe	=	5
Friction Factor for each	=	0.3
Friction factor for all	=	1.5
Gate valve open	=	1
Friction Factor for each	=	0.4
Friction factor for all	=	0.4
Swing check	=	1
Friction Factor for each	=	2.5
Friction factor for all	=	2.5
Total friction factor	=	9.4

Stage	low	ave	peak	
Average flow, cum / day	=	300.00		
Proportion	=	0.6	2	
Design flow, cum / day	=	180	600	
Hazen Williams C	=	140	140	
Desired velocity, m/s	=	0.8	1.5	
Number of Pumping hours	=	16.0	16.0	
Area needed, sqm	=	0.0039	0.0052	0.0069
Dia needed, m	=	0.071	0.081	0.094
Dia needed, mm	=	71	81	94
Dia provided, mm (User)	=	75	75	75
Radius, m	=	0.038	0.038	0.038
Radius power 0.63	=	0.126	0.126	0.126
S power 0.54	=	0.053	0.067	0.100
S	=	0.004	0.007	0.014

Slope 1 in length, m	=	227.8	150.7	71.1
Friction in pipeline, m	=	0.1	0.1	0.3
Velocity head, m	=	0.033	0.051	0.115
Friction factor in fittings	=	9.4	9.4	9.4
Friction in fittings, m	=	0.3	0.5	1.1
Static lift, m	=	8.0	8.0	8.0
Total head, m	=	8.3	8.5	9.1
Efficiency of pumpset	=	0.8	0.8	0.8
Discharge, lps	=	3.1	5.2	10.4
Discharge, Cum/Hr	=	11.3	18.8	37.5
Kw required	=	0.833	1.386	2.765
HP provided	=	1.5	2.0	4.0
Number of Pumps	=	2	2	2

2 PRESSURE SAND FILTER

Number of unit provided	=	1	Nos.
Designed @ 16 hrs working for flow of	=	18.75	m ³ /h
Loading rate	=	12.00	m ³ /m ² /h
Area of DMF	=	1.56	m ²
Dia of DMF	=	1.41	m
Provided	=	1.500	m
Backwash water			
Backwash velocity	=	15.00	m/hr
backwash flowrate	=	24.91	m ³ /h
Backwash volume for 20 mins	=	8.30	m ³

3 ACTIVATED CARBON FILTER

Number of unit provided	=	1	Nos.
Designed @ 16 hrs working for flow of	=	18.75	m ³ /h
Loading rate	=	12.00	m ³ /m ² /h
Area of ACF	=	1.56	m ²
Dia of ACF	=	1.41	m
Provided	=	1.500	m
Backwash water			
Backwash velocity	=	15.00	m/hr
backwash flowrate	=	24.91	m ³ /h
Backwash volume for 20 mins	=	8.30	m ³

4 CHLORINE DOSING SYSTEM NaOCl DOSING SYSTEM

Average Flow	=	18.75	m ³ /hr
Design Chlorine Dosage (Max)	=	3	mg/l
Concentration of Chlorine in commercially available NaOCl	=	10%	

Design NaOCl Dosage	=	30	mg/l
Operating hours	=	16.0	hr
Quantity of NaOCl required	=	18.75 X 30 X 16 / 1000	
	=	9.00	Kg/day
Design Strength of NaOCl Solution	=	100%	
Volume of NaOCl Solution	=	9 / (1 X 1000)	
	=	0.010	m ³
No. of Dosing Tanks provided	=	1	Nos.
Volume of each Dosing Tank	=	0.01 / 1	
	=	0.01	m ³
	=	100	Litres
No. of Working NaOCl Dosing Pump provided	=	1	No.
Capacity of each NaOCl Dosing Pump required	=	Total Volume of NaOCl Solution / (No. of Dosing pumps)	
	=	0.01 / (1 X 16)	
	=	0.001	m ³ /hr
	=	1.00	LPH
Capacity of each NaOCl Dosing Pump provided	=	1.00	LPH
No. of Standby NaOCl Dosing Pump provided	=	1	No.

SIZING DETAILS (CIVIL)
TIGER BIO FILTER OF 300 KLD CAPACITY

S I. N o	Unit name	N o s	Leng th	Widt h	Height			Soling		PCC		Raft		RCC Wall thk	Bric k Wall thk	Slab Thk	Steel - HCR M/ Kg/C
					SW	FB	Tota	offs	Thk	offs	Thk	offs	Thk				
		N	m	m	m	m	m	m	m	m	m	m	m	m	m	m	
1	Screen Chamber	1	2.0	0.5	0.2	1.0	1.2	0.2	0.3	0.1	0.1	0.2	0.1	0.1			80
2	Grit Chamber	1	2.5	0.7	0.6	1.2	1.8	0.2	0.3	0.1	0.1	0.2	0.1	0.1			80
3	Raw Sewage Sump	1	3.6	3.6	2.0	1.2	3.2	0.2	0.3	0.1	0.1	0.2	0.3	0.2		0.2	100
4	TBF Bed 50 KLD	6	11.0	4.0			1.2	0.2	0.3	0.1	0.1	0.2	0.1		0.2		60
5	Filter Feed tank	1	3.5	3.5	2.0	0.5	2.5	0.2	0.3	0.1	0.1	0.2	0.2	0.2		0.2	100
6	Filter Platform	1	2.6	4.1				0.2	0.3	0.1	0.1	0.2	0.1				60

Assumptions

Incoming Sewer Invert 1.0 m Below Ground level
Method of excavation Mechanical means

Underground strata		soil	Muru m	Soft roc	har d	Tota l
0.0 to 1.5 m	=	25	25	25	25	100
1.5 m to 3.0 m	=	25	25	25	25	100
3.0 to 4.5 m	=	25	25	25	25	100
4.5 to 6.0	=	25	25	25	25	100

**TIGER BIO FILTER OF 300 KLD CAPACITY
BILL OF QUANTITIES**

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
1	Excavation for foundation / pipe trenches in earth, soils of all types, sand, gravel and soft murum, including removing the excavated material upto a distance of 50 metres and lifts as below, stacking and spreading as directed, normal dewatering, preparing the bed for foundation and excluding backfilling, etc. complete. (Bd-A-1/259)				
	0.0 to 1.5 m	100.24	Cum	150.00	15,036.00
	1.5 to 3.0 m	33.56	Cum	164.00	5,503.90
	3.0 to 4.5 m	10.57	Cum	178.00	1,881.50
	4.5 to 6.0 m	0.00	Cum	192.00	0.00
	MJP/ SSR/ 2021-22 / Section E / Excavation Item No.1/ Page no. 42				
2	Excavation for foundation / pipe trenches in hard murum and boulders, W.B.M. road including removing the excavated material upto a distance of 50 M beyond the area and lifts as below, stacking and spreading as directed by Engineer-in-charge, normal dewatering, preparing the bed for foundation and excluding backfilling, etc. complete. (Bd-A-3/259)			8.00	
	0.0 to 1.5 m	100.24	Cum	192.00	19,246.10
	1.5 to 3.0 m	33.56	Cum	206.00	6,913.40
	3.0 to 4.5 m	10.57	Cum	220.00	2,325.40
	4.5 to 6.0 m	0.00	Cum	234.00	0.00
	MJP/ SSR/ 2021-22/ Section E/ Excavation Item No.3, Page no. 42				
3	Excavation for foundation / pipe trenches in soft rock and old cement and lime masonry foundation asphalt road including removing the excavated material upto a distance of 50 M beyond the area and lifts as below, stacking as directed by Engineer-in-charge, normal dewatering, preparing the bed for foundation and excluding backfilling, etc. complete. (Bd-A- 4/259)				
	0.0 to 1.5 m	100.24	Cum	572.00	57,337.30
	1.5 to 3.0 m	33.56	Cum	597.00	20,035.40
	3.0 to 4.5 m	10.57	Cum	622.00	6,574.60
	4.5 to 6.0 m	0.00	Cum	647.00	0.00
	MJP/ SSR/ 2021-22 / Section E/ Excavation Item No.5, Page no. 42				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
4	Excavation for foundation / pipe trenches in hard rock and concrete road by chiselling, wedging, line drilling by mechanical means or by all means other than blasting including trimming and levelling the bed, removing the excavated material upto a distance of 50 metres beyond the area and lifts as below, stacking as directed by Engineer-in-charge, normal dewatering, excluding backfilling, etc. complete by all means. (Bd-A-6/259)				
	0.0 to 1.5 m	100.24	Cum	1,017.00	101,944.10
	1.5 to 3.0 m	33.56	Cum	1,042.00	34,969.60
	3.0 to 4.5 m	10.57	Cum	1,067.00	11,278.20
	4.5 to 6.0 m	0.00	Cum	1,092.00	0.00
	MJP/ SSR/ 2021-22 / Section E/ Excavation Item No.7, Page no. 43				
5	Providing dry trap/ granite/ quartzite/ gneiss, rubble stone soling in 15 cm to 20 cm thick layers including hand packing and compacting, etc. complete. (Bd-A-12/264)	144.71	Cum	1,175.00	170,034.30
	MJP/ SSR/ 2021-22 / Section E/ Excavati				
6	Providing and laying in situ Cement Concrete M- 15 of trap/ granite / quartzite / gneiss metal for foundation and bedding including bailing out water, form work, compaction, curing, etc. complete. (Cement 5.90 bags / cum) Spec. No. - Bd E /1 Page No. 287 and B- 7, Page No. 38	43.05	Cum	5,640.00	242,802.00
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.1, Page no.49				
	Providing and laying in situ Cement Concrete of trap/ granite / quartzite / gneiss metal for RCC work in foundation like raft, grillage, strip foundation and footing of RCC columns and steel stanchions including normal dewatering, form work, compaction, finishing and curing, etc. complete. (By weigh batching and mix design for M250 and M-300 only. Use of L&T, A.C.C., Ambuja, Birla Gold, Manikgad, Rajashree, etc. cement is permitted.) (Excluding M.S. or Tor reinforcement)	46.88	Cum	7,448.00	349,162.30
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE/ Item No.2, Page no. 49				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
8	Providing and casting in situ C.C. of trap / granite/ quartzite / gneiss metal of approved quality for RCC works as per detailed drawings and designs or as directed by Engineer-in- charge including normal dewatering, centering, form work, compaction, finishing the formed surfaces with C.M. 1:3 of sufficient minimum thickness to give a smooth and even surface wherever necessary or roughening if special finish is to be provided and curing, etc. complete. (By weigh batching and mix design for M-250 and M-300 only. Use of L&T, A.C.C., Ambuja, Birla Gold, Manikgad, Rajashree, etc. cement is permitted.) (Excluding M.S. or Tor reinforcement)	0.86	Cum	8,624.00	7,416.70
	For Beams / Braces / Lintels In RCC M-300				
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.4, Page no. 50				
9	Providing and casting in situ C.C. of trap / granite/ quartzite / gneiss metal of approved quality for RCC works as per detailed drawings and designs or as directed by Engineer-in- charge including normal dewatering, centering, form work, compaction, finishing the formed surfaces with C.M. 1:3 of sufficient minimum thickness to give a smooth and even surface wherever necessary or roughening if special finish is to be provided and curing, etc. complete. (By weigh batching and mix design for M-250 and M-300 only. Use of L&T, A.C.C., Ambuja, Birla Gold, Manikgad, Rajashree, etc. cement is permitted.) (Excluding M.S. or Tor reinforcement)	5.57	Cum	9,247.00	51,505.80
	Slabs / Landings / Vertical Walls / Waist Slabs / Steps for Staircase In RCC M-300				
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.5, / Page no. 50				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
10	Providing and casting in situ C.C. of trap / granite/ quartzite / gneiss metal of approved quality for RCC works as per detailed drawings and designs or as directed by Engineer-in- charge including normal dewatering, centering, form work, compaction, finishing the formed surfaces with C.M. 1:3 of sufficient minimum thickness to give a smooth and even surface wherever necessary or roughening if special finish is to be provided and curing, etc. complete. (By weigh batching and mix design for M-250 and M-300 only. Use of L&T, A.C.C., Ambuja, Birla Gold, Manikgad, Rajashree, etc. cement is permitted.) (Excluding M.S. or Tor reinforcement)	19.56	Cum	9,218.00	180,304.10
	Chajjas / Parapets / Curtain Walls /Partition Walls / Pardies In RCC M-300				
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.6 / Page no. 51				
11	Providing and fixing in position steel bar reinforcement of various diameters for RCC piles, caps, footings, foundations, slabs, beams, columns, canopies, staircases, newels, chajjas, lintels, pardies, copings, fins, arches, etc. as per detailed designs, drawings and schedules; including cutting, bending, hooking the bars, binding with wires or tack welding and supporting as required, etc. complete (including cost of binding wire). (Bd-F-17/306)				
	c) Corrosion Resistant Steel (Fe 500)	5.83	MT	70,658.00	411,936.20
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.8 / Page no. 52				
12	Providing and fixing mild steel grill work for windows/ ventilators of 20 Kg/Sqm. As per drawings including necessary welding and painting with one coat of anticorrosive paint and two coats of oil painting, etc. complete. (Bd-U- 1/537)	7.06	Sqm	1,895.00	13,378.70
	MJP/ SSR/ 2021-22 / SECTION - F : IRON AND STRUCTURAL STEEL WORK Item No.1 / Page				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
13	Providing structural steel work in rolled stanchions fixed with connecting plates or angle cleats as in main and cross beams, hip and jack rafters, purlins connecting to truss members and like as per detailed designs and drawings or as directed by Engineer-in-charge including cutting, fabricating, hoisting, erecting, fixing in position, making riveted / bolted / welded connections and one coat of anticorrosive paint and over it two coats of oil painting, etc. complete. (Bd-C- 3/275)	4.48	MT	71,286.00	319,521.00
	MJP/ SSR/ 2021-22 / SECTION - F :: IRON AND STRUCTURAL STEEL WORK Item No.3,				
14	Providing and fixing corrugated galvanised iron sheets of 0.63 mm thick (24B .W .G.) for roofing without wind tiles including fastening with galvanised iron screws and bolts , lead and bitumen washers as per drawing etc. complete. (Weight of 5.5 kg/sq.m.).	452.40	Sqm	777.00	351,514.80
	PWD / SSR 2020-21 / Roofing and Ceiling SSR Item No.38.04 Reference No. Bd.R.5, Page No. 453 Item No.1133, Page no. 224				
15	Providing fly ash brick masonry with conventional / I.S. type bricks in cement mortar 1:6 in superstructure including striking joints, raking out joints, watering and scaffolding etc. Complete	89.22	Cum	6,305.00	562,532.10
	PWD / SSR 2020-21 / Brick Masonry SSR Item No.27.13 Reference No. As director by engineer incharge and BDG- 2 and 5 Item No.893, Page no. 190				
16	Providing internal cement plaster 12 mm thick in single coat in cement mortar 1:5 without neeru finish to concrete or brick surfaces, in all positions including scaffolding and curing etc. complete.	489.90	Sqm	257.00	125,904.30
	PWD / SSR 2020-21 / Plastering and Pointing SSR Item No. 32.03 Reference No. Bd. L.2 Page No. 368 Item No.950, Page no. 201				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
17	Providing rough cast cement plaster externally in two coats to concrete, brick or stone masonry surfaces in all positions with base coat of 12 to 15 mm thick in C.M. 1:4 and rough cast treatment 12 mm thick in proportion 1:11 / 2:3 including scaffolding and fourteen days curing complete.	285.00	Sqm	529.00	150,765.00
	PWD / SSR 2020-21 / Plastering and Pointing SSR Item No. 32.12 Reference No. Bd.L.8 Page No. 370 Item No.957, Page no. 201				
18	Providing and applying white-wash in two coats on old / new plastered or masonry surfaces and asbestos cement sheets including scaffolding and preparing the surface by brushing and brooming down etc. complete.	285.00	Sqm	10.00	2,850.00
	PWD / SSR 2020-21 / Colouring SSR Item No. 36.03 Reference No. Bd. P. I Page No. 411				
19	Providing and applying colour-wash of approved colour and shade in one coat to new surface including scaffolding, brushing and brooming down (excluding base coats of white wash) etc. complete.	285.00	Sqm	8.00	2,280.00
	PWD / SSR 2020-21 / Colouring SSR Item No. 36.04 Reference No. Bd. P.2 Page No. 412				
20	Dewatering the excavated trenches and pools of water in the building trenches / pipeline trenches, well works by using pumps and other devices including disposing off water to safe distance as directed by Engineer-in-charge (including cost of machinery, labour, fuel), etc. complete. (Bd-A-9/261)	64.00	HP/ Hr.	77.00	4,928.00
	MJP/ SSR/ 2021-22 / Section E/ Excavat				
21	Refilling the trenches with available excavated stuff with soft material first over pipeline and then hard material in 15 cm layers with all leads and lifts including consolidation, surcharging, etc. complete.	250.32	Cum	84.00	21,026.90
	MJP/ SSR/ 2021-22 / Section E/ Excavat				
22	Transportation as per STATEMENT VI Including loading, unloading and stacking Earth (4.8 Cum) lead 15 Km	457.87	Cum	604.45	276,759.60

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
	Electromechnical Items				
23	Screen (Manual) of size 1.7 m length x 0.5 m width of SS 304 MOC and Manual hand rake for cleaning screen of SS handle 1 m in length and cleaning area of 6 nos 5 mm SS rod of total length 200 mm straight and 50 mm of 90 degree bend.	0.85	Sqm	35,000.00	29,750.00
24	Grit pump				
	Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below				
	MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION - Pumps, Page no. 6, 7of size 1.7 m length				
	1 HP (Up to 9000 LPH)	1.00	No	68,654.00	68,654.00
25	Raw Sewage Pumps				
	Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below				
	MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION -				
	3 HP (Up to 18000 LPH)	2.00	Nos	90,830.00	181,660.00
26	TTU Feed pumps				
	Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below				
	MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION -				
	3 HP (Up to 18000 LPH)	2.00	Nos	90,830.00	181,660.00
27	Pressure Sand Filter of FRP / MSEP vessel with suitable thickness to withstand a water pressure including MPV or 5 Valve system and PVC / UPVC / MSEP interconnecting and underdrain piping including fittings, with standard filter media layer with minimum depth of filter sand 1.0 m supported by gravels. The piping arrangement should provide sufficient pressure for backwash operations and avoid loss of sand during backwash operation. Suitable openings to be provided to ease addition and removal the media.				
	Dia 1.5 m x 2 m minimum height	1.00	Nos	372,000.00	372,000.00

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
28	Activated Carbon Filter of FRP / MSEP vessel with suitable thickness to withstand a water pressure including MPV or 5 Valve system and PVC / UPVC / MSEP interconnecting and underdrain piping including fittings, with standard filter media layer with minimum depth of Activated Carbon 1.0 m supported by gravels. The piping arrangement should provide sufficient pressure for backwash operations and avoid loss of Activated carbon during backwash operation. Suitable openings to be provided to ease addition and removal the media.				
	Dia 1.5 m x 2 m minimum height	1.00	Nos	372,000.00	372,000.00
29	NaOCl Chlorinator Pump Diaphragm Type / peristaltic type / Solenoid Max Flow Rate Upto 10LPH Power Source Electric Phase Single Material PP / PTFE(Teflon) Voltage 230 Volt Frequency				
	Mixing Tank of 100 Ltrs capacity	100.00	Ltrs	8.00	800.00
	Dosing Pump	2.00	Nos	15,000.00	30,000.00
30	Control Panel				
	Design, Supply, Installing, Commissioning & Testing of Master PLC control monitoring and communication panel as per IEC 61131 at Pure Water Sump suitable for monitoring and control of pure water Pumps. Pressure Transmitters, Level Transmitter, PH Transmitter, Turbidity Transmitter ,for all pumps installed.	1.00	No	50,041.00	50,041.00
	MJP/ MECH/ ELECT / SSR/ 2021-22/ SECTION 19 - SA [SCADA & AUTOMATION]				
31	Supplying and erecting Fully Automatic Star Delta starter to operate squirrel cage induction motor working on 380- 440 Volt, 3 phase, 50 Hz with no volt coil, over load element, and ON - OFF push buttons, with necessary material and connected to supply, etc complete. Starter with original sheet steel encloser.				
	> 7.5 HP & Up to 12.5 HP	6.00	nos	7,150.00	42,900.00

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
	MJP /MECH/ ELECT/ SSR/ 2021-22 SECTION 10 - LG [L.T. SWITCHGEAR AND PROTECTION] Item no. LG 3 Page no. 27				
32	Main power supply cable 3 core PVC insulated, PVC sheathed copper conductor flat submersible cable Supplying and erecting, Flat flexible submersible cable with, Copper Conductor, PVC insulated, and PVC sheathed.				
	3 core 16 sq mm	25.00	m	549.00	13,725.00
33	Power cables Aluminium conductor 4 Core, XLPE / PVC insulated & armoured cable Supplying and erecting, XLPE / PVC insulated, armoured cable 1100 V grade with ISI mark Four core, solid / stranded aluminium conductor with 6 mm thick 25 mm width M.S. spacer with G.I. Earth wire 6 sq mm, complete erected on wall / on pole with 25 X 3 mm M.S. clamps or in provided trench in an approved manner.				
	4 Core 6 sq mm	105.00	m	137.00	14,385.00
	MJP MECH/ ELECT/ SSR/ 2021-22 SECTION 12 - CB [L.T. CABLE] Item no. CB 6 Page				
34	Control Cables Copper conductor PVC insulated, Unarmoured control cable Supplying and erecting Un-armoured control cable with ISI mark stranded / solid copper conductor 1.1 kV grade complete erected on wall / panel or in provided trench in an approved manner.				
	4 core 2.5 sq mm	105.00	m	137.00	14,385.00
	MJP MECH/ ELECT/ SSR/ 2021-22/ SECTION 12 - CB [L.T. CABLE] Item no. CB 8-				

Plumbing Items					
Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
35	Providing and supplying in standard lengths ISI mark rigid unplasticised PVC pipes suitable for potable water with solvent cement joints including cost of couplers, as per IS specification no. 4985 / 1988 excluding GST levied by GOI and GOM in all respect, including transportation, freight charges, inspection charges, loading, unloading, conveyance to the departmental stores and stacking the same in closed shed duly protected from sun rays and rains including cost of jointing material i.e. solvent cement, etc. complete (selffit type to be jointed with cement solvent).				
	1) 10% of cost of pipes shall be considered for cost of PVC specials for estimate purpose only. 2) One coupler and required cement solvent shall be provided with each full length pipe cost of which is included in rates below.				
	MJP/ SSR/ 2021-22 / SECTION – I(II) P.V.C. PIPES, Page no.77				
1	Raw Sewage pump to TBF Distribution				
a	Main header				
	90 mm.	40.00	m	303.00	12,120.00
	PVC Specials- 10%				1,212.00
b	Distribution				
	63 mm.	50.00	m	149.00	7,450.00
	PVC Specials- 10%				745.00
2	TBF collection to FFT (gravity)				
a	Main header				
	110 mm.	80.00	m	428.00	34,240.00
	PVC Specials- 10%				3,424.00
b	collection tributary				
	75 mm.	20.00	m	211.00	4,220.00
	PVC Specials- 10%				422.00
3	TTU Plumbing				
	75 mm.	20.00	m	211.00	4,220.00
	PVC Specials- 10%				422.00
4	TBF distribution				
	63 mm.	30.00	m	149.00	4,470.00
	PVC Specials- 10%				447.00
36	Labour				
	Plumber	14.00	days	641.00	8,974.00
	Helper	21.00	days	579.00	12,159.00

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
	MJP/ SSR/ 2021-22 / SECTION - B LABOUR & MACHINERY , Page no. 14				
37	Providing double flange sluice valve confirming for IS- 14846 including worn gear arrangements as per test pressure, stainless steel spindle, caps, including inspection charges, transportation upto departmental store, unloading, stacking excluding GST levied by GOI & GOM in all respect etc. complete.				
	Sluice valves - PN -1 (Without by pass)				
	Raw Sewage pump				
	100 mm.	2.00	Nos	6,835.00	13,670.00
	Filter Feed Pump				
	80 mm.	2.00	Nos	5,132.00	10,264.00
	MJP/ SSR/ 2021-22 / SECTION - I(XII) : PIPES APPURTENANCES , Page no. 132				
38	Providing and supplying ISI mark CI D/F reflux valves (non-return valves) of following dia including railway freight, inspection charges, unloading from railway wagon, loading into truck, transportation upto departmental stores, unloading, stacking excluding GST levied by GOI & GOM in all respect etc. complete. Reflux valves as per I.S.5312 Part I (1984)				
	Without by pass arrangement -PN -1				
	Raw Sewage pump				
	100 mm.	2.00	Nos	5,713.00	11,426.00
	Filter Feed Pump				
	80 mm.	2.00	Nos	4,092.00	8,184.00
	MJP/ SSR/ 2021-22 / SECTION - I(XII) : PIPES APPURTENANCES , Page no. 131				
	Bio media Items				
39	Supplying of Specially designed container for holding Filter media including Lightweight Expanded Clay Aggregates size (8-30 mm) and Bio media including mixture of woodchips Vermicompost, cocopeat and bacterial culture with special worms per designed quantity including transportation & fixing in position as directed etc. complete.	432.00	Nos	4,750.00	2,052,000.00
	Market rate				
40	Rapid sand Gravity filter sand At Source (Godhara, Gokak, Kanhan,	41.10	Cum	1,730.00	71,103.00
	MJP/ SSR/ 2021-22 / SECTION- A MATERIALS				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
41	Trasnsportation Godhara to Pune distance by Road 660 Km.	41.10	Cum	11,031.37	453,389.40
	MJP/ SSR/ 2021-22 / SECTION - C : TRANSPORTATION Page no.				
42	Stone Aggregate 20 mm	41.10	Cum	900.00	36,990.00
	MJP/ SSR/ 2021-22 / SECTION- A MATERIALS				
43	Transportation as per STATEMENT VI Including loading, unloading and stacking				
	Manure or sludge (5.52 Cum) lead 25 Km	158.70	Cum	747.48	118,625.10
	MJP/ SSR/ 2021-22 / SECTION - C : TRANSPORTATION Page no.				
NET TOTAL Rs.					7,769,803.80

MEASUREMENT SHEET - SCREEN CHAMBER, GRIT CHAMBER AND RAW SEWAGE SUMP

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	Short Wall	2	0.70	0.10	1.40	0.2	Cum
				Total for screen		0.82	Cum
	Grit						
	Long Wall (extra than screen chamber)	1	0.50	0.10	2.05	0.11	Cum
	Short Wall	2	0.70	0.10	2.05	0.29	Cum
				Total for grit		0.4	Cum
6	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	80	Cum	1.94	0.16	MT
7	Fabrication work in Frame and Grating for Access						
	Screen	1	2.20	0.70		1.54	Sqm
	Grit	1	2.70	0.80		2.16	Sqm
					Total	3.7	Sqm
8	Removing excess excavated material out of site						
	Screen chamber	1	2.20	0.70	1.20	1.85	Cum
	Grit Chamber	1	2.70	0.70	1.85	3.5	Cum
	soling, PCC, Raft volume					3.31	Cum
	Total Volume					8.66	Cum
	bulkage @ 40%					12.13	Cum
9	Refilling and compaction						
	Total Excavation					39.68	Cum
	Deduction for tank volume, soling, PCC, Raft					8.66	Cum
	Refilling and compaction volume					31.02	Cum

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	Raw Sewage Sump						
1	Excavation				3.90		
A	0.0 to 1.5 m	1	7.6	7.60	1.5	86.64	Cum
	soil					21.66	Cum
	Murum					21.66	Cum
	Soft rock					21.66	Cum
	hard rock					21.66	Cum
B	1.5 to 3.0 m	1	6.60	6.60	1.5	65.34	Cum
	soil					16.34	Cum
	Murum					16.34	Cum
	Soft rock					16.34	Cum
	hard rock					16.34	Cum
C	3.0 to 4.5 m	1	6.60	6.60	0.9	39.21	Cum

MEASUREMENT SHEET - SCREEN CHAMBER, GRIT CHAMBER AND RAW SEWAGE SUMP

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	soil					9.81	Cum
	Murum					9.81	Cum
	Soft rock					9.81	Cum
	hard rock					9.81	Cum
D	4.5 to 6.0 m	1	5.60	5.60	0	0	Cum
	soil					0	Cum
	Murum					0	Cum
	Soft rock					0	Cum
	hard rock					0	Cum
2	Soling						
	RSS	1	5.00	5.00	0.30	7.5	Cum
3	PCC M20						
	RSS	1	4.60	4.60	0.10	2.12	Cum
4	Raft M30						
	RSS	1	4.40	4.40	0.30	5.81	Cum
5	RCC Wall						
	Long Wall	2	4.00	0.20	3.40	5.44	Cum
	Short Wall	2	3.60	0.20	3.40	4.9	Cum
					Total	10.34	Cum
6	Beams						
	Beam 1	1	3.60	0.2	0.3	0.22	Cum
	Beam 2	1	3.60	0.2	0.3	0.22	Cum
					Total	0.44	Cum
7	Slab	1	4.00	4.00	0.2	3.2	Cum
	Deduction for manhole	-2	1.20	0.70	0.2	-0.34	Cum
					Total	2.86	Cum
8	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	100	Cum	19.45	1.95	MT
9	Fabrication work in Frame and Grating for Access						
	RSS	2	1.20	0.70		1.68	Sqm
10	Removing excess excavated material out of site						
	RSS	1	4.00	4.00	3.20	51.2	Cum
	soling, PCC, Raft volume					15.43	Cum
	Total Volume					66.63	Cum
	bulkage @ 40%					93.29	Cum
11	Refilling and compaction						

MEASUREMENT SHEET - SCREEN CHAMBER, GRIT CHAMBER AND RAW SEWAGE SUMP

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	Total Excavation					191.19	Cum
	Deduction for tank volume, soling, PCC, Raft					66.63	Cum
	Refilling and compaction volume					124.56	Cum
12	Dewatering						
	8 Days x 4 hours/day	days	8	hours / day	4	32	Hrs

MEASUREMENT SHEET - TIGER BIO FILTER

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	TIGER BIO FILTER						
1	Excavation				0.50		
A	0.0 to 1.5 m soil	1	12.66	5.66	0.5	35.83	Cum
	Murum					8.96	Cum
	Soft rock					8.96	Cum
	hard rock					8.96	Cum
2	Soling						
	TBF	1	12.46	5.46	0.30	20.41	Cum
3	PCC M20						
	TBF	1	12.06	5.06	0.10	6.11	Cum
4	Raft M30						
	TBF	1	11.86	4.86	0.10	5.77	Cum
5	Brick Wall						
	TBF						
	Long Wall	2	11.46	0.23	1.20	6.33	Cum
	Short Wall	2	4.00	0.23	1.20	2.21	Cum
	Crate Support Wall	5	11.00	0.23	0.50	6.33	Cum
						Total for T	14.87
							Cum
6	Plaster						
	Internal						
	Crate Support Wall						
	Long Wall	6	11.00		0.50	33	Sqm
	Wall top	5	11.00		0.23	12.65	Sqm
	Long Wall	2	11.00		1.20	26.4	Sqm
	Short Wall	2	4.00		1.20	9.6	Sqm
						Total	81.65
							Sqm
	External						
	Long Wall	2	11.46		1.20	27.51	Sqm
	Short Wall	2	4.46		1.20	10.71	Sqm
	Wall Top	1	30.92	0.3		9.28	Sqm
						Total	47.50
							Sqm
7	External-white-wash	1				47.50	Sqm
8	External-colour-wash	1				47.50	Sqm
9	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	60	Cum	5.77	0.35	MT
10	Removing excess excavated material out of site						
	soling, PCC, Raft volume					32.29	Cum
	Total Volume					32.29	Cum
	bulkage @ 40%					45.21	Cum

MEASUREMENT SHEET - TIGER BIO FILTER

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
11	Refilling and compaction						
	Total Excavation					35.83	Cum
	Deduction for tank volume, soling, PCC, Raft					32.29	Cum
	Refilling and compaction volume					3.54	Cum
12	MS Fabricated Shed						
	TBF-II Shed in Fabrication work Shed Size-12 m X 5 m x 3 m		12.00	5.00	3.00		
	for column 50*50*5 Unit Weight 6.97 kg/m	10	3.00	6.97	kg/m	209.10	KG
	for truss 50*50*3 Unit Weight 3.71 kg/m	5	5.00	3.71	kg/m	92.75	KG
	for principle rafter 50*50*3 Unit Weight	10	2.90	3.71	kg/m	107.59	KG
	for strut rafter 50*50*3 Unit Weight 3.71 kg/m	10	0.20	3.71	kg/m	7.42	KG
	for central strut rafter 50*50*3 Unit Weight	5	0.30	3.71	kg/m	5.57	KG
	for bottom frame below truss 50*50*3 Unit Weight 3.71 kg/m	1	34.00	3.71	kg/m	126.14	KG
	for perlin 30*30*3 Unit Weight 2.51 kg/m	5	13.00	2.51	kg/m	163.15	KG
	for Base Plate 150*150*10 mm	20	0.15	0.15	0.010	35.33	KG
					Total Wei	747.04	Kg
						0.75	MT
13	corrugated galvanised iron sheets	2	13.00	2.90		75.4	Sqm

MEASUREMENT SHEET - FILTER FEED TANK

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
8	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	100	Cum	14.83	1.49	MT
9	Fabrication work in Frame and Grating for Access						
	FFT	2	1.20	0.70		1.68	Sqm
10	Removing excess excavated material out of site						
	FFT	1	3.90	3.90	2.50	38.03	Cum
	soling, PCC, Raft volume					12.94	Cum
	Total Volume					50.97	Cum
	bulkage @ 40%					71.36	Cum
11	Refilling and compaction						
	Total Excavation					120.41	Cum
	Deduction for tank volume, soling, PCC, Raft					50.97	Cum
	Refilling and compaction volume					69.44	Cum
12	Dewatering						
	8 Days x 4 hours/day	days	8	hours/day	4	32	Hrs

MEASUREMENT SHEET - FILTER PLATFORM

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	FILTER PLATFORM						
1	Excavation				0.55		
A	0.0 to 1.5 m	1	3.8	5.30	0.55	11.08	Cum
	soil					2.77	Cum
	Murum					2.77	Cum
	Soft rock					2.77	Cum
	hard rock					2.77	Cum
2	Soling						
	Filter Platform	1	3.60	5.10	0.30	5.51	Cum
3	PCC M20						
	Filter Platform	1	3.20	4.70	0.10	1.51	Cum
4	Raft M30						
	Filter Platform	1	3.00	4.50	0.15	2.03	Cum
5	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	60	Cum	2.03	0.13	MT
6	Removing excess excavated material out of site						
	soling and PCC volume					7.02	Cum
	Total Volume					7.02	Cum
	bulkage @ 40%					9.83	Cum
7	Refilling and compaction						
	Total Excavation					11.08	Cum
	Deduction for tank volume, soling, PCC, Raft					7.02	Cum
	Refilling and compaction volume					4.06	Cum

MEASUREMENT SHEET - ELECTROMECHANICAL WORKS

Sr. No.	Item Description	Nos.	Unit
1	Screen (Manual) of size 1.7 m length x 0.5 m width of SS 304 MOC and Manual hand rake for cleaning screen of SS handle 1 m in length and cleaning area of 6 nos 5 mm SS rod of total length 200 mm straight and 50 mm of 90 degree bend.	1	No
2	Grit pump Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION - Pumps, Page no. 6, 7 of size 1.7 m length x 0.5 m width of SS304 MOC 1 HP (Up to 9000 LPH)	1	No
3	Raw Sewage Pumps Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION - Pumps, Page no. 6, 7 3 HP (Up to 18000 LPH)	2	Nos
4	TTU Feed pumps Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION - Pumps, Page no. 6, 7 3 HP (Up to 18000 LPH)	2	Nos
5	Pressure Sand Filter of FRP / MSEP vessel with suitable thickness to withstand a water pressure including MPV or 5 Valve system and PVC / UPVC / MSEP interconnecting and underdrain piping including fittings, with standard filter media layer with minimum depth of filter sand 1.0 m supported by gravels. The piping arrangement should provide sufficient pressure for backwash operations and avoid loss of sand during backwash operation. Suitable openings to be provided to ease addition and removal the media. Dia 1.5 m x 2 m minimum height	1	Nos
6	Activated Carbon Filter of FRP / MSEP vessel with suitable thickness to withstand a water pressure including MPV or 5 Valve system and PVC / UPVC / MSEP interconnecting and underdrain piping including fittings, with standard filter media layer with minimum depth of Activated Carbon 1.0 m supported by gravels. The piping arrangement should provide sufficient pressure for backwash operations and avoid loss of Activated carbon during backwash operation. Suitable openings to be provided to ease addition and removal the media. Dia 1.5 m x 2 m minimum height	1	Nos
7	PurAll Tablet Chlorinator + cartridge	0	nos

MEASUREMENT SHEET - ELECTROMECHANICAL WORKS

Sr. No.	Item Description	Nos.	Unit
7	NaOCl Chlorinator Pump Diaphragm Type / peristaltic type / Solenoid Max Flow Rate Upto 10LPH Power Source Electric Phase Single Material PP / PTFE(Teflon) Voltage 230 Volt Frequency 50Hz		
a	Mixing Tank of 100 Ltrs capacity	1	Nos
b	Dosing Pump	2	Nos
8	Control Panel		
	Design, Supply, Installing, Commissioning & Testing of Master PLC control monitoring and communication panel as per IEC 61131 at Pure Water Sump suitable for monitoring and control of pure water Pumps. Pressure Transmitters, Level Transmitter, PH Transmitter, Turbidity Transmitter ,for all pumps installed.		
	Master PLC Panel	1	No
	MJP/ MECH/ ELECT / SSR/ 2021-22/ SECTION 19 - SA [SCADA & AUTOMATION] Item no. 2.7 Page no. 72		
9	Supplying and erecting Fully Automatic Star Delta starter to operate squirrel cage induction motor working on 380- 440 Volt, 3 phase, 50 Hz with no volt coil, over load element, and ON - OFF push buttons, with necessary material and connected to supply, etc complete. Starter with original sheet steel encloser.		
	> 7.5 HP & Up to 12.5 HP	6	nos
	1 nos extra starter considered as spare.		
	MJP /MECH/ ELECT/ SSR/ 2021-22 SECTION 10 - LG [L.T. SWITCHGEAR AND PROTECTION] Item no. LG 3 Page no. 27		
10	Main power supply cable		
	3 core PVC insulated, PVC sheathed copper conductor flat submersible cable		
	Supplying and erecting, Flat flexible submersible cable with, Copper Conductor, PVC insulated, and PVC sheathed.		
	3 core 16 sq mm	25	m
11	Power cables		
	Aluminium conductor 4 Core, XLPE / PVC insulated & armoured cable		
	Supplying and erecting, XLPE / PVC insulated, armoured cable 1100 V grade with ISI mark Four core, solid / stranded aluminium conductor with 6 mm thick 25 mm width M.S. spacer with G.I. Earth wire 6 sq mm, complete erected on wall / on pole with 25 X 3 mm M.S. clamps or in provided trench in an approved manner.		
	4 Core 6 sq mm	105	m
	MJP MECH/ ELECT/ SSR/ 2021-22 SECTION 12 - CB [L.T. CABLE] Item no. CB 6 Page no. 35		
12	Control Cables		
	Copper conductor PVC insulated, Unarmoured control cable		

MEASUREMENT SHEET - ELECTROMECHANICAL WORKS

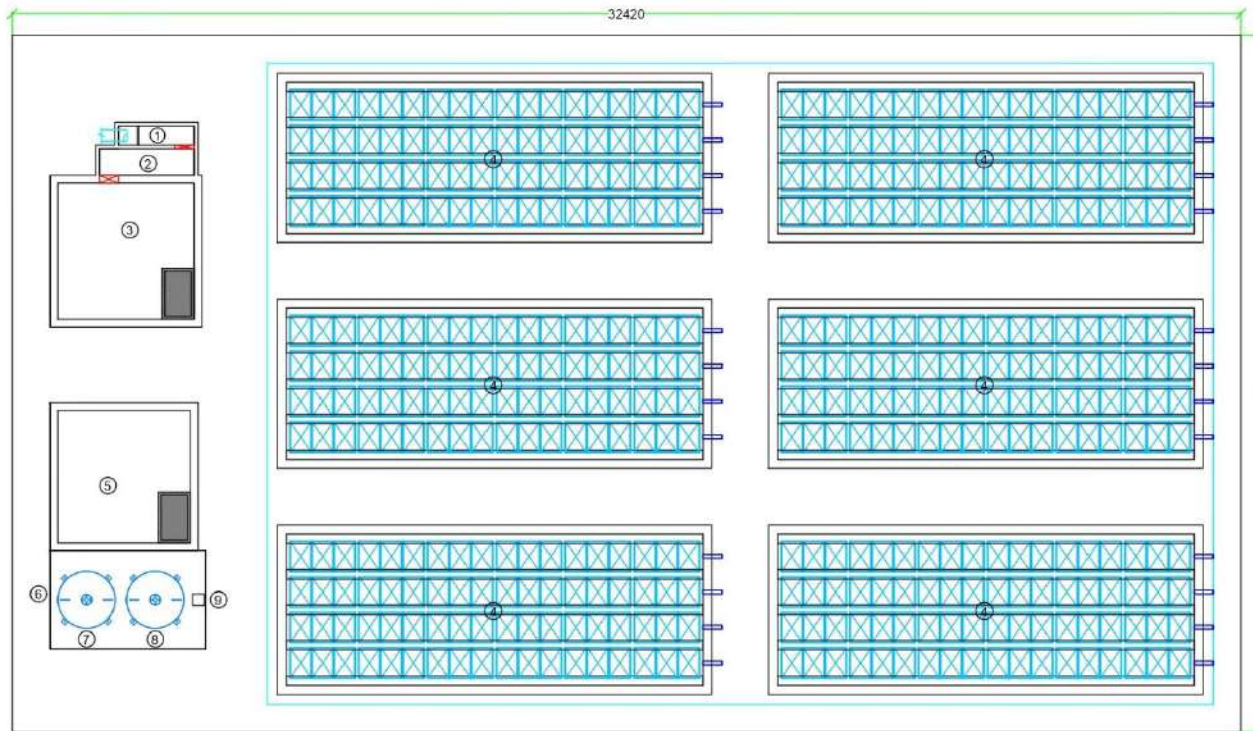
Sr. No.	Item Description	Nos.	Unit
	Supplying and erecting Un-armoured control cable with ISI mark stranded / solid copper conductor 1.1 kV grade complete erected on wall / panel or in provided trench in an approved manner.		
	4 core 2.5 sq mm	105	m
	MJP MECH/ ELECT/ SSR/ 2021-22/ SECTION 12 - CB [L.T. CABLE] Item no. CB 8-2 Page no. 36		

MEASUREMENT SHEET - PLUMBING

Sr. No.	Item Description	Nos.	L (m)	B (m)	Quantity	Unit
	Providing and supplying in standard lengths ISI mark rigid unplasticised PVC pipes suitable for potable water with solvent cement joints including cost of couplers, as per IS specification no. 4985 / 1988 excluding GST levied by GOI and GOM in all respect, including transportation, freight charges, inspection charges, loading, unloading, conveyance to the departmental stores and stacking the same in closed shed duly protected from sun rays and rains including cost of jointing material i.e. solvent cement, etc. complete (selffit type to be jointed with cement solvent).					
	1) 10% of cost of pipes shall be considered for cost of PVC specials for estimate purpose only. 2) One coupler and required cement solvent shall be provided with each full length pipe cost of which is included in rates below.					
	MJP/ SSR/ 2021-22 / SECTION – I(II) P.V.C. PIPES, Page no.77					
1	Raw Sewage pump to TBF Distribution					
a	Main header	Dia	90			
	90 mm.	1	40		40	m
	PVC Specials- 10%					
b	Distribution					
	63 mm.	1	50		50	m
	PVC Specials- 10%					
2	TBF collection to FFT (gravity)					
a	Main header					
	110 mm.	1	80		80	m
	PVC Specials- 10%					
b	collection tributary					
	75 mm.	1	20		20	m
	PVC Specials- 10%					
3	TTU Plumbing	Dia	75			
	75 mm.	1	20		20	m
	PVC Specials- 10%					
4	TBF distribution			No. of beds		
	63 mm.	1	5	6	30	m
	PVC Specials- 10%					
5	Labour	Nos	Days			
	Plumber	2	7		14	days
	Helper	3	7		21	days
6	Sluice valves					

MEASUREMENT SHEET - PLUMBING

Sr. No.	Item Description	Nos.	L (m)	B (m)	Quantity	Unit
	Providing double flange sluice valve confirming for IS- 14846 including worn gear arrangements as per test pressure, stainless steel spindle, caps, including inspection charges, transportation upto departmental store, unloading, stacking excluding GST levied by GOI & GOM in all respect etc. complete.					
	MJP/ SSR/ 2021-22 / SECTION - I(XII) : PIPES APPURTENANCES , Page no. 132					
	Raw Sewage pump					
	100 mm.	2			2	Nos
	Filter Feed Pump					
	80 mm.	2			2	Nos
7	Reflux valves (non-return valves)					
	Providing and supplying ISI mark CI D/F reflux valves (non-return valves) of following dia including railway freight, inspection charges, unloading from railway wagon, loading into truck, transportation upto departmental stores, unloading, stacking excluding GST levied by GOI & GOM in all respect etc. complete. Reflux valves as per I.S.5312 Part I (1984)					
	MJP/ SSR/ 2021-22 / SECTION - I(XII) : PIPES APPURTENANCES , Page no. 131					
	Raw Sewage pump					
	100 mm.	2			2	Nos
	Filter Feed Pump					
	80 mm.	2			2	Nos



PLANT LAYOUT
AREA = 636.5 SQM.

Process Unit Details								
Sr. No	Description	No	L/D m.	B m.	H m.	FB m.	Total H m.	MOC
1	Screen Chamber	1	2.00	0.50	0.20	1.00	1.20	RCC
2	Grit Chamber	1	2.50	0.70	0.65	1.20	1.85	RCC
3	Raw Sewage Sump	1	3.60	3.60	2.00	1.20	3.20	RCC
4	Tiger Bio Filter	6	11.00	4.00	-	-	1.20	BRICK
5	Filter Feed Tank	1	3.50	3.50	2.00	0.50	2.50	RCC
6	Filter Platform	1	2.60	4.10	-	-	-	RCC
7	Pressure Sand Filter	DIA	1.50	-	-	-	2.00	MSEP
8	Activated Carbon Filter	DIA	1.50	-	-	-	2.00	MSEP
9	Chlorination Unit	1	-	-	-	-	-	-

PROJECT NAME :
300 KLD SEWAGE TREATMENT PLANT
BASED ON TIGER BIO FILTER
TECHNOLOGY.

NOTES

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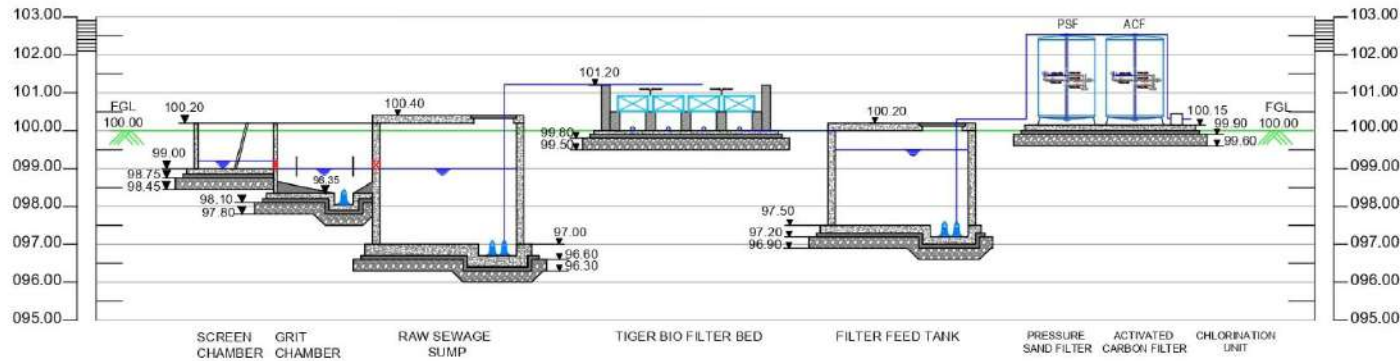
PLANT LAYOUT

PROJECT CODE : TBF-	DRAWING NO : D-01/PL/01	DATE : JUNE-2021
DRAWN BY : L.D.B.	CHECKED BY : S.B.	SCALE : NTS.


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 Web : www.tbfenvironmental.in

PROJECT NAME :
 300 KLD SEWAGE TREATMENT PLANT
 BASED ON TIGER BIO FILTER
 TECHNOLOGY.

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HYDRAULIC FLOW DIAGRAM

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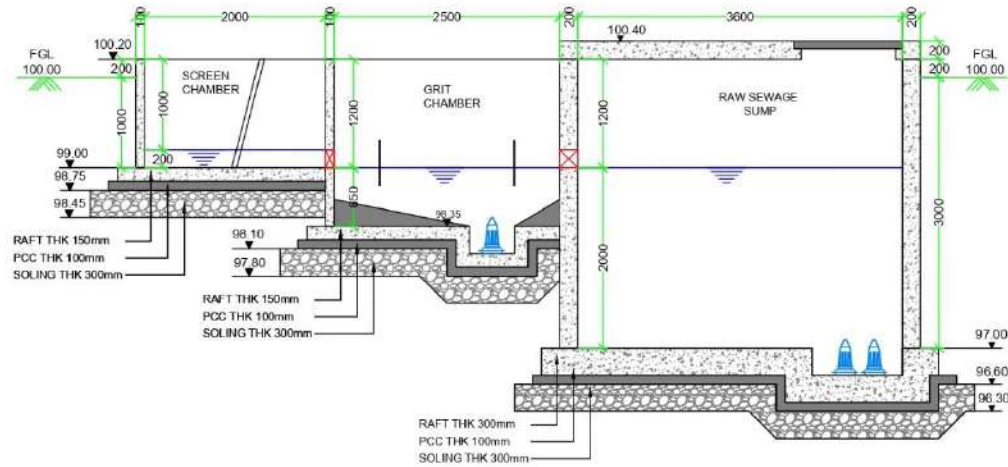
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 HYDRAULIC FLOW DIAGRAM

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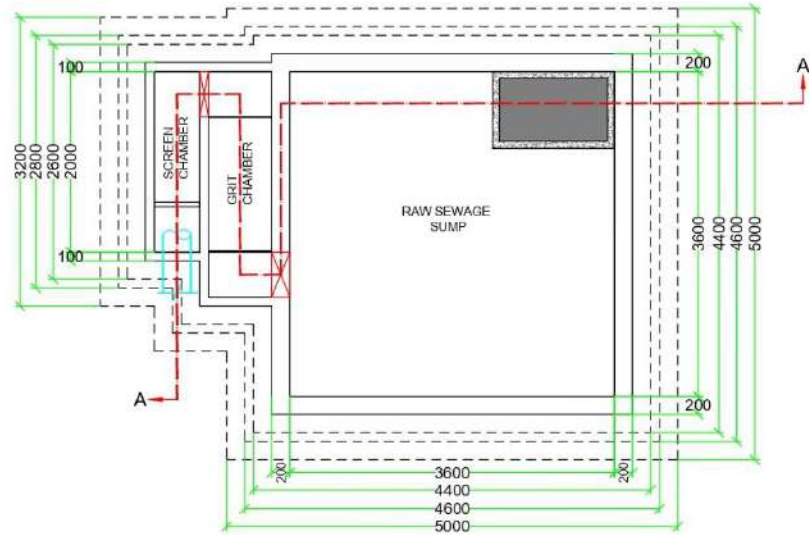


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SECTION A-A



PLAN

SCREEN CHAMBER, GRIT CHAMBER & RAW SEWAGE SUMP

PROJECT NAME :
300 KLD SEWAGE TREATMENT PLANT
BASED ON TIGER BIO FILTER
TECHNOLOGY.

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DRAWING NAME :
SCREEN CHAMBER, GRIT CHAMBER
& RAW SEWAGE SUMP

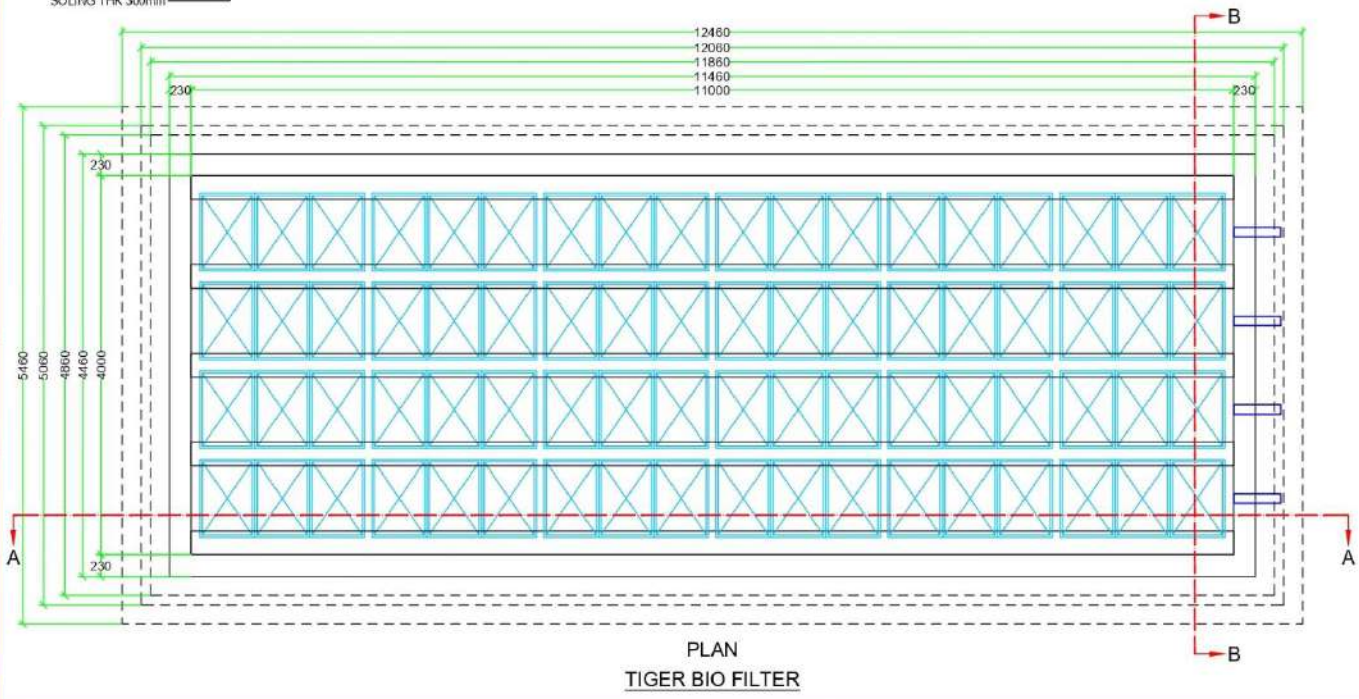
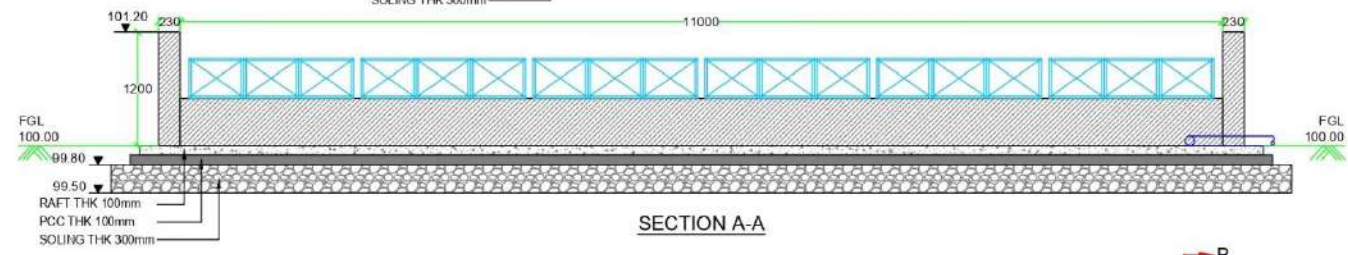
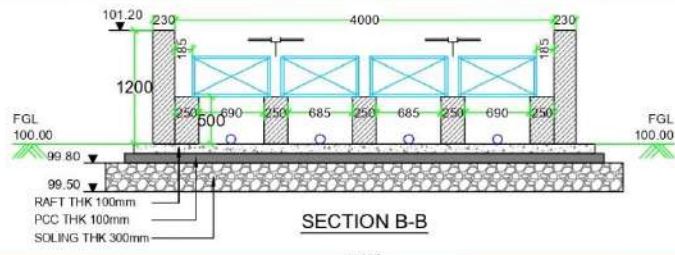
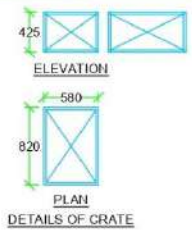
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PROJECT NAME :
300 KLD SEWAGE TREATMENT PLANT
BASED ON TIGER BIO FILTER
TECHNOLOGY.

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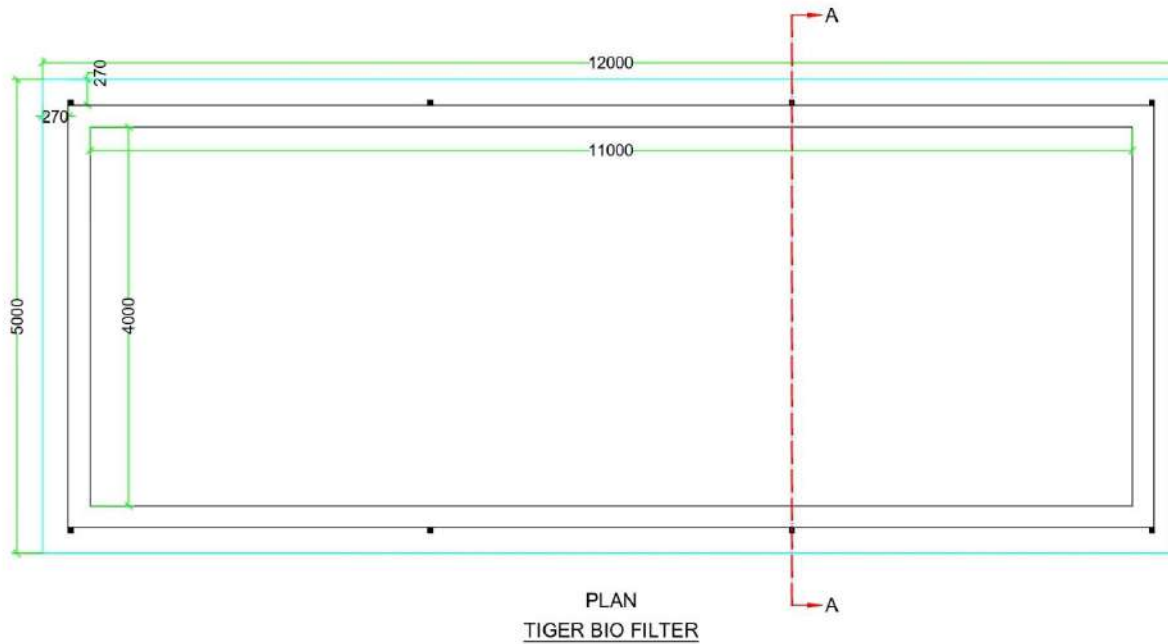
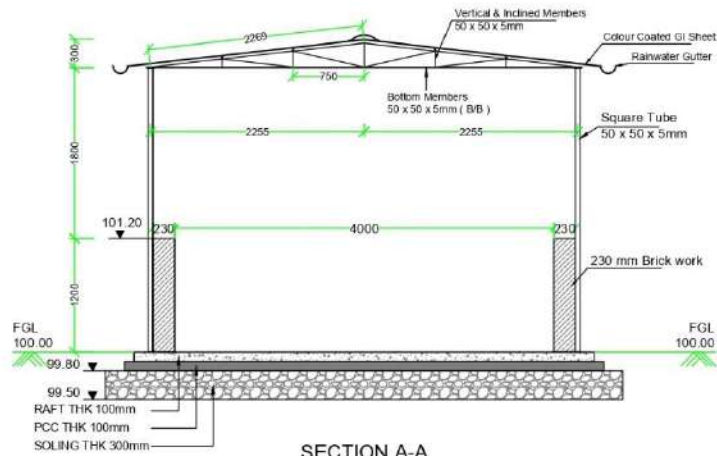


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CLIENT : SWSM, MAHARASHTRA
DRAWING NAME :
TIGER BIO FILTER

PROJECT CODE : TBF-	DRAWING NO : D-04/TBF/01	DATE : JUNE-2021
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BASED ON TIGER BIO FILTER
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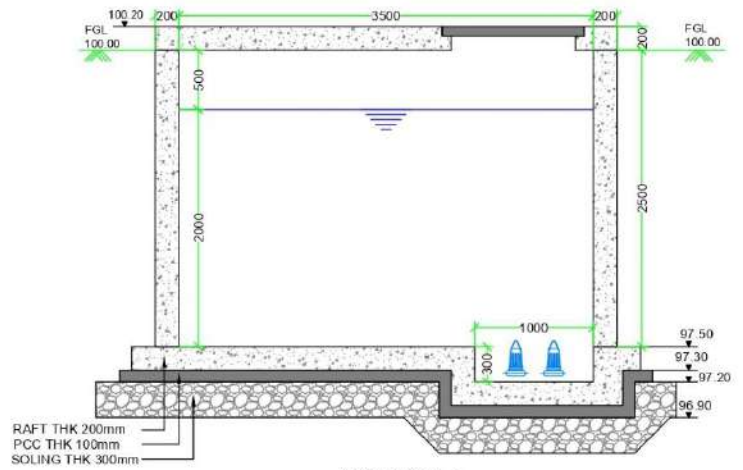
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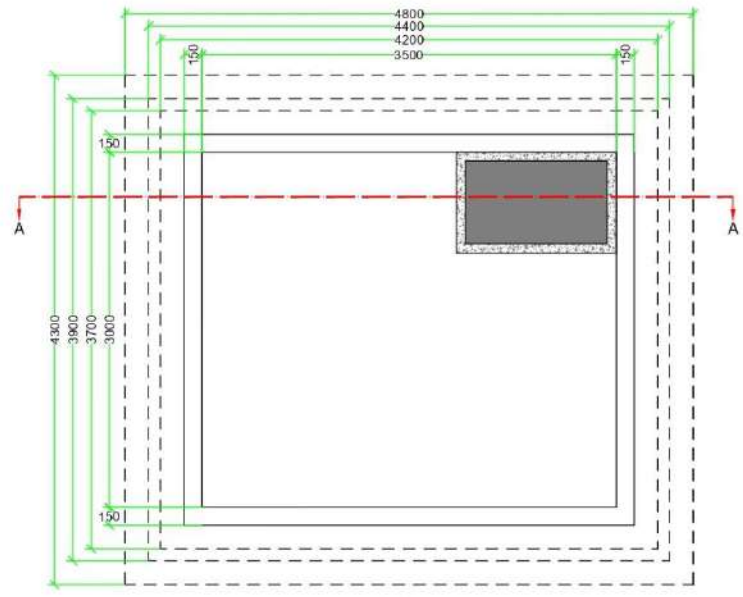
TIGER BIO FILTER

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SECTION A-A



PLAN
FILTER FEED TANK

PROJECT NAME :
300 KLD SEWAGE TREATMENT PLANT
BASED ON TIGER BIO FILTER
TECHNOLOGY.

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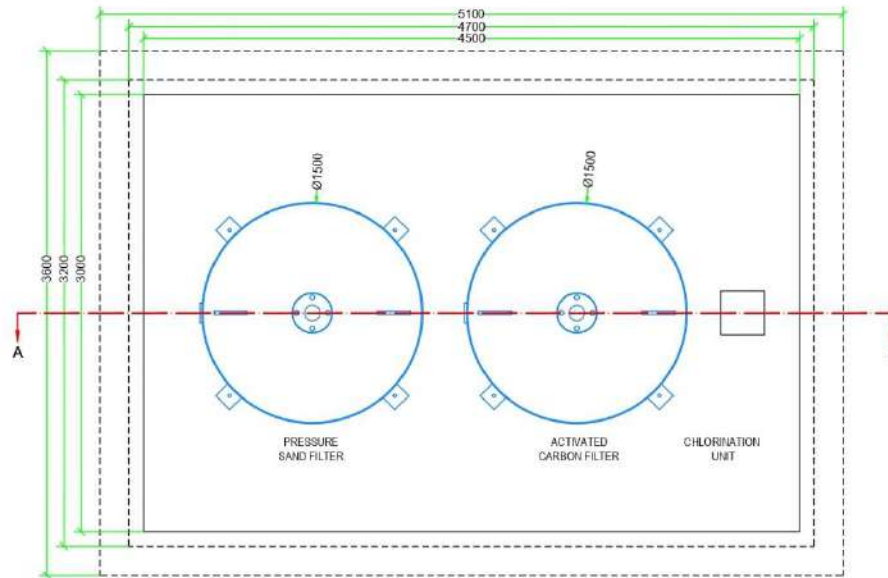
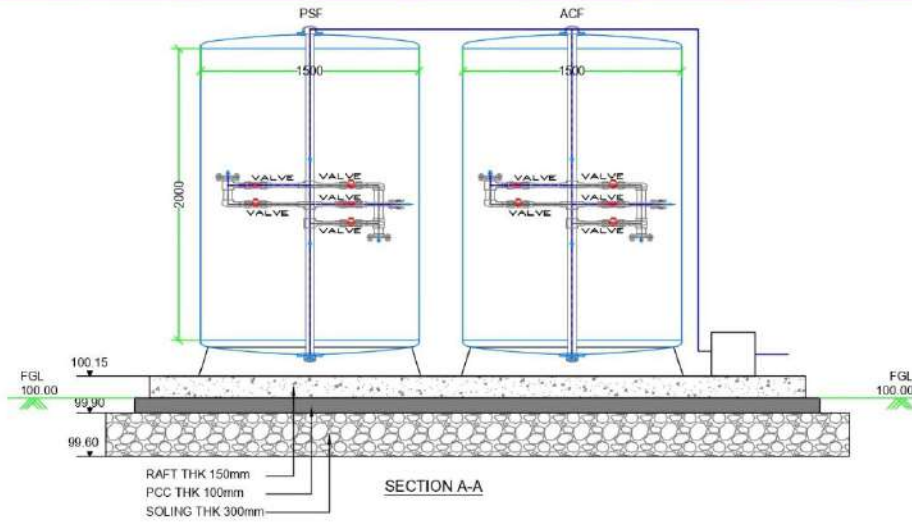
REVISION		
DATE	REMARKS	SIGNATURE

CLIENT : SWSM, MAHARASHTRA

DRAWING NAME:
FILTER FEED TANK

PROJECT CODE : TBF-	DRAWING NO : D-05/FF TAD1	DATE : JUNE-2021
DRAWN BY : L.D.B.	CHECKED BY : S.B.	SCALE : NTS.


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PLAN
PRESSURE SAND FILTER,
ACTIVATED CARBON FILTER & CHLORINATION UNIT

PROJECT NAME :

300 KLD SEWAGE TREATMENT PLANT
BASED ON TIGER BIO FILTER
TECHNOLOGY.

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REVISION		
DATE	REMARKS	SIGNATURE

CLIENT : SWSM, MAHARASHTRA

DRAWING NAME:
PRESSURE SAND FILTER,
ACTIVATED CARBON FILTER
& CHLORINATION UNIT

PROJECT CODE : TBF-	DRAWING NO : D-06PSF,ACF&CLU01	DATE : JUNE-2021
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**400 KLD STP
BASED ON TBF TECHNOLOGY**

PROCESS CALCULATIONS
TIGER BIO FILTER OF 400 KLD CAPACITY

Design flow	=	400.00	KLD
	=	0.400	MLD
Peak flow factor	=	3.00	
1 SCREEN CHANNELS: MANUAL			
No. of Manual Screen	=	1	No.
Average Flow	=	0.40	MLD
Peak Flow Factor	=	3.00	
Design Flow	=	Peak Flow	
	=	1.20	MLD
	=	50.00	m ³ /hr
	=	0.014	m ³ /sec
Average Flow	=	0.40	MLD
	=	16.667	m ³ /hr
	=	0.005	m ³ /sec
Design Flow in each Screen	=	0.014	m ³ /sec
		1	No.
	=	0.014	m ³ /sec
Average Flow in each Screen	=	0.005	m ³ /sec
		1	No.
	=	0.005	m ³ /sec
Maximum Velocity through Screen at Peak Flow	=	1.2	m/sec
Minimum Velocity through Screen at Average Flow	=	0.6	m/sec
Clear Area of Opening through Screen for Peak Flow	=	0.014	m ³ /sec
		1.2	m/sec
	=	0.012	m ²
Clear Area of Opening through Screen for Average Flow	=	0.005	m ³ /sec
		0.6	m/sec
	=	0.008	m ²
Considering maximum Area of Opening through Screen	=	0.012	m ²
Clear Spacing of Bars	=	10	mm

Thickness of Bars	=	5	mm	
Gross Area of Screen	=	$0.012 \times (10+5) / 10$		
	=	0.018	m ²	
Assuming Depth of Screen Channel	=	250.00	mm	
Gross Width of Screen	=	$0.018 / 0.25$		
	=	0.072	m	
No. of Bars	=	(Gross Width of Screen / Center to Center Spacing of Bars) - 1		
	=	$0.072 / ((10+5) / 1000)$		
	=	-1		
	=	3.8	Nos.	
Say	=	4	Nos.	
Width of Screen provided	=	(Number of Bars+1) x Clear Spacing + (Number of Bars x Bar Thickness)		
	=	$(4+1) \times 10 + (4 \times 5)$		
	=	70	mm	
Width Say	=	0.50	m	
Liquid Depth of Screen Channel provided	=	0.25	m	
L:B	=	4.00		
Length of Screen Channel provided	=	2.00	m	
Freeboard provided	=	1.00	m	Invert Depth of incoming sewer
Total Depth of Screen Chamber	=	1.25	m	
Velocity in Channel at Average Flow	=	Average Flow / Cross Sectional Area of Screen Channel		
	=	$0.005 / ((0.5 \times 0.25) / 1000 \times 1000)$		
	=	0.040	m/sec	
	>	0.300	m/sec	
Head Loss across Screen				
Head Loss across Screen	=	$0.0728 (V^2 - v^2)$		
V = Velocity through Screen at Peak Flow	=	Peak Flow through Screen Channel / Clear Area of Opening through Screen		
	=	1.120	m/sec	
v = Velocity in approach Channel at Peak Flow	=	Peak Flow through Screen Channel / Cross Sectional Area of Screen Channel		
	=	0.8	m/sec	
Head Loss across Screen at Peak Flow	=	0.047	m	
Head Loss across Screen at 50% Clogged Condition				
Velocity through Screen at 50% Clogged Condition at Peak Flow	=	2.240	m/sec	
Head Loss across screen at 50% Clogged Condition at Peak Flow	=	0.321	m	
	>	0.300	m/sec	OK

2 CONVENTIONAL GRIT CHAMBER: MANUAL

No. of Grit Chamber	=	1	
Average Flow	=	0.40	MLD
Peak Flow Factor	=	3.00	
Design Flow	=	Peak Flow	
Peak Flow	=	1.20	MLD
	=	1200	m ³ /day
	=	50	m ³ /hr
	=	0.014	m ³ /sec
Design Flow to each Grit Chamber	=	1200/1	
	=	1200	m ³ /day
	=	50	m ³ /hr
	=	0.014	m ³ /sec
According to CPHEEO Manual			
Particle Size	=	0.15	mm
Specific Gravity	=	2.65	
Surface Overflow Rate for 100% removal efficiency in an ideal Grit Chamber	=	Settling Velocity of the minimum size of Particles to be removed	
	=	1.5	m/s
	=	1296	m ³ /m ² /day
Considering Efficiency of removal of desired Particles, $\eta = 75\%$ and Measure of Settling Basin Performance, $n = 1/8$ for very good performance	=	75%	
	=	0.125	
Design Overflow Rate	=	857	m ³ /m ² /day
Surface Overflow Rate for 0.15 mm dia. Particle Size with Specific Gravity $S_s > 2.65$ Table 5.6	=	1555	m ³ /m ² /day
Considering Design Overflow Rate	=	960	m ³ /m ² /day
Area of Grit Chamber required	=	1200	m ³ /day
	=	960	m ³ /m ² /day
	=	1.25	m ²
L:B ratio	=	2	
Length of Chamber provided	=	3.00	m
Width of Chamber provided	=	0.80	m
Hydraulic Retention Time (HRT) in Grit Chamber at Peak Flow	=	60	sec
Volume of Grit Chamber required	=	0.014x60	
	=	0.84	m ³

Depth required in Grit Chamber	=	0.84 / (3x0.8)	
	=	0.35	m
Say	=	0.40	m
Grit Storage Depth	=	0.30	m
Total Liquid Depth required	=	0.70	m
Length of Grit Pit	=	0.50	m
Width of Grit Pit	=	0.50	m
Depth of Grit Pit	=	0.30	m
Free Board	=	1.25	m

3 RAW SEWAGE SUMP (WET WELL)

No. of Units	=	1	No.
Average Flow	=	0.40	MLD
	=	16.667	m ³ /hr
	=	0.0046	m ³ /sec

Peak Flow Factor = 3.00

Design Flow	=	Peak Flow	
	=	1.20	MLD
	=	50	m ³ /hr
	=	0.014	m ³ /sec

Hydraulic Retention Time (HRT) at Average Flow = 120 min

Volume required = 0.0046 x 120 x 60
= 33 m³

Hydraulic Retention Time (HRT) at Peak Flow = Volume / Average Flow

= 39 min
< 30 min

Total Volume of Wet Well = 33 m³

Side Water Depth (SWD) provided = 2.00 m

Plan Area of Wet Well = 16.56 m²

Length/width of Sump required = 4.07 m

Length/width of Sump provided = 4.10 m

Volume of Sump provided = 33.62 m³

Length of Pump Pit = 1.00 m

Width of Pump Pit = 0.50 m

Depth of Pump Pit = 0.30 m

Free Board = 1.25 m

3.1 DESIGN STATEMENT-RSS E&M

Design Considerations

Design flow	=	0.40	MLD
	=	400.00	Cum/Day
Peak flow factor	=	3.00	

Pumping machinery

Friction factor for Fittings in Pressure Mains

Elbow 90 degrees	=	13
Friction Factor for each	=	1
Friction factor for all	=	13
Elbow 45 degrees	=	0
Friction Factor for each	=	0.75
Friction factor for all	=	0
Elbow 22 degrees	=	0
Friction Factor for each	=	0.5
Friction factor for all	=	0
Tee 90 degrees	=	0
Friction Factor for each	=	1.5
Friction factor for all	=	0
Tee in straight pipe	=	8
Friction Factor for each	=	0.3
Friction factor for all	=	2.4
Gate valve open	=	1
Friction Factor for each	=	0.4
Friction factor for all	=	0.4
Swing check	=	1
Friction Factor for each	=	2.5
Friction factor for all	=	2.5
Total friction factor	=	18.3

Stage		low	ave	peak
Average flow, cum / day	=		400.00	
Proportion	=	0.6	1	2
Design flow, cum / day	=	240	400	800
Hazen Williams C	=	140	140	140
Desired velocity, m/s	=	0.6	1.0	1.5
Number of Pumping hours	=	16.0	16.0	16.0
Area needed, sqm	=	0.0069	0.0069	0.0093
Dia needed, m	=	0.094	0.094	0.109
Dia needed, mm	=	94	94	109
Dia provided, mm (User)	=	90	90	90
Radius, m	=	0.045	0.045	0.045
Radius power 0.63	=	0.142	0.142	0.142
S power 0.54	=	0.036	0.059	0.089
S	=	0.002	0.005	0.011
Slope 1 in length, m	=	480.1	186.4	88.0
Friction in pipeline, m	=	0.1	0.2	0.5

Velocity head, m	=	0.018	0.051	0.115
Friction factor in fittings	=	18.3	18.3	18.3
Friction in fittings, m	=	0.3	0.9	2.1
Static lift, m	=	3.5	3.5	3.5
Total head, m	=	3.8	4.4	5.6
Efficiency of pumpset	=	0.8	0.8	0.8
Discharge, lps	=	4.2	6.9	13.9
Discharge, Cum/Hr	=	15.0	25.0	50.0
Kw required	=	0.645	1.075	2.150
HP required	=	1.0	1.5	3.0
Number of Pumps	=	2	2	2

4 TIGER BIO FILTER

DESIGN STATEMENT-TBF1- 50 KLD

Number of pumping hours	=	16	Hrs	
Number of BMF tanks provided	=	8	Nos	
Design flow to each tank	=	50.00	Cum/day	
	=	3.13	Cum/ Hr for 16 Hr	
	=	0.87	lps	
Inlet BOD	=	250.00	mg/l	
Inlet TSS	=	400.00	mg/l	
BOD load applied	=	12.5	kg/day	
BOD uptake rate	=	0.1	Kg of BOD / Kg of worms	(0.5 - 1.0)
Worms required	=	125	Kg worms	
Sewage application rate	=	1.85	Cum/Sqm/day	(1 - 2 Cum/Sqm/day)
Area required	=	27.03	Sqm	
Area Provided	=	28	Sqm	
Area of each crate	=	0.4	Sqm	
Number of crates	=	70	Nos	
say	=	72	Nos	
Crate in longitudinal direction	=	18	Nos	
Crate in travers direction	=	4	Nos	
crates provided	=	72	Nos	OK
Width provided	=	4.00	m	
Length required	=	11.00	m	
Depth provided	=	1.2	m	

5 TERTIARY TREATMENT UNIT

Design Considerations

Design flow	=	0.40	MLD
	=	400.00	Cum/Day
Peak flow factor	=	3.00	

5.1 FILTER FEED TANK

Number of FFT provided	=	1	Nos
Number of operating hours	=	16	Hrs

Design flow	=	400.00	Cum/Day
	=	25.00	Cum/Hr
	=	0.00694	Cum/Sec
Hydraulic Retention time	=	60	min
Volume required	=	25.00	Cum
Depth	=	2.00	m
Civil Tanks			
Area	=	12.50	Sqm
Length/Width required	=	3.54	m
Length/Width provided	=	4.00	m
Freeboard provided	=	0.50	m
Volume Provided	=	32.00	Cum

DESIGN STATEMENT-TTU E&M

Design Considerations

Design flow	=	0.40	MLD
	=	400.00	Cum/Day
Peak flow factor	=	3.00	

Pumping machinery

Friction factor for Fittings in Pressure Mains

Elbow 90 degrees	=	5
Friction Factor for each	=	1
Friction factor for all	=	5
Elbow 45 degrees	=	0
Friction Factor for each	=	0.75
Friction factor for all	=	0
Elbow 22 degrees	=	0
Friction Factor for each	=	0.5
Friction factor for all	=	0
Tee 90 degrees	=	0
Friction Factor for each	=	1.5
Friction factor for all	=	0
Tee in straight pipe	=	5
Friction Factor for each	=	0.3
Friction factor for all	=	1.5
Gate valve open	=	1
Friction Factor for each	=	0.4
Friction factor for all	=	0.4
Swing check	=	1
Friction Factor for each	=	2.5
Friction factor for all	=	2.5
Total friction factor	=	9.4

Stage	low	ave	peak
Average flow, cum / day	=	400.00	
Proportion	=	0.6	2
Design flow, cum / day	=	240	800
Hazen Williams C	=	140	140
Desired velocity, m/s	=	0.8	1.5

Number of Pumping hours	=	16.0	16.0	16.0
Area needed, sqm	=	0.0052	0.0069	0.0093
Dia needed, m	=	0.081	0.094	0.109
Dia needed, mm	=	81	94	109
Dia provided, mm (User)	=	90	110	90
Radius, m	=	0.045	0.055	0.045
Radius power 0.63	=	0.142	0.161	0.142
S power 0.54	=	0.048	0.052	0.089
S	=	0.004	0.004	0.011
Slope 1 in	=	281.8	235.6	88.0
length, m	=	25	25	25
Friction in pipeline, m	=	0.1	0.1	0.3
Velocity head, m	=	0.033	0.051	0.115
Friction factor in fittings	=	9.4	9.4	9.4
Friction in fittings, m	=	0.3	0.5	1.1
Static lift, m	=	8.0	8.0	8.0
Total head, m	=	8.3	8.5	9.1
Efficiency of pumpset	=	0.8	0.8	0.8
Discharge, lps	=	4.2	6.9	13.9
Discharge, Cum/Hr	=	15.0	25.0	50.0
Kw required	=	1.106	1.843	3.686
HP provided	=	1.5	2.5	5.0
Number of Pumps	=	2	2	2

5.2 PRESSURE SAND FILTER

Number of unit provided	=	2	Nos.
Designed @ 16 hrs working for flow of	=	12.50	m3/h
Loading rate	=	12.00	m3/m2/h
Area of DMF	=	1.04	m2
Dia of DMF	=	1.15	m
Provided	=	1.200	m
Backwash water			
Backwash velocity	=	15.00	m/hr
backwash flowrate	=	16.27	m3/h
Backwash volume for 20 mins	=	5.42	m3

5.3 ACTIVATED CARBON FILTER

Number of unit provided	=	2	Nos.
Designed @ 16 hrs working for flow of	=	12.50	m3/h
Loading rate	=	12.00	m3/m2/h
Area of ACF	=	1.04	m2
Dia of ACF	=	1.15	m
Provided	=	1.200	m
Backwash water			
Backwash velocity	=	15.00	m/hr
backwash flowrate	=	16.27	m3/h
Backwash volume for 20 mins	=	5.42	m3

5.4 CHLORINE DOSING SYSTEM NaOCI DOSING SYSTEM

Average Flow	=	25.00	m ³ /hr
Design Chlorine Dosage (Max)	=	3	mg/l
Concentration of Chlorine in commercially available NaOCl	=	10%	
Design NaOCl Dosage	=	30	mg/l
Operating hours	=	16.0	hr
Quantity of NaOCl required	=	$25 \times 30 \times 16 / 1000$	
	=	12.00	Kg/day
	=		
Design Strength of NaOCl Solution	=	100%	
Volume of NaOCl Solution	=	$12 / (1 \times 1000)$	
	=	0.020	m ³
No. of Dosing Tanks provided	=	1	Nos.
Volume of each Dosing Tank	=	$0.02 / 1$	
	=	0.02	m ³
	=	100	Litres
	=		
No. of Working NaOCl Dosing Pump provided	=	1	No.
Capacity of each NaOCl Dosing Pump required	=	$\frac{\text{Total Volume of NaOCl Solution}}{\text{(No. of Dosing pumps)}}$	
	=	$0.02 / (1 \times 16)$	
	=	0.001	m ³ /hr
	=	1.00	LPH
Capacity of each NaOCl Dosing Pump provided	=	1.00	LPH
No. of Standby NaOCl Dosing Pump provided	=	1	No.

SIZING DETAILS (CIVIL)
TIGER BIO FILTER OF 400 KLD CAPACITY

S I. N o	Unit name	N o s	Leng th	Widt h	Height			Soling		PCC		Raft		RCC Wall thk	Bric k Wall thk	Slab Thk	Steel - HCR M/ Kg/C
					SW	FB	Tota	offs	Thk	offs	Thk	offs	Thk				
		N	m	m	m	m	m	m	m	m	m	m	m	m	m	m	
1	Screen Chamber	1	2.0	0.5	0.2	1.0	1.2	0.2	0.3	0.1	0.1	0.2	0.1	0.1			80
2	Grit Chamber	1	3.0	0.8	0.7	1.2	1.9	0.2	0.3	0.1	0.1	0.2	0.1	0.1			80
3	Raw Sewage Sump	1	4.1	4.1	2.0	1.2	3.2	0.2	0.3	0.1	0.1	0.2	0.3	0.2		0.2	100
4	TBF Bed 50 KLD	8	11.0	4.0			1.2	0.2	0.3	0.1	0.1	0.2	0.1		0.2		60
5	Filter Feed tank	1	4.0	4.0	2.0	0.5	2.5	0.2	0.3	0.1	0.1	0.2	0.2	0.2		0.2	100
6	Filter Platform	1	4.0	3.6				0.2	0.3	0.1	0.1	0.2	0.1				60

Assumptions

Incoming Sewer Invert 1.0 m Below Ground level

Method of excavation Mechanical means

Underground strata		soil	Muru m	Soft roc	hard	Total
0.0 to 1.5 m	=	25	25	25	25	100
1.5 m to 3.0 m	=	25	25	25	25	100
3.0 to 4.5 m	=	25	25	25	25	100
4.5 to 6.0	=	25	25	25	25	100

**TIGER BIO FILTER OF 400 KLD CAPACITY
BILL OF QUANTITIES**

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
1	Excavation for foundation / pipe trenches in earth, soils of all types, sand, gravel and soft murum, including removing the excavated material upto a distance of 50 metres and lifts as below, stacking and spreading as directed, normal dewatering, preparing the bed for foundation and excluding backfilling, etc. complete. (Bd-A-1/259)				
	0.0 to 1.5 m	126.23	Cum	150.00	18,934.50
	1.5 to 3.0 m	40.43	Cum	164.00	6,630.60
	3.0 to 4.5 m	13.26	Cum	178.00	2,360.30
	4.5 to 6.0 m	0.00	Cum	192.00	0.00
	MJP/ SSR/ 2021-22 / Section E / Excavation Item No.1/ Page no. 42				
2	Excavation for foundation / pipe trenches in hard murum and boulders, W.B.M. road including removing the excavated material upto a distance of 50 M beyond the area and lifts as below, stacking and spreading as directed by Engineer-in-charge, normal dewatering, preparing the bed for foundation and excluding backfilling, etc. complete. (Bd-A-3/259)			8.00	
	0.0 to 1.5 m	126.23	Cum	192.00	24,236.20
	1.5 to 3.0 m	40.43	Cum	206.00	8,328.60
	3.0 to 4.5 m	13.26	Cum	220.00	2,917.20
	4.5 to 6.0 m	0.00	Cum	234.00	0.00
	MJP/ SSR/ 2021-22/ Section E/ Excavation Item No.3, Page no. 42				
3	Excavation for foundation / pipe trenches in soft rock and old cement and lime masonry foundation asphalt road including removing the excavated material upto a distance of 50 M beyond the area and lifts as below, stacking as directed by Engineer-in-charge, normal dewatering, preparing the bed for foundation and excluding backfilling, etc. complete. (Bd-A- 4/259)				
	0.0 to 1.5 m	126.23	Cum	572.00	72,203.60
	1.5 to 3.0 m	40.43	Cum	597.00	24,136.80
	3.0 to 4.5 m	13.26	Cum	622.00	8,247.80
	4.5 to 6.0 m	0.00	Cum	647.00	0.00
	MJP/ SSR/ 2021-22 / Section E/ Excavation Item No.5, Page no. 42				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
4	Excavation for foundation / pipe trenches in hard rock and concrete road by chiselling, wedging, line drilling by mechanical means or by all means other than blasting including trimming and levelling the bed, removing the excavated material upto a distance of 50 metres beyond the area and lifts as below, stacking as directed by Engineer-in-charge, normal dewatering, excluding backfilling, etc. complete by all means. (Bd-A-6/259)				
	0.0 to 1.5 m	126.23	Cum	1,017.00	128,376.00
	1.5 to 3.0 m	40.43	Cum	1,042.00	42,128.10
	3.0 to 4.5 m	13.26	Cum	1,067.00	14,148.50
	4.5 to 6.0 m	0.00	Cum	1,092.00	0.00
	MJP/ SSR/ 2021-22 / Section E/ Excavation Item No.7, Page no. 43				
5	Providing dry trap/ granite/ quartzite/ gneiss, rubble stone soling in 15 cm to 20 cm thick layers including hand packing and compacting, etc. complete. (Bd-A-12/264)	191.02	Cum	1,175.00	224,448.50
	MJP/ SSR/ 2021-22 / Section E/ Excavati				
6	Providing and laying in situ Cement Concrete M- 15 of trap/ granite / quartzite / gneiss metal for foundation and bedding including bailing out water, form work, compaction, curing, etc. complete. (Cement 5.90 bags / cum) Spec. No. - Bd E /1 Page No. 287 and B- 7, Page No. 38	57.05	Cum	5,640.00	321,762.00
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.1, Page no.49				
7	Providing and laying in situ Cement Concrete of trap/ granite / quartzite / gneiss metal for RCC work in foundation like raft, grillage, strip foundation and footing of RCC columns and steel stanchions including normal dewatering, form work, compaction, finishing and curing, etc. complete. (By weigh batching and mix design for M250 and M-300 only. Use of L&T, A.C.C., Ambuja, Birla Gold, Manikgad, Rajashree, etc. cement is permitted.) (Excluding M.S. or Tor reinforcement)	61.96	Cum	7,448.00	461,478.10
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE/ Item No.2, Page no. 49				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
8	Providing and casting in situ C.C. of trap / granite/ quartzite / gneiss metal of approved quality for RCC works as per detailed drawings and designs or as directed by Engineer-in- charge including normal dewatering, centering, form work, compaction, finishing the formed surfaces with C.M. 1:3 of sufficient minimum thickness to give a smooth and even surface wherever necessary or roughening if special finish is to be provided and curing, etc. complete. (By weigh batching and mix design for M-250 and M-300 only. Use of L&T, A.C.C., Ambuja, Birla Gold, Manikgad, Rajashree, etc. cement is permitted.) (Excluding M.S. or Tor reinforcement)	0.98	Cum	8,624.00	8,451.60
	For Beams / Braces / Lintels In RCC M-300				
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.4, Page no. 50				
9	Providing and casting in situ C.C. of trap / granite/ quartzite / gneiss metal of approved quality for RCC works as per detailed drawings and designs or as directed by Engineer-in- charge including normal dewatering, centering, form work, compaction, finishing the formed surfaces with C.M. 1:3 of sufficient minimum thickness to give a smooth and even surface wherever necessary or roughening if special finish is to be provided and curing, etc. complete. (By weigh batching and mix design for M-250 and M-300 only. Use of L&T, A.C.C., Ambuja, Birla Gold, Manikgad, Rajashree, etc. cement is permitted.) (Excluding M.S. or Tor reinforcement)	7.61	Cum	9,247.00	70,369.70
jj					
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.5, / Page no. 50				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
10	Providing and casting in situ C.C. of trap / granite/ quartzite / gneiss metal of approved quality for RCC works as per detailed drawings and designs or as directed by Engineer-in- charge including normal dewatering, centering, form work, compaction, finishing the formed surfaces with C.M. 1:3 of sufficient minimum thickness to give a smooth and even surface wherever necessary or roughening if special finish is to be provided and curing, etc. complete. (By weigh batching and mix design for M-250 and M-300 only. Use of L&T, A.C.C., Ambuja, Birla Gold, Manikgad, Rajashree, etc. cement is permitted.) (Excluding M.S. or Tor reinforcement)	27.92	Cum	9,218.00	257,366.60
	Chajjas / Parapets / Curtain Walls /Partition Walls / Pardies In RCC M-300				
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.6 / Page no. 51				
11	Providing and fixing in position steel bar reinforcement of various diameters for RCC piles, caps, footings, foundations, slabs, beams, columns, canopies, staircases, newels, chajjas, lintels, pardies, copings, fins, arches, etc. as per detailed designs, drawings and schedules; including cutting, bending, hooking the bars, binding with wires or tack welding and supporting as required, etc. complete (including cost of binding wire). (Bd-F-17/306)				
	c) Corrosion Resistant Steel (Fe 500)	7.90	MT	70,658.00	558,198.20
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.8 / Page no. 52				
12	Providing and fixing mild steel grill work for windows/ ventilators of 20 Kg/Sqm. As per drawings including necessary welding and painting with one coat of anticorrosive paint and two coats of oil painting, etc. complete. (Bd-U- 1/537)	7.78	Sqm	1,895.00	14,743.10
	MJP/ SSR/ 2021-22 / SECTION - F : IRON AND STRUCTURAL STEEL WORK Item No.1 / Page				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
13	Providing structural steel work in rolled stanchions fixed with connecting plates or angle cleats as in main and cross beams, hip and jack rafters, purlins connecting to truss members and like as per detailed designs and drawings or as directed by Engineer-in-charge including cutting, fabricating, hoisting, erecting, fixing in position, making riveted / bolted / welded connections and one coat of anticorrosive paint and over it two coats of oil painting, etc. complete. (Bd-C- 3/275)	5.98	MT	71,286.00	426,028.00
	MJP/ SSR/ 2021-22 / SECTION - F :: IRON AND STRUCTURAL STEEL WORK Item No.3,				
14	Providing and fixing corrugated galvanised iron sheets of 0.63 mm thick (24B .W .G.) for roofing without wind tiles including fastening with galvanised iron screws and bolts , lead and bitumen washers as per drawing etc. complete. (Weight of 5.5 kg/sq.m.).	603.20	Sqm	777.00	468,686.40
	PWD / SSR 2020-21 / Roofing and Ceiling SSR Item No.38.04 Reference No. Bd.R.5, Page No. 453 Item No.1133, Page no. 224				
15	Providing fly ash brick masonry with conventional / I.S. type bricks in cement mortar 1:6 in superstructure including striking joints, raking out joints, watering and scaffolding etc. Complete	118.96	Cum	6,305.00	750,042.80
	PWD / SSR 2020-21 / Brick Masonry SSR Item No.27.13 Reference No. As director by engineer incharge and BDG- 2 and 5 Item No.893, Page no. 190				
16	Providing internal cement plaster 12 mm thick in single coat in cement mortar 1:5 without neeru finish to concrete or brick surfaces, in all positions including scaffolding and curing etc. complete.	653.20	Sqm	257.00	167,872.40
	PWD / SSR 2020-21 / Plastering and Pointing SSR Item No. 32.03 Reference No. Bd. L.2 Page No. 368 Item No.950, Page no. 201				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
17	Providing rough cast cement plaster externally in two coats to concrete, brick or stone masonry surfaces in all positions with base coat of 12 to 15 mm thick in C.M. 1:4 and rough cast treatment 12 mm thick in proportion 1:11 / 2:3 including scaffolding and fourteen days curing complete.	380.00	Sqm	529.00	201,020.00
	PWD / SSR 2020-21 / Plastering and Pointing SSR Item No. 32.12 Reference No. Bd.L.8 Page No. 370 Item No.957, Page no. 201				
18	Providing and applying white-wash in two coats on old / new plastered or masonry surfaces and asbestos cement sheets including scaffolding and preparing the surface by brushing and brooming down etc. complete.	380.00	Sqm	10.00	3,800.00
	PWD / SSR 2020-21 / Colouring SSR Item No. 36.03 Reference No. Bd. P. I Page No. 411				
19	Providing and applying colour-wash of approved colour and shade in one coat to new surface including scaffolding, brushing and brooming down (excluding base coats of white wash) etc. complete.	380.00	Sqm	8.00	3,040.00
	PWD / SSR 2020-21 / Colouring SSR Item No. 36.04 Reference No. Bd. P.2 Page No. 412				
20	Dewatering the excavated trenches and pools of water in the building trenches / pipeline trenches, well works by using pumps and other devices including disposing off water to safe distance as directed by Engineer-in-charge (including cost of machinery, labour, fuel), etc. complete. (Bd-A-9/261)	64.00	HP/ Hr.	77.00	4,928.00
	MJP/ SSR/ 2021-22 / Section E/ Excavat				
21	Refilling the trenches with available excavated stuff with soft material first over pipeline and then hard material in 15 cm layers with all leads and lifts including consolidation, surcharging, etc. complete.	285.95	Cum	84.00	24,019.80
	MJP/ SSR/ 2021-22 / Section E/ Excavat				
22	Transportation as per STATEMENT VI Including loading, unloading and stacking Earth (4.8 Cum) lead 15 Km	606.92	Cum	604.45	366,852.80

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
	Electromechanical Items				
23	Screen (Manual) of size 1.75 m length x 0.5 m width of SS 304 MOC and Manual hand rake for cleaning screen of SS handle 1 m in length and cleaning area of 6 nos 5 mm SS rod of total length 200 mm straight and 50 mm of 90 degree bend.	0.88	Sqm	35,000.00	30,625.00
24	Grit pump				
	Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below				
	MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION - Pumps, Page no. 6, 7 of size 1.75 m length				
	1 HP (Up to 9000 LPH)	1.00	No	68,654.00	68,654.00
25	Raw Sewage Pumps				
	Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below				
	MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION -				
	5 HP (Up to 35000 LPH)	2.00	Nos	104,459.00	208,918.00
26	TTU Feed pumps				
	Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below				
	MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION -				
	5 HP (Up to 35000 LPH)	2.00	Nos	104,459.00	208,918.00
27	Pressure Sand Filter of FRP / MSEP vessel with suitable thickness to withstand a water pressure including MPV or 5 Valve system and PVC / UPVC / MSEP interconnecting and underdrain piping including fittings, with standard filter media layer with minimum depth of filter sand 1.0 m supported by gravels. The piping arrangement should provide sufficient pressure for backwash operations and avoid loss of sand during backwash operation. Suitable openings to be provided to ease addition and removal the media.				
	Dia 1.2 m x 2 m minimum height	2.00	Nos	236,000.00	472,000.00

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
28	Activated Carbon Filter of FRP / MSEP vessel with suitable thickness to withstand a water pressure including MPV or 5 Valve system and PVC / UPVC / MSEP interconnecting and underdrain piping including fittings, with standard filter media layer with minimum depth of Activated Carbon 1.0 m supported by gravels. The piping arrangement should provide sufficient pressure for backwash operations and avoid loss of Activated carbon during backwash operation. Suitable openings to be provided to ease addition and removal				
	Dia 1.2 m x 2 m minimum height	2.00	Nos	236,000.00	472,000.00
29	NaOCl Chlorinator Pump Diaphragm Type / peristaltic type / Solenoid Max Flow Rate Upto 10LPH Power Source Electric Phase Single Material PP / PTFE(Teflon) Voltage 230 Volt Frequency				
	Mixing Tank of 100 Ltrs capacity	100.00	Ltrs	8.00	800.00
	Dosing Pump	2.00	Nos	15,000.00	30,000.00
30	Control Panel				
	Design, Supply, Installing, Commissioning & Testing of Master PLC control monitoring and communication panel as per IEC 61131 at Pure Water Sump suitable for monitoring and control of pure water Pumps. Pressure Transmitters, Level Transmitter, PH Transmitter, Turbidity Transmitter ,for all pumps installed.	1.00	No	50,041.00	50,041.00
	MJP/ MECH/ ELECT / SSR/ 2021-22/ SECTION 19 - SA [SCADA & AUTOMATION]				
31	Supplying and erecting Fully Automatic Star Delta starter to operate squirrel cage induction motor working on 380- 440 Volt, 3 phase, 50 Hz with no volt coil, over load element, and ON - OFF push buttons, with necessary material and connected to supply, etc complete. Starter with original sheet steel encloser.				
	> 7.5 HP & Up to 12.5 HP	6.00	nos	7,150.00	42,900.00

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
	MJP /MECH/ ELECT/ SSR/ 2021-22 SECTION 10 - LG [L.T. SWITCHGEAR AND PROTECTION] Item no. LG 3 Page no. 27				
32	Main power supply cable				
	3 core PVC insulated, PVC sheathed copper conductor flat submersible cable				
	Supplying and erecting, Flat flexible submersible cable with, Copper Conductor, PVC insulated, and PVC sheathed.				
	3 core 16 sq mm	25.00	m	549.00	13,725.00
33	Power cables				
	Aluminium conductor 4 Core, XLPE / PVC insulated & armoured cable				
	Supplying and erecting, XLPE / PVC insulated, armoured cable 1100 V grade with ISI mark Four core, solid / stranded aluminium conductor with 6 mm thick 25 mm width M.S. spacer with G.I. Earth wire 6 sq mm, complete erected on wall / on pole with 25 X 3 mm M.S. clamps or in provided trench in an approved manner.				
	4 Core 6 sq mm	115.00	m	137.00	15,755.00
	MJP MECH/ ELECT/ SSR/ 2021-22 SECTION 12 - CB [L.T. CABLE] Item no. CB 6 Page				
34	Control Cables				
	Copper conductor PVC insulated, Unarmoured control cable				
	Supplying and erecting Un-armoured control cable with ISI mark stranded / solid copper conductor 1.1 kV grade complete erected on wall / panel or in provided trench in an approved manner.				
	4 core 2.5 sq mm	115.00	m	137.00	15,755.00
	MJP MECH/ ELECT/ SSR/ 2021-22/ SECTION 12 - CB [L.T. CABLE] Item no. CB 8-				

Plumbing Items					
Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
35	Providing and supplying in standard lengths ISI mark rigid unplasticised PVC pipes suitable for potable water with solvent cement joints including cost of couplers, as per IS specification no. 4985 / 1988 excluding GST levied by GOI and GOM in all respect, including transportation, freight charges, inspection charges, loading, unloading, conveyance to the departmental stores and stacking the same in closed shed duly protected from sun rays and rains including cost of jointing material i.e. solvent cement, etc. complete (selffit type to be jointed with cement solvent).				
	1) 10% of cost of pipes shall be considered for cost of PVC specials for estimate purpose only. 2) One coupler and required cement solvent shall be provided with each full length pipe				
	MJP/ SSR/ 2021-22 / SECTION – I(II) P.V.C. PIPES, Page no.77				
1	Raw Sewage pump to TBF Distribution				
a	Main header				
	90 mm.	40.00	m	303.00	12,120.00
	PVC Specials- 10%				1,212.00
b	Distribution				
	75 mm.	55.00	m	211.00	11,605.00
	PVC Specials- 10%				1,160.50
2	TBF collection to FFT (gravity)				
a	Main header				
	110 mm.	100.00	m	428.00	42,800.00
	PVC Specials- 10%				4,280.00
b	collection tributary				
	75 mm.	20.00	m	211.00	4,220.00
	PVC Specials- 10%				422.00
3	TTU Plumbing				
	90 mm.	25.00	m	303.00	7,575.00
	PVC Specials- 10%				757.50
4	TBF distribution				
	63 mm.	40.00	m	149.00	5,960.00
	PVC Specials- 10%				596.00
36	Labour				
	Plumber	16.00	days	641.00	10,256.00
	Helper	32.00	days	579.00	18,528.00

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
	MJP/ SSR/ 2021-22 / SECTION - B LABOUR & MACHINERY , Page no. 14				
37	Providing double flange sluice valve confirming for IS- 14846 including worn gear arrangements as per test pressure, stainless steel spindle, caps, including inspection charges, transportation upto departmental store, unloading, stacking excluding GST levied by GOI & GOM in all respect etc. complete.				
	Sluice valves - PN -1 (Without by pass)				
	Raw Sewage pump				
	100 mm.	2.00	Nos	6,835.00	13,670.00
	Filter Feed Pump				
	100 mm.	2.00	Nos	6,835.00	13,670.00
	MJP/ SSR/ 2021-22 / SECTION - I(XII) : PIPES APPURTENANCES , Page no. 132				
38	Providing and supplying ISI mark CI D/F reflux valves (non-return valves) of following dia including railway freight, inspection charges, unloading from railway wagon, loading into truck, transportation upto departmental stores, unloading, stacking excluding GST levied by GOI & GOM in all respect etc. complete. Reflux valves as per I.S.5312 Part I (1984)				
	Without by pass arrangement -PN -1				
	Raw Sewage pump				
	100 mm.	2.00	Nos	5,713.00	11,426.00
	Filter Feed Pump				
	100 mm.	2.00	Nos	5,713.00	11,426.00
	MJP/ SSR/ 2021-22 / SECTION - I(XII) : PIPES APPURTENANCES , Page no. 131				
	Bio media Items				
39	Supplying of Specially designed container for holding Filter media including Lightweight Expanded Clay Aggregates size (8-30 mm) and Bio media including mixture of woodchips Vermicompost, cocopeat and bacterial culture with special worms per designed quantity including transportation & fixing in position as directed etc. complete.	576.00	Nos	4,750.00	2,736,000.00
	Market rate				
40	Rapid sand Gravity filter sand At Source (Godhara, Gokak, Kanhan,	54.79	Cum	1,730.00	94,786.70
	MJP/ SSR/ 2021-22 / SECTION- A MATERIALS				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
41	Trasnsportation Godhara to Pune distance by Road 660 Km.	54.79	Cum	11,031.37	604,408.80
	MJP/ SSR/ 2021-22 / SECTION - C : TRANSPORTATION Page no.				
42	Stone Aggregate 20 mm	54.79	Cum	900.00	49,311.00
	MJP/ SSR/ 2021-22 / SECTION- A MATERIALS				
43	Transportation as per STATEMENT VI Including loading, unloading and stacking				
	Manure or sludge (5.52 Cum) lead 25 Km	211.60	Cum	747.48	158,166.80
	MJP/ SSR/ 2021-22 / SECTION - C : TRANSPORTATION Page no.				
NET TOTAL Rs.					10,130,204.50

MEASUREMENT SHEET - SCREEN CHAMBER, GRIT CHAMBER AND RAW SEWAGE SUMP

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	Short Wall	2	0.70	0.10	1.45	0.21	Cum
				Total for screen		0.85	Cum
	Grit						
	Long Wall (extra than screen chamber)	1	1.00	0.10	2.15	0.22	Cum
	Short Wall	2	0.80	0.10	2.15	0.35	Cum
				Total for grit		0.57	Cum
6	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	80	Cum	2.27	0.19	MT
7	Fabrication work in Frame and Grating for Access						
	Screen	1	2.20	0.70		1.54	Sqm
	Grit	1	3.20	0.90		2.88	Sqm
					Total	4.42	Sqm
8	Removing excess excavated material out of site						
	Screen chamber	1	2.20	0.70	1.25	1.93	Cum
	Grit Chamber	1	3.20	0.80	1.95	5	Cum
	soling, PCC, Raft volume					3.87	Cum
	Total Volume					10.8	Cum
	bulkage @ 40%					15.12	Cum
9	Refilling and compaction						
	Total Excavation					46.5	Cum
	Deduction for tank volume, soling, PCC, Raft					10.8	Cum
	Refilling and compaction volume					35.7	Cum

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	Raw Sewage Sump						
1	Excavation				3.95		
A	0.0 to 1.5 m	1	8.2	8.20	1.5	100.86	Cum
	soil					25.22	Cum
	Murum					25.22	Cum
	Soft rock					25.22	Cum
	hard rock					25.22	Cum
B	1.5 to 3.0 m	1	7.20	7.20	1.5	77.76	Cum
	soil					19.44	Cum
	Murum					19.44	Cum
	Soft rock					19.44	Cum
	hard rock					19.44	Cum
C	3.0 to 4.5 m	1	7.20	7.20	0.95	49.25	Cum

MEASUREMENT SHEET - SCREEN CHAMBER, GRIT CHAMBER AND RAW SEWAGE SUMP

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	soil					12.32	Cum
	Murum					12.32	Cum
	Soft rock					12.32	Cum
	hard rock					12.32	Cum
D	4.5 to 6.0 m	1	6.20	6.20	0	0	Cum
	soil					0	Cum
	Murum					0	Cum
	Soft rock					0	Cum
	hard rock					0	Cum
2	Soling						
	RSS	1	5.60	5.60	0.30	9.41	Cum
3	PCC M20						
	RSS	1	5.20	5.20	0.10	2.71	Cum
4	Raft M30						
	RSS	1	5.00	5.00	0.30	7.5	Cum
5	RCC Wall						
	Long Wall	2	4.60	0.25	3.45	7.94	Cum
	Short Wall	2	4.10	0.25	3.45	7.08	Cum
					Total	15.02	Cum
6	Beams						
	Beam 1	1	4.10	0.2	0.3	0.25	Cum
	Beam 2	1	4.10	0.2	0.3	0.25	Cum
					Total	0.5	Cum
7	Slab	1	4.60	4.60	0.2	4.24	Cum
	Deduction for manhole	-2	1.20	0.70	0.2	-0.34	Cum
					Total	3.9	Cum
8	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	100	Cum	26.92	2.7	MT
9	Fabrication work in Frame and Grating for Access						
	RSS	2	1.20	0.70		1.68	Sqm
10	Removing excess excavated material out of site						
	RSS	1	4.60	4.60	3.25	68.77	Cum
	soling, PCC, Raft volume					19.62	Cum
	Total Volume					88.39	Cum
	bulkage @ 40%					123.75	Cum
11	Refilling and compaction						

MEASUREMENT SHEET - SCREEN CHAMBER, GRIT CHAMBER AND RAW SEWAGE SUMP

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	Total Excavation					227.87	Cum
	Deduction for tank volume, soling, PCC, Raft					88.39	Cum
	Refilling and compaction volume					139.48	Cum
12	Dewatering						
	8 Days x 4 hours/day	days	8	hours / day	4	32	Hrs

MEASUREMENT SHEET - TIGER BIO FILTER

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	TIGER BIO FILTER						
1	Excavation				0.50		
A	0.0 to 1.5 m soil	1	12.66	5.66	0.5	35.83	Cum
	Murum					8.96	Cum
	Soft rock					8.96	Cum
	hard rock					8.96	Cum
2	Soling						
	TBF	1	12.46	5.46	0.30	20.41	Cum
3	PCC M20						
	TBF	1	12.06	5.06	0.10	6.11	Cum
4	Raft M30						
	TBF	1	11.86	4.86	0.10	5.77	Cum
5	Brick Wall						
	TBF						
	Long Wall	2	11.46	0.23	1.20	6.33	Cum
	Short Wall	2	4.00	0.23	1.20	2.21	Cum
	Crate Support Wall	5	11.00	0.23	0.50	6.33	Cum
					Total for T	14.87	Cum
6	Plaster						
	Internal						
	Crate Support Wall						
	Long Wall	6	11.00		0.50	33	Sqm
	Wall top	5	11.00		0.23	12.65	Sqm
	Long Wall	2	11.00		1.20	26.4	Sqm
	Short Wall	2	4.00		1.20	9.6	Sqm
					Total	81.65	Sqm
	External						
	Long Wall	2	11.46		1.20	27.51	Sqm
	Short Wall	2	4.46		1.20	10.71	Sqm
	Wall Top	1	30.92	0.3		9.28	Sqm
					Total	47.50	Sqm
7	External-white-wash	1				47.50	Sqm
8	External-colour-wash	1				47.50	Sqm
9	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	60	Cum	5.77	0.35	MT
10	Removing excess excavated material out of site						
	soling, PCC, Raft volume					32.29	Cum
	Total Volume					32.29	Cum
	bulkage @ 40%					45.21	Cum

MEASUREMENT SHEET - TIGER BIO FILTER

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
11	Refilling and compaction						
	Total Excavation					35.83	Cum
	Deduction for tank volume, soling, PCC, Raft					32.29	Cum
	Refilling and compaction volume					3.54	Cum
12	MS Fabricated Shed						
	TBF-II Shed in Fabrication work Shed Size-12 m X 5 m x		12.00	5.00	3.00		
	for column 50*50*5 Unit Weight 6.97 kg/m	10	3.00	6.97	kg/m	209.10	KG
	for truss 50*50*3 Unit Weight 3.71 kg/m	5	5.00	3.71	kg/m	92.75	KG
	for principle rafter 50*50*3 Unit Weight	10	2.90	3.71	kg/m	107.59	KG
	for strut rafter 50*50*3 Unit Weight 3.71 kg/m	10	0.20	3.71	kg/m	7.42	KG
	for central strut rafter 50*50*3 Unit Weight	5	0.30	3.71	kg/m	5.57	KG
	for bottom frame below truss 50*50*3 Unit Weight 3.71 kg/m	1	34.00	3.71	kg/m	126.14	KG
	for perlin 30*30*3 Unit Weight 2.51 kg/m	5	13.00	2.51	kg/m	163.15	KG
	for Base Plate 150*150*10 mm	20	0.15	0.15	0.010	35.33	KG
					Total Wei	747.04	Kg
						0.75	MT
13	corrugated galvanised iron sheets	2	13.00	2.90		75.4	Sqm

MEASUREMENT SHEET - FILTER FEED TANK

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
8	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	100	Cum	20.48	2.05	MT
9	Fabrication work in Frame and Grating for Access						
	FFT	2	1.20	0.70		1.68	Sqm
10	Removing excess excavated material out of site						
	FFT	1	4.50	4.50	2.50	50.63	Cum
	soling, PCC, Raft volume					16.5	Cum
	Total Volume					67.13	Cum
	bulkage @ 40%					93.99	Cum
11	Refilling and compaction						
	Total Excavation					144.69	Cum
	Deduction for tank volume, soling, PCC, Raft					67.13	Cum
	Refilling and compaction volume					77.56	Cum
12	Dewatering						
	8 Days x 4 hours/day	days	8	hours/day	4	32	Hrs

MEASUREMENT SHEET - FILTER PLATFORM

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	FILTER PLATFORM						
1	Excavation				0.55		
A	0.0 to 1.5 m	1	5.2	4.80	0.55	13.73	Cum
	soil					3.44	Cum
	Murum					3.44	Cum
	Soft rock					3.44	Cum
	hard rock					3.44	Cum
2	Soling						
	Filter Platform	1	5.00	4.60	0.30	6.9	Cum
3	PCC M20						
	Filter Platform	1	4.60	4.20	0.10	1.94	Cum
4	Raft M30						
	Filter Platform	1	4.40	4.00	0.15	2.64	Cum
5	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	60	Cum	2.64	0.16	MT
6	Removing excess excavated material out of site						
	soling and PCC volume					8.84	Cum
	Total Volume					8.84	Cum
	bulkage @ 40%					12.38	Cum
7	Refilling and compaction						
	Total Excavation					13.73	Cum
	Deduction for tank volume, soling, PCC, Raft					8.84	Cum
	Refilling and compaction volume					4.89	Cum

MEASUREMENT SHEET - ELECTROMECHANICAL WORKS

Sr. No.	Item Description	Nos.	Unit
1	Screen (Manual) of size 1.75 m length x 0.5 m width of SS 304 MOC and Manual hand rake for cleaning screen of SS handle 1 m in length and cleaning area of 6 nos 5 mm SS rod of total length 200 mm straight and 50 mm of 90 degree bend.	1	No
2	Grit pump Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION - Pumps, Page no. 6, 7 of size 1.75 m length x 0.5 m width of SS304 MOC 1 HP (Up to 9000 LPH)	1	No
3	Raw Sewage Pumps Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION - Pumps, Page no. 6, 7 5 HP (Up to 35000 LPH)	2	Nos
4	TTU Feed pumps Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION - Pumps, Page no. 6, 7 5 HP (Up to 35000 LPH)	2	Nos
5	Pressure Sand Filter of FRP / MSEP vessel with suitable thickness to withstand a water pressure including MPV or 5 Valve system and PVC / UPVC / MSEP interconnecting and underdrain piping including fittings, with standard filter media layer with minimum depth of filter sand 1.0 m supported by gravels. The piping arrangement should provide sufficient pressure for backwash operations and avoid loss of sand during backwash operation. Suitable openings to be provided to ease addition and removal the media. Dia 1.2 m x 2 m minimum height	2	Nos
6	Activated Carbon Filter of FRP / MSEP vessel with suitable thickness to withstand a water pressure including MPV or 5 Valve system and PVC / UPVC / MSEP interconnecting and underdrain piping including fittings, with standard filter media layer with minimum depth of Activated Carbon 1.0 m supported by gravels. The piping arrangement should provide sufficient pressure for backwash operations and avoid loss of Activated carbon during backwash operation. Suitable openings to be provided to ease addition and removal the media. Dia 1.2 m x 2 m minimum height	2	Nos
7	PurAll Tablet Chlorinator + cartridge	0	nos

MEASUREMENT SHEET - ELECTROMECHANICAL WORKS

Sr. No.	Item Description	Nos.	Unit
7	NaOCl Chlorinator Pump Diaphragm Type / peristaltic type / Solenoid Max Flow Rate Upto 10LPH Power Source Electric Phase Single Material PP / PTFE(Teflon) Voltage 230 Volt Frequency 50Hz		
a	Mixing Tank of 100 Ltrs capacity	1	Nos
b	Dosing Pump	2	Nos
8	Control Panel		
	Design, Supply, Installing, Commissioning & Testing of Master PLC control monitoring and communication panel as per IEC 61131 at Pure Water Sump suitable for monitoring and control of pure water Pumps. Pressure Transmitters, Level Transmitter, PH Transmitter, Turbidity Transmitter ,for all pumps installed.		
	Master PLC Panel	1	No
	MJP/ MECH/ ELECT / SSR/ 2021-22/ SECTION 19 - SA [SCADA & AUTOMATION] Item no. 2.7 Page no. 72		
9	Supplying and erecting Fully Automatic Star Delta starter to operate squirrel cage induction motor working on 380- 440 Volt, 3 phase, 50 Hz with no volt coil, over load element, and ON - OFF push buttons, with necessary material and connected to supply, etc complete. Starter with original sheet steel encloser.		
	> 7.5 HP & Up to 12.5 HP	6	nos
	1 nos extra starter considered as spare.		
	MJP /MECH/ ELECT/ SSR/ 2021-22 SECTION 10 - LG [L.T. SWITCHGEAR AND PROTECTION] Item no. LG 3 Page no. 27		
10	Main power supply cable		
	3 core PVC insulated, PVC sheathed copper conductor flat submersible cable		
	Supplying and erecting, Flat flexible submersible cable with, Copper Conductor, PVC insulated, and PVC sheathed.		
	3 core 16 sq mm	25	m
11	Power cables		
	Aluminium conductor 4 Core, XLPE / PVC insulated & armoured cable		
	Supplying and erecting, XLPE / PVC insulated, armoured cable 1100 V grade with ISI mark Four core, solid / stranded aluminium conductor with 6 mm thick 25 mm width M.S. spacer with G.I. Earth wire 6 sq mm, complete erected on wall / on pole with 25 X 3 mm M.S. clamps or in provided trench in an approved manner.		
	4 Core 6 sq mm	115	m
	MJP MECH/ ELECT/ SSR/ 2021-22 SECTION 12 - CB [L.T. CABLE] Item no. CB 6 Page no. 35		
12	Control Cables		
	Copper conductor PVC insulated, Unarmoured control cable		

MEASUREMENT SHEET - ELECTROMECHANICAL WORKS

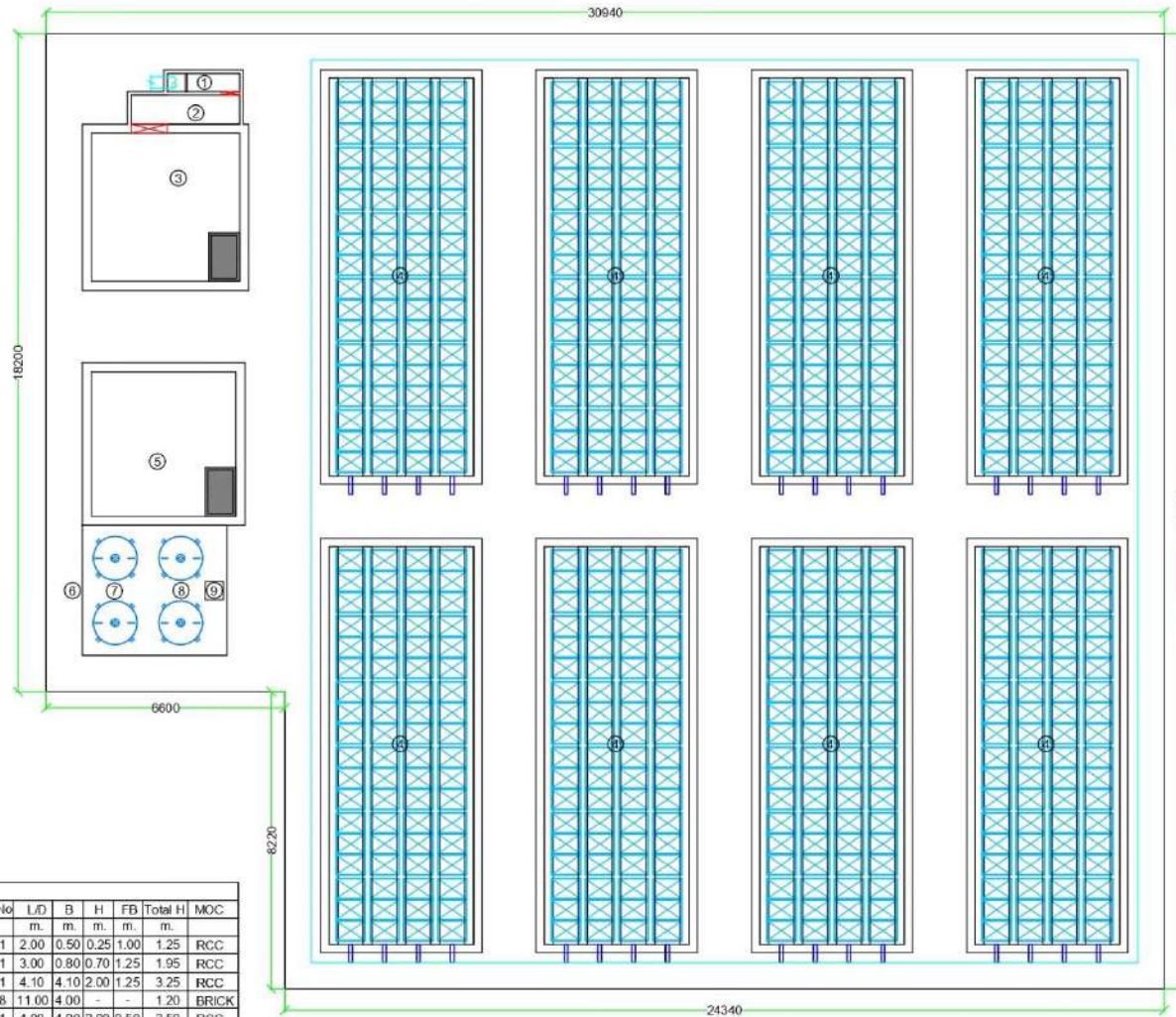
Sr. No.	Item Description	Nos.	Unit
	Supplying and erecting Un-armoured control cable with ISI mark stranded / solid copper conductor 1.1 kV grade complete erected on wall / panel or in provided trench in an approved manner.		
	4 core 2.5 sq mm	115	m
	MJP MECH/ ELECT/ SSR/ 2021-22/ SECTION 12 - CB [L.T. CABLE] Item no. CB 8-2 Page no. 36		

MEASUREMENT SHEET - PLUMBING

Sr. No.	Item Description	Nos.	L (m)	B (m)	Quantity	Unit
	Providing and supplying in standard lengths ISI mark rigid unplasticised PVC pipes suitable for potable water with solvent cement joints including cost of couplers, as per IS specification no. 4985 / 1988 excluding GST levied by GOI and GOM in all respect, including transportation, freight charges, inspection charges, loading, unloading, conveyance to the departmental stores and stacking the same in closed shed duly protected from sun rays and rains including cost of jointing material i.e. solvent cement, etc. complete (selffit type to be jointed with cement solvent).					
	1) 10% of cost of pipes shall be considered for cost of PVC specials for estimate purpose only. 2) One coupler and required cement solvent shall be provided with each full length pipe cost of which is included in rates below.					
	MJP/ SSR/ 2021-22 / SECTION – I(II) P.V.C. PIPES,					
1	Raw Sewage pump to TBF Distribution					
a	Main header	Dia	90			
	90 mm.	1	40		40	m
	PVC Specials- 10%					
b	Distribution					
	75 mm.	1	55		55	m
	PVC Specials- 10%					
2	TBF collection to FFT (gravity)					
a	Main header					
	110 mm.	1	100		100	m
	PVC Specials- 10%					
b	collection tributary					
	75 mm.	1	20		20	m
	PVC Specials- 10%					
3	TTU Plumbing	Dia	90			
	90 mm.	1	25		25	m
	PVC Specials- 10%					
4	TBF distribution			No. of beds		
	63 mm.	1	5	8	40	m
	PVC Specials- 10%					
5	Labour	Nos	Days			
	Plumber	2	8		16	days
	Helper	4	8		32	days
6	Sluice valves					

MEASUREMENT SHEET - PLUMBING

Sr. No.	Item Description	Nos.	L (m)	B (m)	Quantity	Unit
	Providing double flange sluice valve confirming for IS- 14846 including worn gear arrangements as per test pressure, stainless steel spindle, caps, including inspection charges, transportation upto departmental store, unloading, stacking excluding GST levied by GOI & GOM in all respect etc. complete.					
	MJP/ SSR/ 2021-22 / SECTION - I(XII) : PIPES APPURTENANCES , Page no. 132					
	Raw Sewage pump					
	100 mm.	2			2	Nos
	Filter Feed Pump					
	100 mm.	2			2	Nos
7	Reflux valves (non-return valves)					
	Providing and supplying ISI mark CI D/F reflux valves (non-return valves) of following dia including railway freight, inspection charges, unloading from railway wagon, loading into truck, transportation upto departmental stores, unloading, stacking excluding GST levied by GOI & GOM in all respect etc. complete. Reflux valves as per I.S.5312 Part I (1984)					
	MJP/ SSR/ 2021-22 / SECTION - I(XII) : PIPES APPURTENANCES , Page no. 131					
	Raw Sewage pump					
	100 mm.	2			2	Nos
	Filter Feed Pump					
	100 mm.	2			2	Nos



PROJECT NAME :
 400 KLD SEWAGE TREATMENT PLANT
 BASED ON TIGER BIO FILTER
 TECHNOLOGY.

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REVISION		
DATE	REMARKS	SIGNATURE

CLIENT : SWSM, MAHARASHTRA

DRAWING NAME :
 PLANT LAYOUT

PROJECT CODE : TBF-	DRAWING NO : D-01/PL/01	DATE : JUNE-2021
DRAWN BY : L.D.B.	CHECKED BY : S.B.	SCALE : NTS.

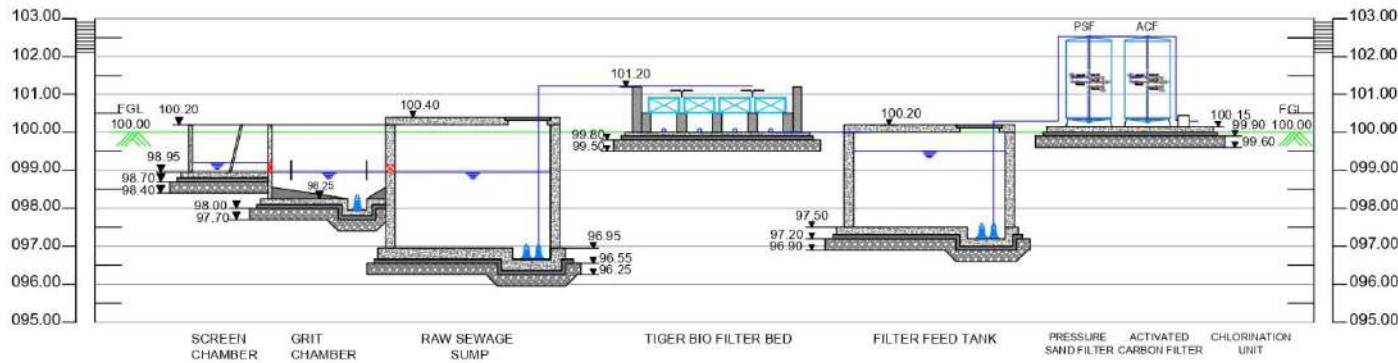
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Process Unit Details								
Sr. No	Description	No	L/D m.	B m.	H m.	FB m.	Total H m.	MOC
1	Screen Chamber	1	2.00	0.50	0.25	1.00	1.25	RCC
2	Grit Chamber	1	3.00	0.80	0.70	1.25	1.95	RCC
3	Raw Sewage Sump	1	4.10	4.10	2.00	1.25	3.25	RCC
4	Tiger Bio Filter	8	11.00	4.00	-	-	1.20	BRICK
5	Filter Feed Tank	1	4.00	4.00	2.00	0.50	2.50	RCC
6	Filter Platform	1	4.00	3.60	-	-	-	RCC
7	Pressure Sand Filter	2	DIA	1.20	-	-	2.00	MSEP
8	Activated Carbon Filter	2	DIA	1.20	-	-	2.00	MSEP
9	Chlorination Unit	1	-	-	-	-	-	-

PLANT LAYOUT
 AREA = 763 SQM.

PROJECT NAME :
 400 KLD SEWAGE TREATMENT PLANT
 BASED ON TIGER BIO FILTER
 TECHNOLOGY.

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HYDRAULIC FLOW DIAGRAM

REVISION		
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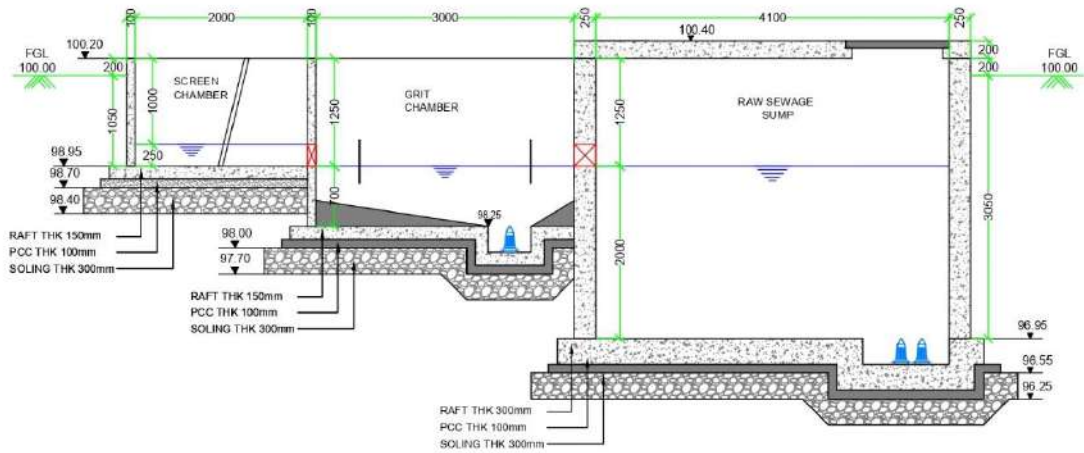
DRAWING NAME :
 HYDRAULIC FLOW DIAGRAM

PROJECT CODE : TBF-	DRAWING NO : D-02/HFD/01	DATE : JUNE-2021
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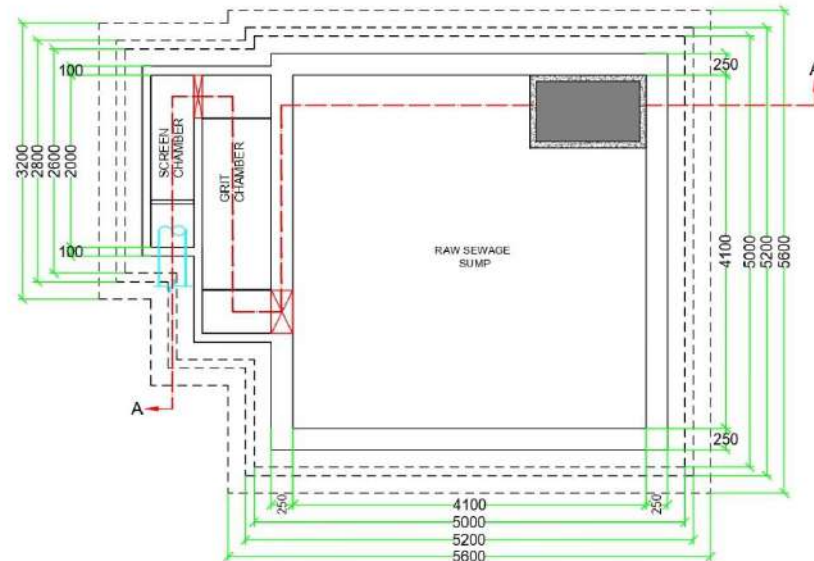


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SECTION A-A



PLAN

SCREEN CHAMBER, GRIT CHAMBER & RAW SEWAGE SUMP

PROJECT NAME :
400 KLD SEWAGE TREATMENT PLANT
BASED ON TIGER BIO FILTER
TECHNOLOGY.

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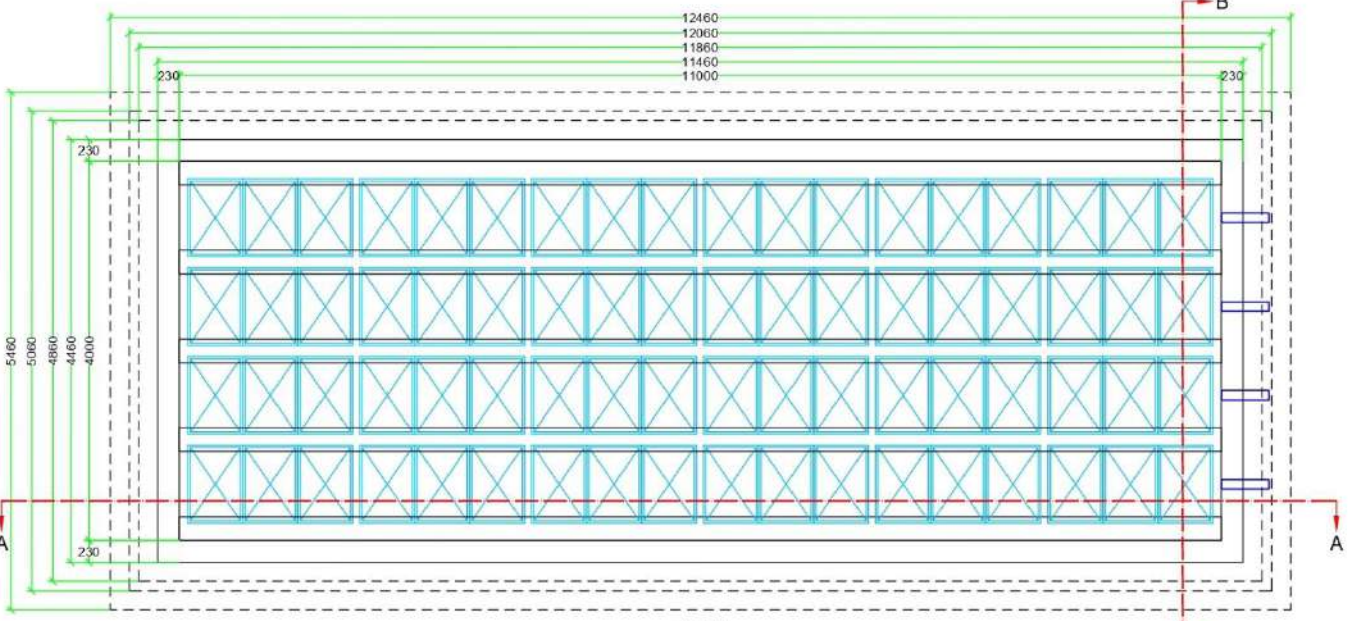
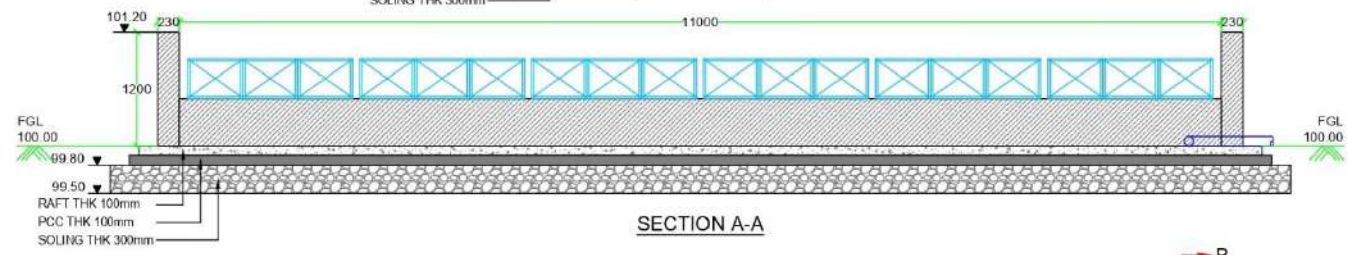
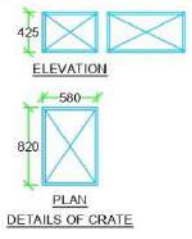
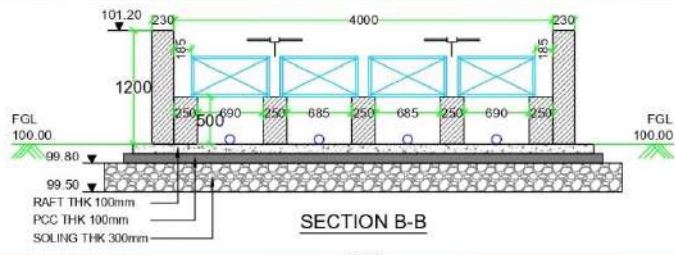
REVISION		
DATE	REMARKS	SIGNATURE

CLIENT : SWSM, MAHARASHTRA

DRAWING NAME :
SCREEN CHAMBER, GRIT CHAMBER
& RAW SEWAGE SUMP

PROJECT CODE : TBF-	DRAWING NO : D-03/SC.G&RSS/01	DATE : JUNE-2021
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PLAN
TIGER BIO FILTER

PROJECT NAME :
400 KLD SEWAGE TREATMENT PLANT
BASED ON TIGER BIO FILTER
TECHNOLOGY.

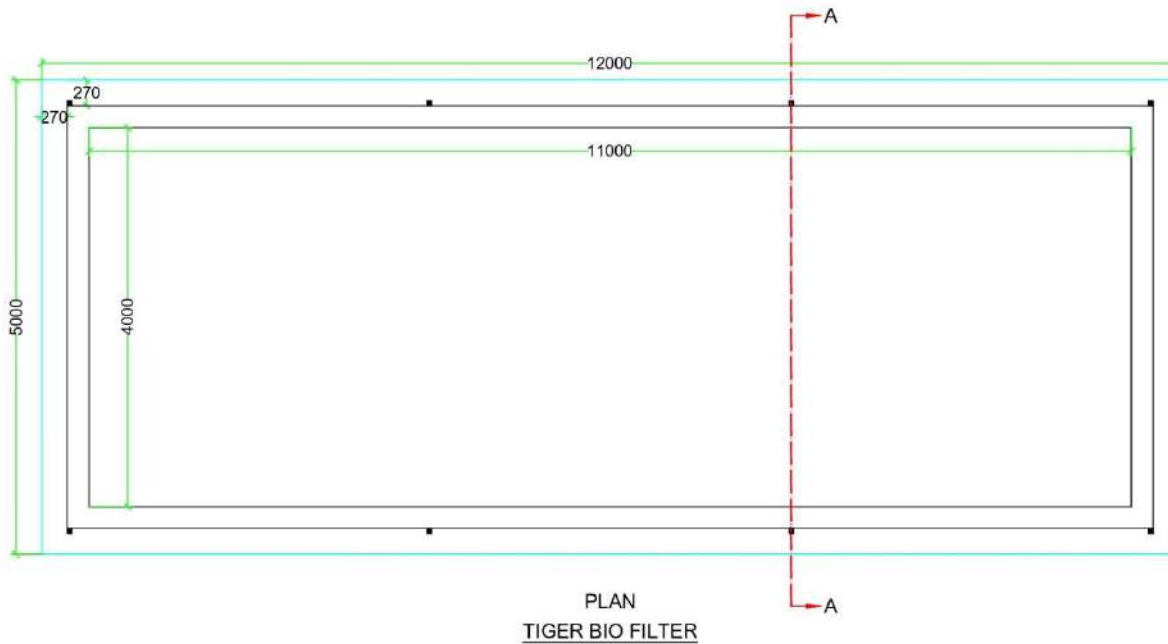
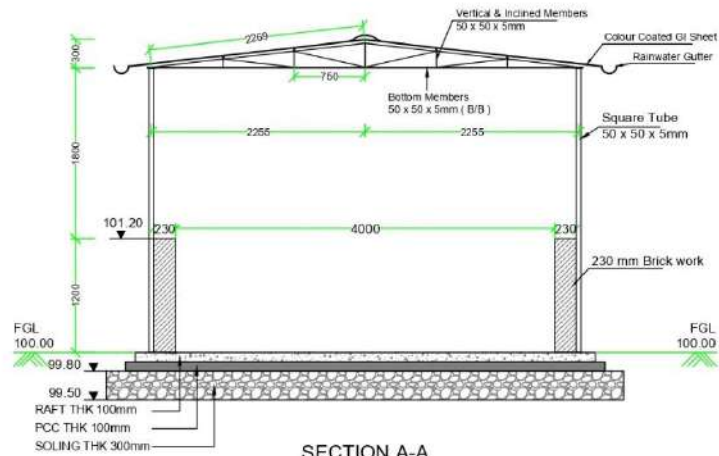
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REVISION		
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CLIENT : SWSM, MAHARASHTRA
DRAWING NAME :
TIGER BIO FILTER

PROJECT CODE : TBF-	DRAWING NO : D-04/TBF/01	DATE : JUNE-2021
DRAWN BY : L.D.B.	CHECKED BY : S.B.	SCALE : NTS.

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PROJECT NAME :

400 KLD SEWAGE TREATMENT PLANT
BASED ON TIGER BIO FILTER
TECHNOLOGY.

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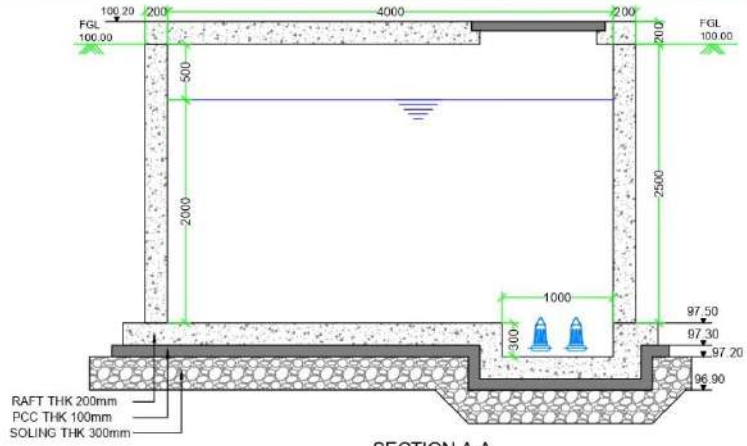
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DATE	REMARKS	SIGNATURE

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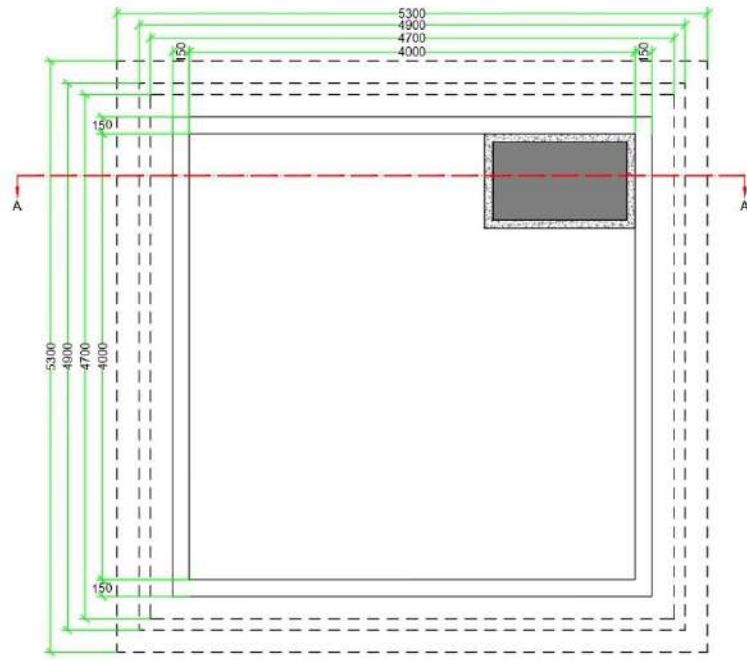
DRAWING NAME:
TIGER BIO FILTER

PROJECT CODE: TBF-	DRAWING NO: D-04/TBF/02	DATE: JUNE-2021
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SECTION A-A



PLAN
FILTER FEED TANK

PROJECT NAME :
400 KLD SEWAGE TREATMENT PLANT
BASED ON TIGER BIO FILTER
TECHNOLOGY.

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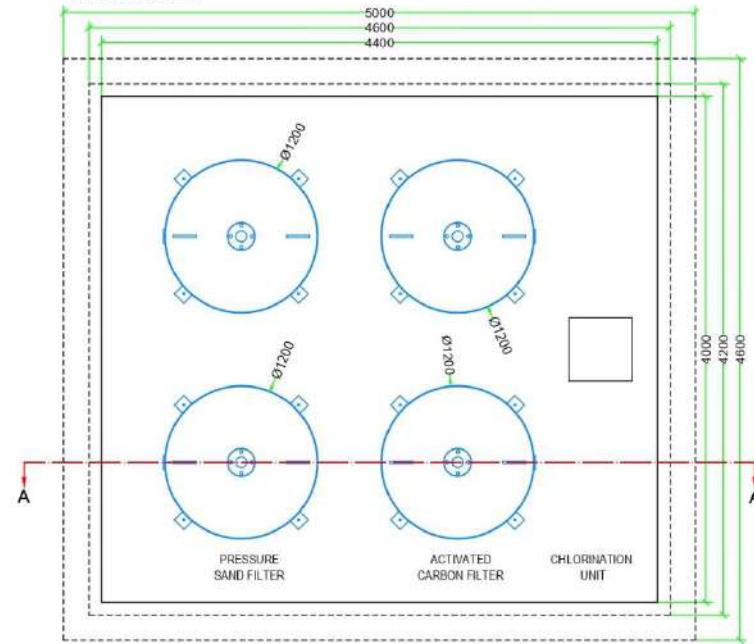
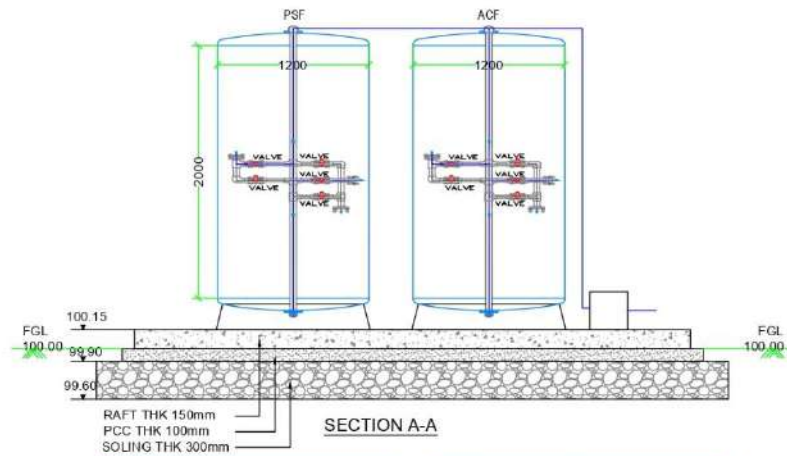
REVISION		
DATE	REMARKS	SIGNATURE

CLIENT : SWSM, MAHARASHTRA

DRAWING NAME:
FILTER FEED TANK

PROJECT CODE : TBF-	DRAWING NO : D-05/FF/T/01	DATE : JUNE-2021
DRAWN BY : L.D.B.	CHECKED BY : S.B.	SCALE : NTS.

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PLAN
**PRESSURE SAND FILTER,
 ACTIVATED CARBON FILTER & CHLORINATION UNIT**

PROJECT NAME :
 400 KLD SEWAGE TREATMENT PLANT
 BASED ON TIGER BIO FILTER
 TECHNOLOGY.

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REVISION		
DATE	REMARKS	SIGNATURE

CLIENT : SWSM, MAHARASHTRA
 DRAWING NAME :
**PRESSURE SAND FILTER,
 ACTIVATED CARBON FILTER
 & CHLORINATION UNIT**

PROJECT CODE : TBF-	DRAWING NO : D-06PSF,ACF&CU/01	DATE : JUNE-2021
DRAWN BY : L.D.B.	CHECKED BY : S.B.	SCALE : NTS.


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**500 KLD STP
BASED ON TBF TECHNOLOGY**

PROCESS CALCULATIONS
TIGER BIO FILTER OF 500 KLD CAPACITY

Design flow	=	500.00	KLD
	=	0.500	MLD
Peak flow factor	=	3.00	

1 SCREEN CHANNELS: MANUAL

No. of Manual Screen	=	1	No.
Average Flow	=	0.50	MLD
Peak Flow Factor	=	3.00	
Design Flow	=	Peak Flow	
	=	1.50	MLD
	=	62.50	m ³ /hr
	=	0.017	m ³ /sec
 Average Flow	=	0.50	MLD
	=	20.833	m ³ /hr
	=	0.006	m ³ /sec
 Design Flow in each Screen	=	0.017	m ³ /sec
		1	No.
	=	0.017	m ³ /sec
 Average Flow in each Screen	=	0.006	m ³ /sec
		1	No.
	=	0.006	m ³ /sec
 Maximum Velocity through Screen at Peak Flow	=	1.2	m/sec
Minimum Velocity through Screen at Average Flow	=	0.6	m/sec
 Clear Area of Opening through Screen for Peak Flow	=	0.017	m ³ /sec
		1.2	m/sec
	=	0.014	m ²
 Clear Area of Opening through Screen for Average Flow	=	0.006	m ³ /sec
		0.6	m/sec
	=	0.010	m ²
 Considering maximum Area of Opening through Screen	=	0.014	m ²

Clear Spacing of Bars	=	10	mm	
Thickness of Bars	=	5	mm	
Gross Area of Screen	=	$0.014 \times (10+5) / 10$		
	=	0.021	m ²	
Assuming Depth of Screen Channel	=	300.00	mm	
Gross Width of Screen	=	$0.021 / 0.3$		
	=	0.070	m	
No. of Bars	=	(Gross Width of Screen / Center to Center Spacing of Bars) - 1		
	=	$0.07 / ((10+5) / 1000) - 1$		
	=	3.7	Nos.	
Say	=	4	Nos.	
Width of Screen provided	=	(Number of Bars+1) x Clear Spacing + (Number of Bars x Bar Thickness)		
	=	$(4+1) \times 10 + (4 \times 5)$		
	=	70	mm	
Width Say	=	0.50	m	
Liquid Depth of Screen Channel provided	=	0.30	m	
L:B	=	4.00		
Length of Screen Channel provided	=	2.00	m	
Freeboard provided	=	1.00	m	Invert Depth of incoming sewer
Total Depth of Screen Chamber	=	1.30	m	
Velocity in Channel at Average Flow	=	Average Flow / Cross Sectional Area of Screen Channel		
	=	$0.006 / ((0.5 \times 0.3) / 1000 \times 1000)$		
	=	0.040	m/sec	
	>	0.300	m/sec	
Head Loss across Screen				
Head Loss across Screen	=	$0.0728 (V^2 - v^2)$		
V = Velocity through Screen at Peak Flow	=	Peak Flow through Screen Channel / Clear Area of Opening through Screen		
	=	1.133	m/sec	
v = Velocity in approach Channel at Peak Flow	=	Peak Flow through Screen Channel / Cross Sectional Area of Screen Channel		
	=	0.8	m/sec	
Head Loss across Screen at Peak Flow	=	0.046	m	
Head Loss across Screen at 50% Clogged Condition				
Velocity through Screen at 50% Clogged Condition at Peak Flow	=	2.267	m/sec	
Head Loss across screen at 50% Clogged Condition at Peak Flow	=	0.326	m	
	>	0.300	m/sec	OK

2 CONVENTIONAL GRIT CHAMBER: MANUAL

No. of Grit Chamber	=	1	
Average Flow	=	0.50	MLD
Peak Flow Factor	=	3.00	
Design Flow	=	Peak Flow	
Peak Flow	=	1.50	MLD
	=	1500	m ³ /day
	=	63	m ³ /hr
	=	0.017	m ³ /sec
Design Flow to each Grit Chamber	=	1500/1	
	=	1500	m ³ /day
	=	63	m ³ /hr
	=	0.017	m ³ /sec
According to CPHEEO Manual			
Particle Size	=	0.15	mm
Specific Gravity	=	2.65	
Surface Overflow Rate for 100% removal efficiency in an ideal Grit Chamber	=	Settling Velocity of the minimum size of Particles to be removed	
	=	1.5	m/s
	=	1296	m ³ /m ² /day
Considering Efficiency of removal of desired Particles, $\eta = 75\%$ and Measure of Settling Basin Performance, $n = 1/8$ for very good performance	=	0.125	
Design Overflow Rate	=	857	m ³ /m ² /day
Surface Overflow Rate for 0.15 mm dia. Particle Size with Specific Gravity $S_s > 2.65$ Table 5.6	=	1555	m ³ /m ² /day
Considering Design Overflow Rate	=	960	m ³ /m ² /day
Area of Grit Chamber required	=	1500	m ³ /day
		960	m ³ /m ² /day
	=	1.56	m ²
L:B ratio	=	2	
Length of Chamber provided	=	3.00	m
Width of Chamber provided	=	0.90	m
Hydraulic Retention Time (HRT) in Grit Chamber at Peak Flow	=	60	sec
Volume of Grit Chamber required	=	0.017x60	
	=	1.02	m ³

Depth required in Grit Chamber	=	1.02 / (3x0.9)	
	=	0.38	m
Say	=	0.40	m
Grit Storage Depth	=	0.30	m
Total Liquid Depth required	=	0.70	m
Length of Grit Pit	=	0.50	m
Width of Grit Pit	=	0.50	m
Depth of Grit Pit	=	0.30	m
Free Board	=	1.30	m

3 RAW SEWAGE SUMP (WET WELL)

No. of Units	=	1	No.
Average Flow	=	0.50	MLD
	=	20.833	m ³ /hr
	=	0.0058	m ³ /sec

Peak Flow Factor	=	3.00	
------------------	---	------	--

Design Flow	=	Peak Flow	
	=	1.50	MLD
	=	63	m ³ /hr
	=	0.017	m ³ /sec

Hydraulic Retention Time (HRT) at Average Flow	=	120	min
Volume required	=	0.0058 x 120 x 60	
	=	42	m ³

Hydraulic Retention Time (HRT) at Peak Flow	=	Volume / Average Flow	
	=	41	min
	<	30	min

Total Volume of Wet Well	=	42	m ³
--------------------------	---	----	----------------

Side Water Depth (SWD) provided	=	2.00	m
Plan Area of Wet Well	=	20.88	m ²
Length/width of Sump required	=	4.57	m
Length/width of Sump provided	=	4.60	m
Volume of Sump provided	=	42.32	m ³
Length of Pump Pit	=	1.00	m
Width of Pump Pit	=	0.50	m
Depth of Pump Pit	=	0.30	m
Free Board	=	1.30	m

3.1 DESIGN STATEMENT-RSS E&M

Design Considerations

Design flow	=	0.50	MLD
	=	500.00	Cum/Day
Peak flow factor	=	3.00	

Pumping machinery

Friction factor for Fittings in Pressure Mains

Elbow 90 degrees	=	15
Friction Factor for each	=	1
Friction factor for all	=	15
Elbow 45 degrees	=	0
Friction Factor for each	=	0.75
Friction factor for all	=	0
Elbow 22 degrees	=	0
Friction Factor for each	=	0.5
Friction factor for all	=	0
Tee 90 degrees	=	0
Friction Factor for each	=	1.5
Friction factor for all	=	0
Tee in straight pipe	=	10
Friction Factor for each	=	0.3
Friction factor for all	=	3
Gate valve open	=	1
Friction Factor for each	=	0.4
Friction factor for all	=	0.4
Swing check	=	1
Friction Factor for each	=	2.5
Friction factor for all	=	2.5
Total friction factor	=	20.9

Stage	low	ave	peak
Average flow, cum / day	=	500.00	
Proportion	=	0.6	1
Design flow, cum / day	=	300	500
Hazen Williams C	=	140	140
Desired velocity, m/s	=	0.6	1.0
Number of Pumping hours	=	16.0	16.0
Area needed, sqm	=	0.0087	0.0087
Dia needed, m	=	0.105	0.105
Dia needed, mm	=	105	105
Dia provided, mm (User)	=	110	110
Radius, m	=	0.055	0.055
Radius power 0.63	=	0.161	0.161
S power 0.54	=	0.031	0.052
S	=	0.002	0.004
Slope 1 in	=	606.7	235.6
length, m	=	45	45
Friction in pipeline, m	=	0.1	0.2
Velocity head, m	=	0.018	0.051
Friction factor in fittings	=	20.9	20.9
Friction in fittings, m	=	0.4	1.1

Static lift, m	=	4.0	4.0	4.0
Total head, m	=	4.4	5.1	6.4
Efficiency of pumpset	=	0.8	0.8	0.8
Discharge, lps	=	5.2	8.7	17.4
Discharge, Cum/Hr	=	18.8	31.3	62.5
Kw required	=	0.808	1.346	2.688
HP required	=	1.5	2.0	4.0
Number of Pumps	=	2	2	2

4 TIGER BIO FILTER

DESIGN STATEMENT-TBF1- 50 KLD

Number of pumping hours	=	16	Hrs	
Number of BMF tanks provided	=	10	Nos	
Design flow to each tank	=	50.00	Cum/day	
	=	3.13	Cum/ Hr for 16 Hr	
	=	0.87	lps	
Inlet BOD	=	250.00	mg/l	
Inlet TSS	=	400.00	mg/l	
BOD load applied	=	12.5	kg/day	
BOD uptake rate	=	0.1	Kg of BOD / Kg of worms	(0.5 - 1.0)
Worms required	=	125	Kg worms	
Sewage application rate	=	1.85	Cum/Sqm/day	(1 - 2 Cum/Sqm/day)
Area required	=	27.03	Sqm	
Area Provided	=	28	Sqm	
Area of each crate	=	0.4	Sqm	
Number of crates	=	70	Nos	
say	=	72	Nos	
Crate in longitudinal direction	=	18	Nos	
Crate in travers direction	=	4	Nos	
crates provided	=	72	Nos	OK
Width provided	=	4.00	m	
Length required	=	11.00	m	
Depth provided	=	1.2	m	

5 TERTIARY TREATMENT UNIT

Design Considerations

Design flow	=	0.50	MLD
	=	500.00	Cum/Day
Peak flow factor	=	3.00	

5.1 FILTER FEED TANK

Number of FFT provided	=	1	Nos
Number of operating hours	=	16	Hrs
Design flow	=	500.00	Cum/Day
	=	31.25	Cum/Hr

	=	0.00868	Cum/Sec
Hydraulic Retention time	=	60	min
Volume required	=	31.25	Cum
Depth	=	2.00	m
Civil Tanks			
Area	=	15.63	Sqm
Length/Width required	=	3.95	m
Length/Width provided	=	4.00	m
Freeboard provided	=	0.50	m
Volume Provided		32.00	Cum

DESIGN STATEMENT-TTU E&M

Design Considerations

Design flow	=	0.50	MLD
	=	500.00	Cum/Day
Peak flow factor	=	3.00	

Pumping machinery

Friction factor for Fittings in Pressure Mains

Elbow 90 degrees	=	5
Friction Factor for each	=	1
Friction factor for all	=	5
Elbow 45 degrees	=	0
Friction Factor for each	=	0.75
Friction factor for all	=	0
Elbow 22 degrees	=	0
Friction Factor for each	=	0.5
Friction factor for all	=	0
Tee 90 degrees	=	0
Friction Factor for each	=	1.5
Friction factor for all	=	0
Tee in straight pipe	=	5
Friction Factor for each	=	0.3
Friction factor for all	=	1.5
Gate valve open	=	1
Friction Factor for each	=	0.4
Friction factor for all	=	0.4
Swing check	=	1
Friction Factor for each	=	2.5
Friction factor for all	=	2.5
Total friction factor	=	9.4

Stage	low	ave	peak
Average flow, cum / day	=	500.00	
Proportion	=	0.6	2
Design flow, cum / day	=	300	1000
Hazen Williams C	=	140	140
Desired velocity, m/s	=	0.8	1.5
Number of Pumping hours	=	16.0	16.0

Area needed, sqm	=	0.0065	0.0087	0.0116
Dia needed, m	=	0.091	0.105	0.121
Dia needed, mm	=	91	105	121
Dia provided, mm (User)	=	110	110	110
Radius, m	=	0.055	0.055	0.055
Radius power 0.63	=	0.161	0.161	0.161
S power 0.54	=	0.042	0.052	0.079
S	=	0.003	0.004	0.009
Slope 1 in	=	356.1	235.6	111.2
length, m	=	25	25	25
Friction in pipeline, m	=	0.1	0.1	0.2
Velocity head, m	=	0.033	0.051	0.115
Friction factor in fittings	=	9.4	9.4	9.4
Friction in fittings, m	=	0.3	0.5	1.1
Static lift, m	=	8.0	8.0	8.0
Total head, m	=	8.3	8.5	9.1
Efficiency of pumpset	=	0.8	0.8	0.8
Discharge, lps	=	5.2	8.7	17.4
Discharge, Cum/Hr	=	18.8	31.3	62.5
Kw required	=	1.386	2.307	4.608
HP provided	=	2.0	3.5	6.5
Number of Pumps	=	2	2	2

5.2 PRESSURE SAND FILTER

Number of unit provided	=	2	Nos.
Designed @ 16 hrs working for flow of	=	15.63	m ³ /h
Loading rate	=	12.00	m ³ /m ² /h
Area of DMF	=	1.30	m ²
Dia of DMF	=	1.29	m
Provided	=	1.300	m
Backwash water			
Backwash velocity	=	15.00	m/hr
backwash flowrate	=	19.71	m ³ /h
Backwash volume for 20 mins	=	6.57	m ³

5.3 ACTIVATED CARBON FILTER

Number of unit provided	=	2	Nos.
Designed @ 16 hrs working for flow of	=	15.63	m ³ /h
Loading rate	=	12.00	m ³ /m ² /h
Area of ACF	=	1.30	m ²
Dia of ACF	=	1.29	m
Provided	=	1.300	m
Backwash water			
Backwash velocity	=	15.00	m/hr
backwash flowrate	=	19.71	m ³ /h
Backwash volume for 20 mins	=	6.57	m ³

**5.4 CHLORINE DOSING SYSTEM
NaOCl DOSING SYSTEM**

Average Flow	=	31.25	m3/hr
Design Chlorine Dosage (Max)	=	3	mg/l
Concentration of Chlorine in commercially available NaOCl	=	10%	
Design NaOCl Dosage	=	30	mg/l
Operating hours	=	16.0	hr
Quantity of NaOCl required	=	$31.25 \times 30 \times 16 / 1000$	
	=	15.00	Kg/day
Design Strength of NaOCl Solution	=	100%	
Volume of NaOCl Solution	=	$15 / (1 \times 1000)$	
	=	0.020	m3
No. of Dosing Tanks provided	=	1	Nos.
Volume of each Dosing Tank	=	$0.02 / 1$	
	=	0.02	m3
	=	100	Litres
No. of Working NaOCl Dosing Pump provided	=	1	No.
Capacity of each NaOCl Dosing Pump required	=	Total Volume of NaOCl Solution / (No. of Dosing pumps)	
	=	$0.02 / (1 \times 16)$	
	=	0.001	m3/hr
	=	1.00	LPH
Capacity of each NaOCl Dosing Pump provided	=	1.00	LPH
No. of Standby NaOCl Dosing Pump provided	=	1	No.

SIZING DETAILS (CIVIL)
TIGER BIO FILTER OF 500 KLD CAPACITY

S I. N o	Unit name	N o s	Leng th	Widt h	Height			Soling		PCC		Raft		RCC Wall thk	Bric k Wall thk	Slab Thk	Steel - HCR M/ Kg/C
					SW	FB	Tota	offs	Thk	offs	Thk	offs	Thk				
		N	m	m	m	m	m	m	m	m	m	m	m	m	m		
1	Screen Chamber	1	2.0	0.5	0.3	1.0	1.3	0.2	0.3	0.1	0.1	0.2	0.1	0.1		80	
2	Grit Chamber	1	3.0	0.9	0.7	1.3	2.0	0.2	0.3	0.1	0.1	0.2	0.1	0.1		80	
3	Raw Sewage Sump	1	4.6	4.6	2.0	1.3	3.3	0.2	0.3	0.1	0.1	0.2	0.3	0.2	0.2	100	
4	TBF Bed 50 KLD	1	11.0	4.0			1.2	0.2	0.3	0.1	0.1	0.2	0.1		0.2	60	
5	Filter Feed tank	1	4.0	4.0	2.0	0.5	2.5	0.2	0.3	0.1	0.1	0.2	0.2	0.2	0.2	100	
6	Filter Platform	1	4.2	3.8				0.2	0.3	0.1	0.1	0.2	0.1			60	

Assumptions

Incoming Sewer Invert 1.0 m Below Ground level

Method of excavation Mechanical means

Underground strata		soil	Muru m	Soft roc	hard	Total
0.0 to 1.5 m	=	25	25	25	25	100
1.5 m to 3.0 m	=	25	25	25	25	100
3.0 to 4.5 m	=	25	25	25	25	100
4.5 to 6.0	=	25	25	25	25	100

**TIGER BIO FILTER OF 500 KLD CAPACITY
BILL OF QUANTITIES**

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
1	Excavation for foundation / pipe trenches in earth, soils of all types, sand, gravel and soft murum, including removing the excavated material upto a distance of 50 metres and lifts as below, stacking and spreading as directed, normal dewatering, preparing the bed for foundation and excluding backfilling, etc. complete. (Bd-A-1/259)				
	0.0 to 1.5 m	147.83	Cum	150.00	22,174.50
	1.5 to 3.0 m	43.63	Cum	164.00	7,155.40
	3.0 to 4.5 m	15.77	Cum	178.00	2,807.10
	4.5 to 6.0 m	0.00	Cum	192.00	0.00
	MJP/ SSR/ 2021-22 / Section E / Excavation Item No.1/ Page no. 42				
2	Excavation for foundation / pipe trenches in hard murum and boulders, W.B.M. road including removing the excavated material upto a distance of 50 M beyond the area and lifts as below, stacking and spreading as directed by Engineer-in-charge, normal dewatering, preparing the bed for foundation and excluding backfilling, etc. complete. (Bd-A-3/259)				
	0.0 to 1.5 m	147.83	Cum	192.00	28,383.40
	1.5 to 3.0 m	43.63	Cum	206.00	8,987.80
	3.0 to 4.5 m	15.77	Cum	220.00	3,469.40
	4.5 to 6.0 m	0.00	Cum	234.00	0.00
	MJP/ SSR/ 2021-22/ Section E/ Excavation Item No.3, Page no. 42				
3	Excavation for foundation / pipe trenches in soft rock and old cement and lime masonry foundation asphalt road including removing the excavated material upto a distance of 50 M beyond the area and lifts as below, stacking as directed by Engineer-in-charge, normal dewatering, preparing the bed for foundation and excluding backfilling, etc. complete. (Bd-A- 4/259)				
	0.0 to 1.5 m	147.83	Cum	572.00	84,558.80
	1.5 to 3.0 m	43.63	Cum	597.00	26,047.20
	3.0 to 4.5 m	15.77	Cum	622.00	9,809.00
	4.5 to 6.0 m	0.00	Cum	647.00	0.00
	MJP/ SSR/ 2021-22 / Section E/ Excavation Item No.5, Page no. 42				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
4	Excavation for foundation / pipe trenches in hard rock and concrete road by chiselling, wedging, line drilling by mechanical means or by all means other than blasting including trimming and levelling the bed, removing the excavated material upto a distance of 50 metres beyond the area and lifts as below, stacking as directed by Engineer-in-charge, normal dewatering, excluding backfilling, etc. complete by all means. (Bd-A-6/259)				
	0.0 to 1.5 m	147.83	Cum	1,017.00	150,343.20
	1.5 to 3.0 m	43.63	Cum	1,042.00	45,462.50
	3.0 to 4.5 m	15.77	Cum	1,067.00	16,826.60
	4.5 to 6.0 m	0.00	Cum	1,092.00	0.00
	MJP/ SSR/ 2021-22 / Section E/ Excavation Item No.7, Page no. 43				
5	Providing dry trap/ granite/ quartzite/ gneiss, rubble stone soling in 15 cm to 20 cm thick layers including hand packing and compacting, etc. complete. (Bd-A-12/264)	234.32	Cum	1,175.00	275,326.00
	MJP/ SSR/ 2021-22 / Section E/ Excavati				
6	Providing and laying in situ Cement Concrete M- 15 of trap/ granite / quartzite / gneiss metal for foundation and bedding including bailing out water, form work, compaction, curing, etc. complete. (Cement 5.90 bags / cum) Spec. No. - Bd E /1 Page No. 287 and B- 7, Page No. 38	70.06	Cum	5,640.00	395,138.40
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.1, Page no.49				
7	Providing and laying in situ Cement Concrete of trap/ granite / quartzite / gneiss metal for RCC work in foundation like raft, grillage, strip foundation and footing of RCC columns and steel stanchions including normal dewatering, form work, compaction, finishing and curing, etc. complete. (By weigh batching and mix design for M250 and M-300 only. Use of L&T, A.C.C., Ambuja, Birla Gold, Manikgad, Rajashree, etc. cement is permitted.) (Excluding M.S. or Tor reinforcement)	75.39	Cum	7,448.00	561,504.80
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE/ Item No.2, Page no. 49				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
8	Providing and casting in situ C.C. of trap / granite/ quartzite / gneiss metal of approved quality for RCC works as per detailed drawings and designs or as directed by Engineer-in- charge including normal dewatering, centering, form work, compaction, finishing the formed surfaces with C.M. 1:3 of sufficient minimum thickness to give a smooth and even surface wherever necessary or roughening if special finish is to be provided and curing, etc. complete. (By weigh batching and mix design for M-250 and M-300 only. Use of L&T, A.C.C., Ambuja, Birla Gold, Manikgad, Rajashree, etc. cement is permitted.) (Excluding M.S. or Tor reinforcement)	1.04	Cum	8,624.00	8,969.00
	For Beams / Braces / Lintels In RCC M-300				
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.4, Page no. 50				
9	Providing and casting in situ C.C. of trap / granite/ quartzite / gneiss metal of approved quality for RCC works as per detailed drawings and designs or as directed by Engineer-in- charge including normal dewatering, centering, form work, compaction, finishing the formed surfaces with C.M. 1:3 of sufficient minimum thickness to give a smooth and even surface wherever necessary or roughening if special finish is to be provided and curing, etc. complete. (By weigh batching and mix design for M-250 and M-300 only. Use of L&T, A.C.C., Ambuja, Birla Gold, Manikgad, Rajashree, etc. cement is permitted.) (Excluding M.S. or Tor reinforcement)	8.58	Cum	9,247.00	79,339.30
	Slabs / Landings / Vertical Walls / Waist Slabs / Steps for Staircase In RCC M-300j				
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.5, / Page no. 50				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
10	Providing and casting in situ C.C. of trap / granite/ quartzite / gneiss metal of approved quality for RCC works as per detailed drawings and designs or as directed by Engineer-in- charge including normal dewatering, centering, form work, compaction, finishing the formed surfaces with C.M. 1:3 of sufficient minimum thickness to give a smooth and even surface wherever necessary or roughening if special finish is to be provided and curing, etc. complete. (By weigh batching and mix design for M-250 and M-300 only. Use of L&T, A.C.C., Ambuja, Birla Gold, Manikgad, Rajashree, etc. cement is permitted.) (Excluding M.S. or Tor reinforcement)	29.95	Cum	9,218.00	276,079.10
	Chajjas / Parapets / Curtain Walls /Partition Walls / Pardies In RCC M-300				
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.6 / Page no. 51				
11	Providing and fixing in position steel bar reinforcement of various diameters for RCC piles, caps, footings, foundations, slabs, beams, columns, canopies, staircases, newels, chajjas, lintels, pardies, copings, fins, arches, etc. as per detailed designs, drawings and schedules; including cutting, bending, hooking the bars, binding with wires or tack welding and supporting as required, etc. complete (including cost of binding wire). (Bd-F-17/306)				
	c) Corrosion Resistant Steel (Fe 500)	9.08	MT	70,658.00	641,574.70
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.8 / Page no. 52				
12	Providing and fixing mild steel grill work for windows/ ventilators of 20 Kg/Sqm. As per drawings including necessary welding and painting with one coat of anticorrosive paint and two coats of oil painting, etc. complete. (Bd-U- 1/537)	8.10	Sqm	1,895.00	15,349.50
	MJP/ SSR/ 2021-22 / SECTION - F : IRON AND STRUCTURAL STEEL WORK Item No.1 / Page				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
13	Providing structural steel work in rolled stanchions fixed with connecting plates or angle cleats as in main and cross beams, hip and jack rafters, purlins connecting to truss members and like as per detailed designs and drawings or as directed by Engineer-in-charge including cutting, fabricating, hoisting, erecting, fixing in position, making riveted / bolted / welded connections and one coat of anticorrosive paint and over it two coats of oil painting, etc. complete. (Bd-C- 3/275)	7.47	MT	71,286.00	532,535.00
	MJP/ SSR/ 2021-22 / SECTION - F :: IRON AND STRUCTURAL STEEL WORK Item No.3,				
14	Providing and fixing corrugated galvanised iron sheets of 0.63 mm thick (24B .W .G.) for roofing without wind tiles including fastening with galvanised iron screws and bolts , lead and bitumen washers as per drawing etc. complete. (Weight of 5.5 kg/sq.m.).	754.00	Sqm	777.00	585,858.00
	PWD / SSR 2020-21 / Roofing and Ceiling SSR Item No.38.04 Reference No. Bd.R.5, Page No. 453 Item No.1133, Page no. 224				
15	Providing fly ash brick masonry with conventional / I.S. type bricks in cement mortar 1:6 in superstructure including striking joints, raking out joints, watering and scaffolding etc. Complete	148.70	Cum	6,305.00	937,553.50
	PWD / SSR 2020-21 / Brick Masonry SSR Item No.27.13 Reference No. As director by engineer incharge and BDG- 2 and 5 Item No.893, Page no. 190				
16	Providing internal cement plaster 12 mm thick in single coat in cement mortar 1:5 without neeru finish to concrete or brick surfaces, in all positions including scaffolding and curing etc. complete.	816.50	Sqm	257.00	209,840.50
	PWD / SSR 2020-21 / Plastering and Pointing SSR Item No. 32.03 Reference No. Bd. L.2 Page No. 368 Item No.950, Page no. 201				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
17	Providing rough cast cement plaster externally in two coats to concrete, brick or stone masonry surfaces in all positions with base coat of 12 to 15 mm thick in C.M. 1:4 and rough cast treatment 12 mm thick in proportion 1:11 / 2:3 including scaffolding and fourteen days curing complete.	475.00	Sqm	529.00	251,275.00
	PWD / SSR 2020-21 / Plastering and Pointing SSR Item No. 32.12 Reference No. Bd.L.8 Page No. 370 Item No.957, Page no. 201				
18	Providing and applying white-wash in two coats on old / new plastered or masonry surfaces and asbestos cement sheets including scaffolding and preparing the surface by brushing and brooming down etc. complete.	475.00	Sqm	10.00	4,750.00
	PWD / SSR 2020-21 / Colouring SSR Item No. 36.03 Reference No. Bd. P. I Page No. 411				
19	Providing and applying colour-wash of approved colour and shade in one coat to new surface including scaffolding, brushing and brooming down (excluding base coats of white wash) etc. complete.	475.00	Sqm	8.00	3,800.00
	PWD / SSR 2020-21 / Colouring SSR Item No. 36.04 Reference No. Bd. P.2 Page No. 412				
20	Dewatering the excavated trenches and pools of water in the building trenches / pipeline trenches, well works by using pumps and other devices including disposing off water to safe distance as directed by Engineer-in-charge (including cost of machinery, labour, fuel), etc. complete. (Bd-A-9/261)	80.00	HP/ Hr.	77.00	6,160.00
	MJP/ SSR/ 2021-22 / Section E/ Excavat				
21	Refilling the trenches with available excavated stuff with soft material first over pipeline and then hard material in 15 cm layers with all leads and lifts including consolidation, surcharging, etc. complete.	307.79	Cum	84.00	25,854.40
	MJP/ SSR/ 2021-22 / Section E/ Excavat				
22	Transportation as per STATEMENT VI Including loading, unloading and stacking	729.24	Cum	604.45	440,789.20

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
	Earth (4.8 Cum) lead 15 Km				
	Electromechanical Items				
23	Screen (Manual) of size 1.8 m length x 0.5 m width of SS 304 MOC and Manual hand rake for cleaning screen of SS handle 1 m in length and cleaning area of 6 nos 5 mm SS rod of total length 200 mm straight and 50 mm of 90 degree bend.	0.90	Sqm	35,000.00	31,500.00
24	Grit pump				
	Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below				
	MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION - Pumps, Page no. 6, 7of size 1.8 m length				
	1 HP (Up to 9000 LPH)	1.00	No	68,654.00	68,654.00
25	Raw Sewage Pumps				
	Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below				
	MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION -				
	5 HP (Up to 35000 LPH)	2.00	Nos	104,459.00	208,918.00
26	TTU Feed pumps				
	Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below				
	MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION -				
	5 HP (Up to 35000 LPH)	2.00	Nos	104,459.00	208,918.00
27	Pressure Sand Filter of FRP / MSEP vessel with suitable thickness to withstand a water pressure including MPV or 5 Valve system and PVC / UPVC / MSEP interconnecting and underdrain piping including fittings, with standard filter media layer with minimum depth of filter sand 1.0 m supported by gravels. The piping arrangement should provide sufficient pressure for backwash operations and avoid loss of sand during backwash operation. Suitable openings to be provided to ease addition and removal the media.				
	Dia 1.3 m x 2 m minimum height	2.00	Nos	348,000.00	696,000.00

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
28	Activated Carbon Filter of FRP / MSEP vessel with suitable thickness to withstand a water pressure including MPV or 5 Valve system and PVC / UPVC / MSEP interconnecting and underdrain piping including fittings, with standard filter media layer with minimum depth of Activated Carbon 1.0 m supported by gravels. The piping arrangement should provide sufficient pressure for backwash operations and avoid loss of Activated carbon during backwash operation. Suitable openings to be provided to ease addition and removal the media				
	Dia 1.3 m x 2 m minimum height	2.00	Nos	348,000.00	696,000.00
29	NaOCl Chlorinator Pump Diaphragm Type / peristaltic type / Solenoid Max Flow Rate Upto 10LPH Power Source Electric Phase Single Material PP / PTFE(Teflon) Voltage 230 Volt Frequency				
	Mixing Tank of 100 Ltrs capacity	100.00	Ltrs	8.00	800.00
	Dosing Pump	2.00	Nos	15,000.00	30,000.00
30	Control Panel				
	Design, Supply, Installing, Commissioning & Testing of Master PLC control monitoring and communication panel as per IEC 61131 at Pure Water Sump suitable for monitoring and control of pure water Pumps. Pressure Transmitters, Level Transmitter, PH Transmitter, Turbidity Transmitter ,for all pumps installed.	1.00	No	50,041.00	50,041.00
	MJP/ MECH/ ELECT / SSR/ 2021-22/ SECTION 19 - SA [SCADA & AUTOMATION]				
31	Supplying and erecting Fully Automatic Star Delta starter to operate squirrel cage induction motor working on 380- 440 Volt, 3 phase, 50 Hz with no volt coil, over load element, and ON - OFF push buttons, with necessary material and connected to supply, etc complete. Starter with original sheet steel encloser.				
	> 7.5 HP & Up to 12.5 HP	6.00	nos	7,150.00	42,900.00

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
	MJP /MECH/ ELECT/ SSR/ 2021-22 SECTION 10 - LG [L.T. SWITCHGEAR AND PROTECTION] Item no. LG 3 Page no. 27				
32	Main power supply cable				
	3 core PVC insulated, PVC sheathed copper conductor flat submersible cable				
	Supplying and erecting, Flat flexible submersible cable with, Copper Conductor, PVC insulated, and PVC sheathed.				
	3 core 16 sq mm	25.00	m	549.00	13,725.00
33	Power cables				
	Aluminium conductor 4 Core, XLPE / PVC insulated & armoured cable				
	Supplying and erecting, XLPE / PVC insulated, armoured cable 1100 V grade with ISI mark Four core, solid / stranded aluminium conductor with 6 mm thick 25 mm width M.S. spacer with G.I. Earth wire 6 sq mm, complete erected on wall / on pole with 25 X 3 mm M.S. clamps or in provided trench in an approved manner.				
	4 Core 6 sq mm	125.00	m	137.00	17,125.00
	MJP MECH/ ELECT/ SSR/ 2021-22 SECTION 12 - CB [L.T. CABLE] Item no. CB 6 Page				
34	Control Cables				
	Copper conductor PVC insulated, Unarmoured control cable				
	Supplying and erecting Un-armoured control cable with ISI mark stranded / solid copper conductor 1.1 kV grade complete erected on wall / panel or in provided trench in an approved manner.				
	4 core 2.5 sq mm	125.00	m	137.00	17,125.00
	MJP MECH/ ELECT/ SSR/ 2021-22/ SECTION 12 - CB [L.T. CABLE] Item no. CB 8-				

Plumbing Items					
Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
35	Providing and supplying in standard lengths ISI mark rigid unplasticised PVC pipes suitable for potable water with solvent cement joints including cost of couplers, as per IS specification no. 4985 / 1988 excluding GST levied by GOI and GOM in all respect, including transportation, freight charges, inspection charges, loading, unloading, conveyance to the departmental stores and stacking the same in closed shed duly protected from sun rays and rains including cost of jointing material i.e. solvent cement, etc. complete (selffit type to be jointed with				
	1) 10% of cost of pipes shall be considered for cost of PVC specials for estimate purpose only. 2) One coupler and required cement solvent shall be provided with each full length pipe				
	MJP/ SSR/ 2021-22 / SECTION – I(II) P.V.C. PIPES, Page no.77				
1	Raw Sewage pump to TBF Distribution				
a	Main header				
	110 mm.	45.00	m	428.00	19,260.00
	PVC Specials- 10%				1,926.00
b	Distribution				
	90 mm.	65.00	m	303.00	19,695.00
	PVC Specials- 10%				1,969.50
2	TBF collection to FFT (gravity)				
a	Main header				
	110 mm.	120.00	m	428.00	51,360.00
	PVC Specials- 10%				5,136.00
b	collection tributary				
	75 mm.	20.00	m	211.00	4,220.00
	PVC Specials- 10%				422.00
3	TTU Plumbing				
	110 mm.	25.00	m	428.00	10,700.00
	PVC Specials- 10%				1,070.00
4	TBF distribution				
	63 mm.	50.00	m	149.00	7,450.00
	PVC Specials- 10%				745.00
36	Labour				
	Plumber	20.00	days	641.00	12,820.00
	Helper	40.00	days	579.00	23,160.00

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
	MJP/ SSR/ 2021-22 / SECTION - B LABOUR & MACHINERY , Page no. 14				
37	Providing double flange sluice valve confirming for IS- 14846 including worn gear arrangements as per test pressure, stainless steel spindle, caps, including inspection charges, transportation upto departmental store, unloading, stacking excluding GST levied by GOI & GOM in all respect etc. complete.				
	Sluice valves - PN -1 (Without by pass)				
	Raw Sewage pump				
	100 mm.	2.00	Nos	6,835.00	13,670.00
	Filter Feed Pump				
	100 mm.	2.00	Nos	6,835.00	13,670.00
	MJP/ SSR/ 2021-22 / SECTION - I(XII) : PIPES APPURTENANCES , Page no. 132				
38	Providing and supplying ISI mark CI D/F reflux valves (non-return valves) of following dia including railway freight, inspection charges, unloading from railway wagon, loading into truck, transportation upto departmental stores, unloading, stacking excluding GST levied by GOI & GOM in all respect etc. complete. Reflux valves as per I.S.5312 Part I (1984)				
	Without by pass arrangement -PN -1				
	Raw Sewage pump				
	100 mm.	2.00	Nos	5,713.00	11,426.00
	Filter Feed Pump				
	100 mm.	2.00	Nos	5,713.00	11,426.00
	MJP/ SSR/ 2021-22 / SECTION - I(XII) : PIPES APPURTENANCES , Page no. 131				
	Bio media Items				
39	Supplying of Specially designed container for holding Filter media including Lightweight Expanded Clay Aggregates size (8-30 mm) and Bio media including mixture of woodchips Vermicompost, cocopeat and bacterial culture with special worms per designed quantity including transportation & fixing in position as directed etc. complete.	720.00	Nos	4,750.00	3,420,000.00
	Market rate				
40	Rapid sand Gravity filter sand At Source (Godhara, Gokak, Kanhan,	68.49	Cum	1,730.00	118,487.70
	MJP/ SSR/ 2021-22 / SECTION- A MATERIALS				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
41	Trasnsportation Godhara to Pune distance by Road 660 Km.	68.49	Cum	11,031.37	755,538.60
	MJP/ SSR/ 2021-22 / SECTION - C : TRANSPORTATION Page no.				
42	Stone Aggregate 20 mm	68.49	Cum	900.00	61,641.00
	MJP/ SSR/ 2021-22 / SECTION- A MATERIALS				
43	Transportation as per STATEMENT VI Including loading, unloading and stacking				
	Manure or sludge (5.52 Cum) lead 25 Km	264.50	Cum	747.48	197,708.50
	MJP/ SSR/ 2021-22 / SECTION - C : TRANSPORTATION Page no.				
NET TOTAL Rs.					12,502,928.60

MEASUREMENT SHEET - SCREEN CHAMBER, GRIT CHAMBER AND RAW SEWAGE SUMP

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	Screen And Grit chamber						
1	Excavation				2.55		
A	0.0 to 1.5 m	1	6.20	3.10	1.5	28.83	Cum
	soil					7.21	Cum
	Murum					7.21	Cum
	Soft rock					7.21	Cum
	hard rock					7.21	Cum
B	1.5 to 3.0 m	1	6.2	3.10	1.05	20.19	Cum
	soil					5.05	Cum
	Murum					5.05	Cum
	Soft rock					5.05	Cum
	hard rock					5.05	Cum
C	3.0 to 4.5 m	1	5.2	2.60	0	0	Cum
	soil					0	Cum
	Murum					0	Cum
	Soft rock					0	Cum
	hard rock					0	Cum
D	4.5 to 6.0 m	1	5.2	2.60	0	0	Cum
	soil					0	Cum
	Murum					0	Cum
	Soft rock					0	Cum
	hard rock					0	Cum
2	Soling						
	Screen	1	3.20	1.20	0.30	1.16	Cum
	Grit	1	4.20	0.90	0.30	1.14	Cum
	extra for grit chamber	1	1.00	0.60	0.30	0.18	Cum
						Total for grit	1.32
							Cum
3	PCC M20						
	Screen	1	2.80	1.00	0.10	0.28	Cum
	Grit	1	3.80	0.90	0.10	0.35	Cum
		1	1.00	0.40	0.20	0.08	Cum
	Internal slope	1	Area	0.19	0.90	0.18	Cum
	Internal slope	1	Area	0.10	0.90	0.09	Cum
						Total for grit	0.7
							Cum
4	Raft M30						
	Screen	1	2.60	0.90	0.15	0.36	Cum
	Grit	1	3.60	0.90	0.15	0.49	Cum
		1	1.00	0.30	0.15	0.05	Cum
						Total for grit	0.54
							Cum
5	RCC Wall						
	Screen						
	Long Wall	2	2.20	0.10	1.50	0.66	Cum

MEASUREMENT SHEET - SCREEN CHAMBER, GRIT CHAMBER AND RAW SEWAGE SUMP

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	Short Wall	2	0.70	0.10	1.50	0.21	Cum
				Total for screen		0.87	Cum
	Grit						
	Long Wall (extra than screen chamber)	1	1.00	0.10	2.20	0.22	Cum
	Short Wall	2	0.90	0.10	2.20	0.4	Cum
				Total for grit		0.62	Cum
6	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	80	Cum	2.39	0.2	MT
7	Fabrication work in Frame and Grating for Access						
	Screen	1	2.20	0.70		1.54	Sqm
	Grit	1	3.20	1.00		3.2	Sqm
					Total	4.74	Sqm
8	Removing excess excavated material out of site						
	Screen chamber	1	2.20	0.70	1.30	2.01	Cum
	Grit Chamber	1	3.20	0.90	2.00	5.76	Cum
	soling, PCC, Raft volume					4.09	Cum
	Total Volume					11.86	Cum
	bulkage @ 40%					16.61	Cum
9	Refilling and compaction						
	Total Excavation					49.02	Cum
	Deduction for tank volume, soling, PCC, Raft					11.86	Cum
	Refilling and compaction volume					37.16	Cum

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	Raw Sewage Sump						
1	Excavation				4.00		
A	0.0 to 1.5 m	1	8.7	8.70	1.5	113.54	Cum
	soil					28.39	Cum
	Murum					28.39	Cum
	Soft rock					28.39	Cum
	hard rock					28.39	Cum
B	1.5 to 3.0 m	1	7.70	7.70	1.5	88.94	Cum
	soil					22.24	Cum
	Murum					22.24	Cum
	Soft rock					22.24	Cum
	hard rock					22.24	Cum
C	3.0 to 4.5 m	1	7.70	7.70	1	59.29	Cum

MEASUREMENT SHEET - SCREEN CHAMBER, GRIT CHAMBER AND RAW SEWAGE SUMP

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	soil					14.83	Cum
	Murum					14.83	Cum
	Soft rock					14.83	Cum
	hard rock					14.83	Cum
D	4.5 to 6.0 m	1	6.70	6.70	0	0	Cum
	soil					0	Cum
	Murum					0	Cum
	Soft rock					0	Cum
	hard rock					0	Cum
2	Soling						
	RSS	1	6.10	6.10	0.30	11.17	Cum
3	PCC M20						
	RSS	1	5.70	5.70	0.10	3.25	Cum
4	Raft M30						
	RSS	1	5.50	5.50	0.30	9.08	Cum
5	RCC Wall						
	Long Wall	2	5.10	0.25	3.50	8.93	Cum
	Short Wall	2	4.60	0.25	3.50	8.05	Cum
					Total	16.98	Cum
6	Beams						
	Beam 1	1	4.60	0.2	0.3	0.28	Cum
	Beam 2	1	4.60	0.2	0.3	0.28	Cum
					Total	0.56	Cum
7	Slab	1	5.10	5.10	0.2	5.21	Cum
	Deduction for manhole	-2	1.20	0.70	0.2	-0.34	Cum
					Total	4.87	Cum
8	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	100	Cum	31.49	3.15	MT
9	Fabrication work in Frame and Grating for Access						
	RSS	2	1.20	0.70		1.68	Sqm
10	Removing excess excavated material out of site						
	RSS	1	5.10	5.10	3.30	85.84	Cum
	soling, PCC, Raft volume					23.5	Cum
	Total Volume					109.34	Cum
	bulkage @ 40%					153.08	Cum
11	Refilling and compaction						

MEASUREMENT SHEET - SCREEN CHAMBER, GRIT CHAMBER AND RAW SEWAGE SUMP

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	Total Excavation					261.77	Cum
	Deduction for tank volume, soling, PCC, Raft					109.34	Cum
	Refilling and compaction volume					152.43	Cum
12	Dewatering						
	10 Days x 4 hours/day	days	10	hours / day	4	40	Hrs

MEASUREMENT SHEET - TIGER BIO FILTER

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	TIGER BIO FILTER						
1	Excavation				0.50		
A	0.0 to 1.5 m	1	12.66	5.66	0.5	35.83	Cum
	soil					8.96	Cum
	Murum					8.96	Cum
	Soft rock					8.96	Cum
	hard rock					8.96	Cum
2	Soling						
	TBF	1	12.46	5.46	0.30	20.41	Cum
3	PCC M20						
	TBF	1	12.06	5.06	0.10	6.11	Cum
4	Raft M30						
	TBF	1	11.86	4.86	0.10	5.77	Cum
5	Brick Wall						
	TBF						
	Long Wall	2	11.46	0.23	1.20	6.33	Cum
	Short Wall	2	4.00	0.23	1.20	2.21	Cum
	Crate Support Wall	5	11.00	0.23	0.50	6.33	Cum
						Total for T	14.87
							Cum
6	Plaster						
	Internal						
	Crate Support Wall						
	Long Wall	6	11.00		0.50	33	Sqm
	Wall top	5	11.00		0.23	12.65	Sqm
	Long Wall	2	11.00		1.20	26.4	Sqm
	Short Wall	2	4.00		1.20	9.6	Sqm
						Total	81.65
							Sqm
	External						
	Long Wall	2	11.46		1.20	27.51	Sqm
	Short Wall	2	4.46		1.20	10.71	Sqm
	Wall Top	1	30.92	0.3		9.28	Sqm
						Total	47.50
							Sqm
7	External-white-wash	1				47.50	Sqm
8	External-colour-wash	1				47.50	Sqm
9	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	60	Cum	5.77	0.35	MT
10	Removing excess excavated material out of site						
	soling, PCC, Raft volume					32.29	Cum
	Total Volume					32.29	Cum
	bulkage @ 40%					45.21	Cum

MEASUREMENT SHEET - TIGER BIO FILTER

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
11	Refilling and compaction						
	Total Excavation					35.83	Cum
	Deduction for tank volume, soling, PCC, Raft					32.29	Cum
	Refilling and compaction volume					3.54	Cum
12	MS Fabricated Shed						
	TBF-II Shed in Fabrication work Shed Size-12 m X 5 m x		12.00	5.00	3.00		
	for column 50*50*5 Unit Weight 6.97 kg/m	10	3.00	6.97	kg/m	209.10	KG
	for truss 50*50*3 Unit Weight 3.71 kg/m	5	5.00	3.71	kg/m	92.75	KG
	for principle rafter 50*50*3 Unit Weight	10	2.90	3.71	kg/m	107.59	KG
	for strut rafter 50*50*3 Unit Weight 3.71 kg/m	10	0.20	3.71	kg/m	7.42	KG
	for central strut rafter 50*50*3 Unit Weight	5	0.30	3.71	kg/m	5.57	KG
	for bottom frame below truss 50*50*3 Unit Weight 3.71 kg/m	1	34.00	3.71	kg/m	126.14	KG
	for perlin 30*30*3 Unit Weight 2.51 kg/m	5	13.00	2.51	kg/m	163.15	KG
	for Base Plate 150*150*10 mm	20	0.15	0.15	0.010	35.33	KG
					Total Wei	747.04	Kg
						0.75	MT
13	corrugated galvanised iron sheets	2	13.00	2.90		75.4	Sqm

MEASUREMENT SHEET - FILTER FEED TANK

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
8	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	100	Cum	20.48	2.05	MT
9	Fabrication work in Frame and Grating for Access						
	FFT	2	1.20	0.70		1.68	Sqm
10	Removing excess excavated material out of site						
	FFT	1	4.50	4.50	2.50	50.63	Cum
	soling, PCC, Raft volume					16.5	Cum
	Total Volume					67.13	Cum
	bulkage @ 40%					93.99	Cum
11	Refilling and compaction						
	Total Excavation					144.69	Cum
	Deduction for tank volume, soling, PCC, Raft					67.13	Cum
	Refilling and compaction volume					77.56	Cum
12	Dewatering						
	10 Days x 4 hours/day	days	10	hours/day	4	40	Hrs

MEASUREMENT SHEET - FILTER PLATFORM

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	FILTER PLATFORM						
1	Excavation				0.55		
A	0.0 to 1.5 m	1	5.4	5.00	0.55	14.85	Cum
	soil					3.72	Cum
	Murum					3.72	Cum
	Soft rock					3.72	Cum
	hard rock					3.72	Cum
2	Soling						
	Filter Platform	1	5.20	4.80	0.30	7.49	Cum
3	PCC M20						
	Filter Platform	1	4.80	4.40	0.10	2.12	Cum
4	Raft M30						
	Filter Platform	1	4.60	4.20	0.15	2.9	Cum
5	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	60	Cum	2.9	0.18	MT
6	Removing excess excavated material out of site						
	soling and PCC volume					9.61	Cum
	Total Volume					9.61	Cum
	bulkage @ 40%					13.46	Cum
7	Refilling and compaction						
	Total Excavation					14.85	Cum
	Deduction for tank volume, soling, PCC, Raft					9.61	Cum
	Refilling and compaction volume					5.24	Cum

MEASUREMENT SHEET - ELECTROMECHANICAL WORKS

Sr. No.	Item Description	Nos.	Unit
1	Screen (Manual) of size 1.8 m length x 0.5 m width of SS 304 MOC and Manual hand rake for cleaning screen of SS handle 1 m in length and cleaning area of 6 nos 5 mm SS rod of total length 200 mm straight and 50 mm of 90 degree bend.	1	No
2	Grit pump Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION - Pumps, Page no. 6, 7 of size 1.8 m length x 0.5 m width of SS304 MOC 1 HP (Up to 9000 LPH)	1	No
3	Raw Sewage Pumps Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION - Pumps, Page no. 6, 7 5 HP (Up to 35000 LPH)	2	Nos
4	TTU Feed pumps Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION - Pumps, Page no. 6, 7 5 HP (Up to 35000 LPH)	2	Nos
5	Pressure Sand Filter of FRP / MSEP vessel with suitable thickness to withstand a water pressure including MPV or 5 Valve system and PVC / UPVC / MSEP interconnecting and underdrain piping including fittings, with standard filter media layer with minimum depth of filter sand 1.0 m supported by gravels. The piping arrangement should provide sufficient pressure for backwash operations and avoid loss of sand during backwash operation. Suitable openings to be provided to ease addition and removal the media. Dia 1.3 m x 2 m minimum height	2	Nos
6	Activated Carbon Filter of FRP / MSEP vessel with suitable thickness to withstand a water pressure including MPV or 5 Valve system and PVC / UPVC / MSEP interconnecting and underdrain piping including fittings, with standard filter media layer with minimum depth of Activated Carbon 1.0 m supported by gravels. The piping arrangement should provide sufficient pressure for backwash operations and avoid loss of Activated carbon during backwash operation. Suitable openings to be provided to ease addition and removal the media. Dia 1.3 m x 2 m minimum height	2	Nos
7	PurAll Tablet Chlorinator + cartridge	0	nos

MEASUREMENT SHEET - ELECTROMECHANICAL WORKS

Sr. No.	Item Description	Nos.	Unit
7	NaOCl Chlorinator Pump Diaphragm Type / peristaltic type / Solenoid Max Flow Rate Upto 10LPH Power Source Electric Phase Single Material PP / PTFE(Teflon) Voltage 230 Volt Frequency 50Hz		
a	Mixing Tank of 100 Ltrs capacity	1	Nos
b	Dosing Pump	2	Nos
8	Control Panel		
	Design, Supply, Installing, Commissioning & Testing of Master PLC control monitoring and communication panel as per IEC 61131 at Pure Water Sump suitable for monitoring and control of pure water Pumps. Pressure Transmitters, Level Transmitter, PH Transmitter, Turbidity Transmitter ,for all pumps installed.		
	Master PLC Panel	1	No
	MJP/ MECH/ ELECT / SSR/ 2021-22/ SECTION 19 - SA [SCADA & AUTOMATION] Item no. 2.7 Page no. 72		
9	Supplying and erecting Fully Automatic Star Delta starter to operate squirrel cage induction motor working on 380- 440 Volt, 3 phase, 50 Hz with no volt coil, over load element, and ON - OFF push buttons, with necessary material and connected to supply, etc complete. Starter with original sheet steel encloser.		
	> 7.5 HP & Up to 12.5 HP	6	nos
	1 nos extra starter considered as spare.		
	MJP /MECH/ ELECT/ SSR/ 2021-22 SECTION 10 - LG [L.T. SWITCHGEAR AND PROTECTION] Item no. LG 3 Page no. 27		
10	Main power supply cable		
	3 core PVC insulated, PVC sheathed copper conductor flat submersible cable		
	Supplying and erecting, Flat flexible submersible cable with, Copper Conductor, PVC insulated, and PVC sheathed.		
	3 core 16 sq mm	25	m
11	Power cables		
	Aluminium conductor 4 Core, XLPE / PVC insulated & armoured cable		
	Supplying and erecting, XLPE / PVC insulated, armoured cable 1100 V grade with ISI mark Four core, solid / stranded aluminium conductor with 6 mm thick 25 mm width M.S. spacer with G.I. Earth wire 6 sq mm, complete erected on wall / on pole with 25 X 3 mm M.S. clamps or in provided trench in an approved manner.		
	4 Core 6 sq mm	125	m
	MJP MECH/ ELECT/ SSR/ 2021-22 SECTION 12 - CB [L.T. CABLE] Item no. CB 6 Page no. 35		
12	Control Cables		
	Copper conductor PVC insulated, Unarmoured control cable		

MEASUREMENT SHEET - ELECTROMECHANICAL WORKS

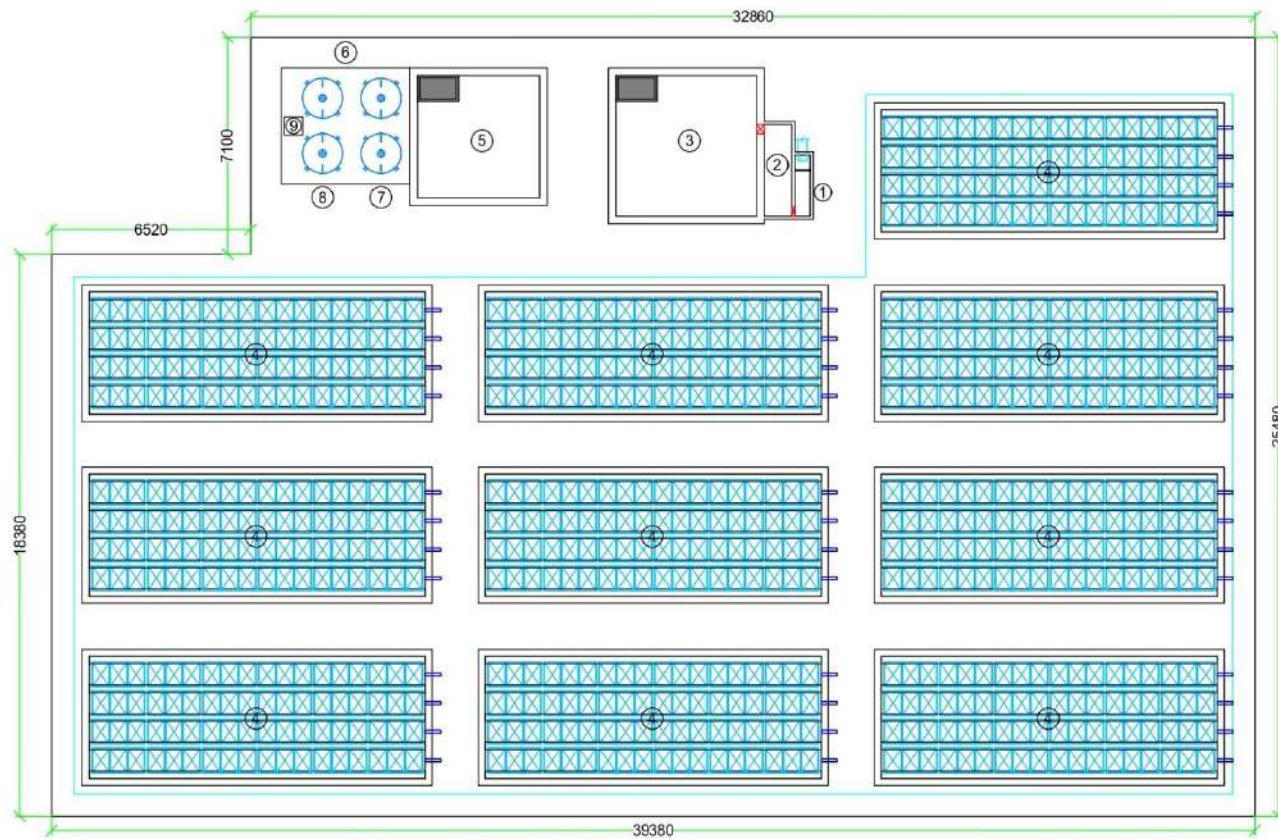
Sr. No.	Item Description	Nos.	Unit
	Supplying and erecting Un-armoured control cable with ISI mark stranded / solid copper conductor 1.1 kV grade complete erected on wall / panel or in provided trench in an approved manner.		
	4 core 2.5 sq mm	125	m
	MJP MECH/ ELECT/ SSR/ 2021-22/ SECTION 12 - CB [L.T. CABLE] Item no. CB 8-2 Page no. 36		

MEASUREMENT SHEET - PLUMBING

Sr. No.	Item Description	Nos.	L (m)	B (m)	Quantity	Unit
	Providing and supplying in standard lengths ISI mark rigid unplasticised PVC pipes suitable for potable water with solvent cement joints including cost of couplers, as per IS specification no. 4985 / 1988 excluding GST levied by GOI and GOM in all respect, including transportation, freight charges, inspection charges, loading, unloading, conveyance to the departmental stores and stacking the same in closed shed duly protected from sun rays and rains including cost of jointing material i.e. solvent cement, etc. complete (selffit type to be jointed with cement solvent).					
	1) 10% of cost of pipes shall be considered for cost of PVC specials for estimate purpose only. 2) One coupler and required cement solvent shall be provided with each full length pipe cost of which is included in rates below.					
	MJP/ SSR/ 2021-22 / SECTION – I(II) P.V.C. PIPES,					
1	Raw Sewage pump to TBF Distribution					
a	Main header	Dia	110			
	110 mm.	1	45		45	m
	PVC Specials- 10%					
b	Distribution					
	90 mm.	1	65		65	m
	PVC Specials- 10%					
2	TBF collection to FFT (gravity)					
a	Main header					
	110 mm.	1	120		120	m
	PVC Specials- 10%					
b	collection tributary					
	75 mm.	1	20		20	m
	PVC Specials- 10%					
3	TTU Plumbing	Dia	110			
	110 mm.	1	25		25	m
	PVC Specials- 10%					
4	TBF distribution			No. of beds		
	63 mm.	1	5	10	50	m
	PVC Specials- 10%					
5	Labour	Nos	Days			
	Plumber	2	10		20	days
	Helper	4	10		40	days
6	Sluice valves					

MEASUREMENT SHEET - PLUMBING

Sr. No.	Item Description	Nos.	L (m)	B (m)	Quantity	Unit
	Providing double flange sluice valve confirming for IS- 14846 including worn gear arrangements as per test pressure, stainless steel spindle, caps, including inspection charges, transportation upto departmental store, unloading, stacking excluding GST levied by GOI & GOM in all respect etc. complete.					
	MJP/ SSR/ 2021-22 / SECTION - I(XII) : PIPES APPURTENANCES , Page no. 132					
	Raw Sewage pump					
	100 mm.	2			2	Nos
	Filter Feed Pump					
	100 mm.	2			2	Nos
7	Reflux valves (non-return valves)					
	Providing and supplying ISI mark CI D/F reflux valves (non-return valves) of following dia including railway freight, inspection charges, unloading from railway wagon, loading into truck, transportation upto departmental stores, unloading, stacking excluding GST levied by GOI & GOM in all respect etc. complete. Reflux valves as per I.S.5312 Part I (1984)					
	MJP/ SSR/ 2021-22 / SECTION - I(XII) : PIPES APPURTENANCES , Page no. 131					
	Raw Sewage pump					
	100 mm.	2			2	Nos
	Filter Feed Pump					
	100 mm.	2			2	Nos



PLANT LAYOUT
AREA = 957 SQM.

Process Unit Details								
Sr. No	Description	No	L/D	B	H	FB	Total H	MOC
			m.	m.	m.	m.	m.	
1	Screen Chamber	1	2.00	0.50	0.30	1.00	1.30	RCC
2	Grit Chamber	1	3.00	0.90	0.70	1.30	2.00	RCC
3	Raw Sewage Sump	1	4.60	4.60	2.00	1.30	3.30	RCC
4	Tiger Bio Filter	10	11.00	4.00	-	-	1.20	BRICK
5	Filter Feed Tank	1	4.00	4.00	2.00	0.50	2.50	RCC
6	Filter Platform	1	4.20	3.80	-	-	-	RCC
7	Pressure Sand Filter	2	DIA	1.30	-	-	2.00	MSEP
8	Activated Carbon Filter	2	DIA	1.30	-	-	2.00	MSEP
9	Chlorination Unit	1	-	-	-	-	-	-

PROJECT NAME
500 KLD SEWAGE TREATMENT PLANT
BASED ON TIGER BIO FILTER
TECHNOLOGY.

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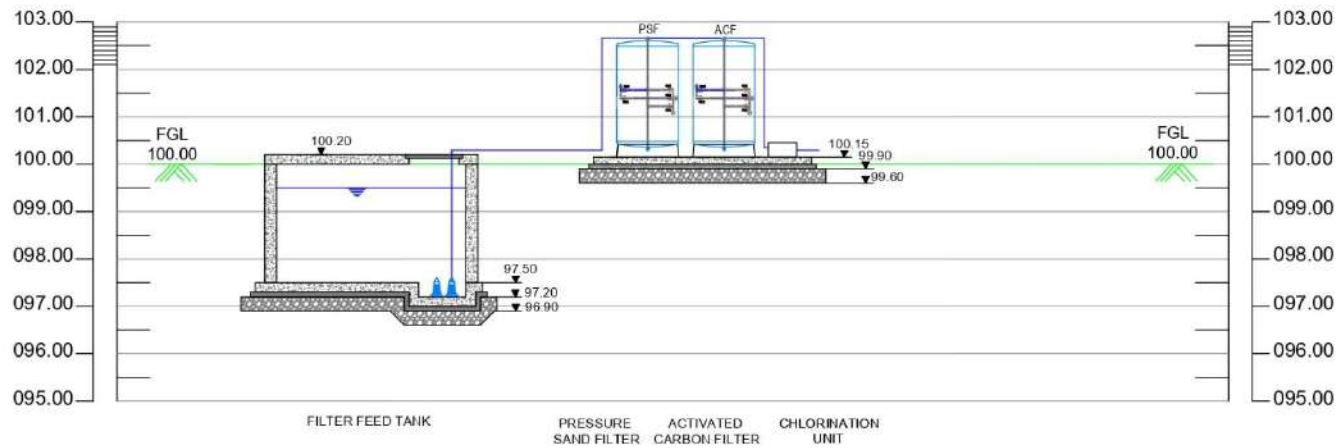
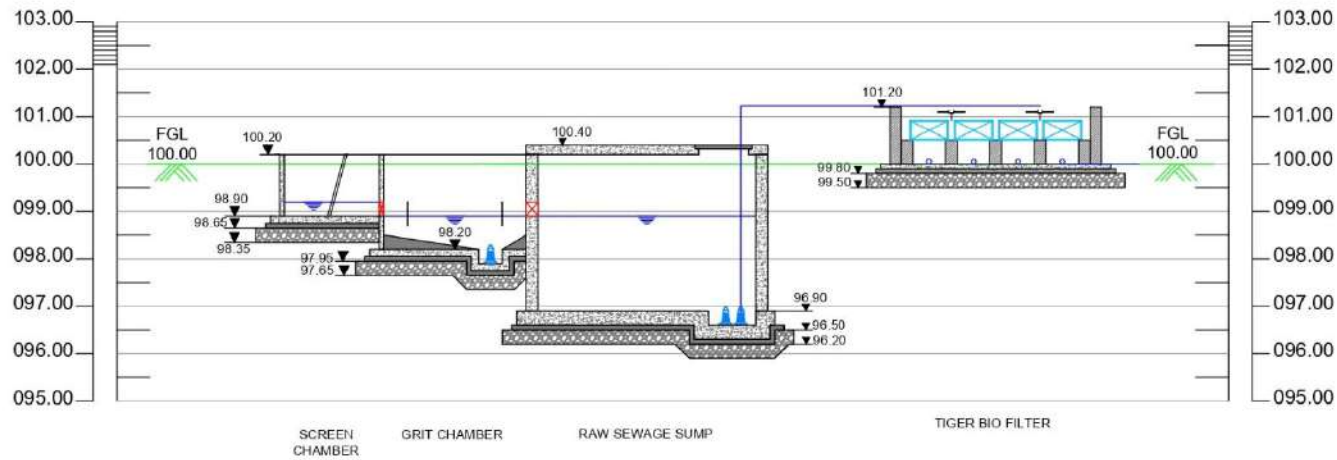
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DATE	REMARKS	SIGNATURE

CLIENT : SWSM, MAHARASHTRA

DRAWING NAME:
PLANT LAYOUT

PROJECT CODE : TBF-	DRAWING NO : D-01/PL/01	DATE : JUNE-2021
DRAWN BY : L.D.B.	CHECKED BY : S.B.	SCALE : NTS.

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HYDRAULIC FLOW DIAGRAM

PROJECT NAME
 500 KLD SEWAGE TREATMENT PLANT
 BASED ON TIGER BIO FILTER
 TECHNOLOGY.

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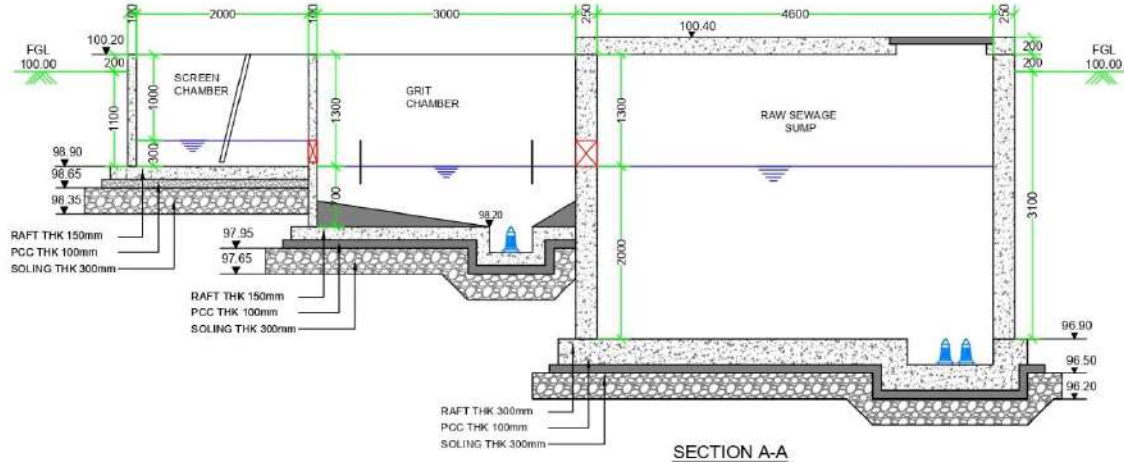
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 DRAWING NAME:
 HYDRAULIC FLOW DIAGRAM

PROJECT CODE : TBF-	DRAWING NO : D-02/HFD/01	DATE : JUNE-2021
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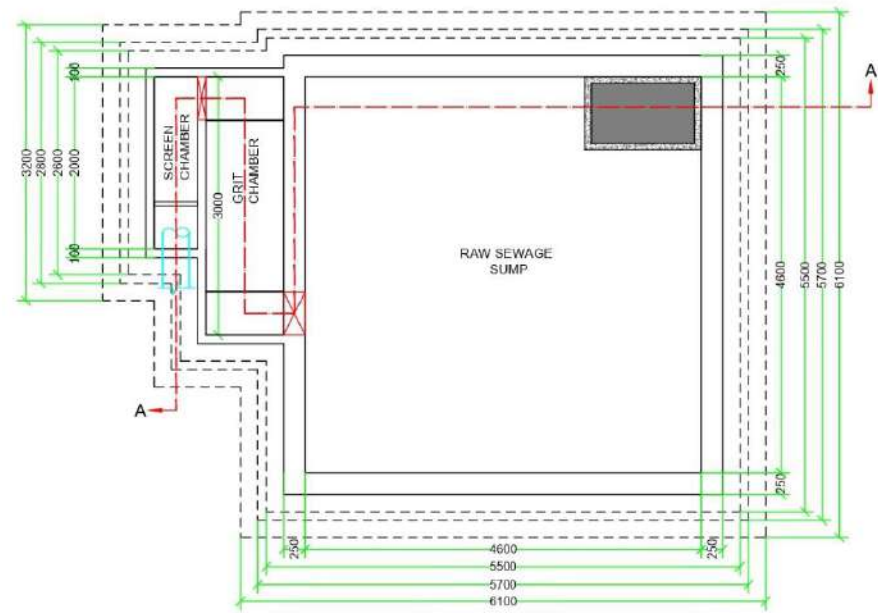


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SECTION A-A



PLAN

SCREEN CHAMBER, GRIT CHAMBER & RAW SEWAGE SUMP

PROJECT NAME
500 KLD SEWAGE TREATMENT PLANT
BASED ON TIGER BIO FILTER
TECHNOLOGY.

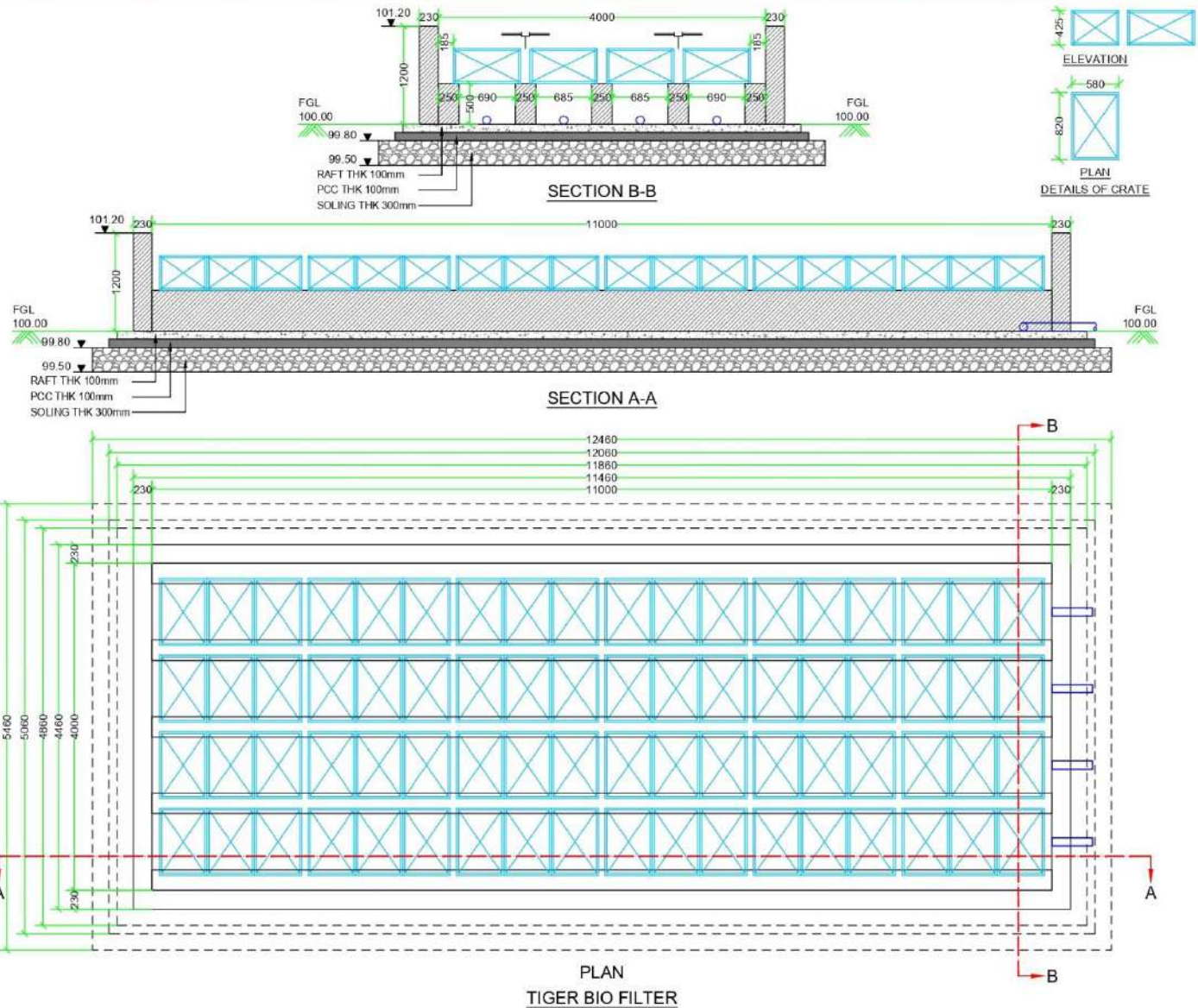
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REVISION		
DATE	REMARKS	SIGNATURE

CLIENT : SWSM, MAHARASHTRA
DRAWING NAME:
SCREEN CHAMBER, GRIT CHAMBER
& RAW SEWAGE SUMP

PROJECT CODE : TBF-	DRAWING NO : D.03/SC.GC&RS/01	DATE: JUNE-2021
DRAWN BY : L.D.B.	CHECKED BY : S.B.	SCALE : NTS.

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PROJECT NAME
 500 KLD SEWAGE TREATMENT PLANT
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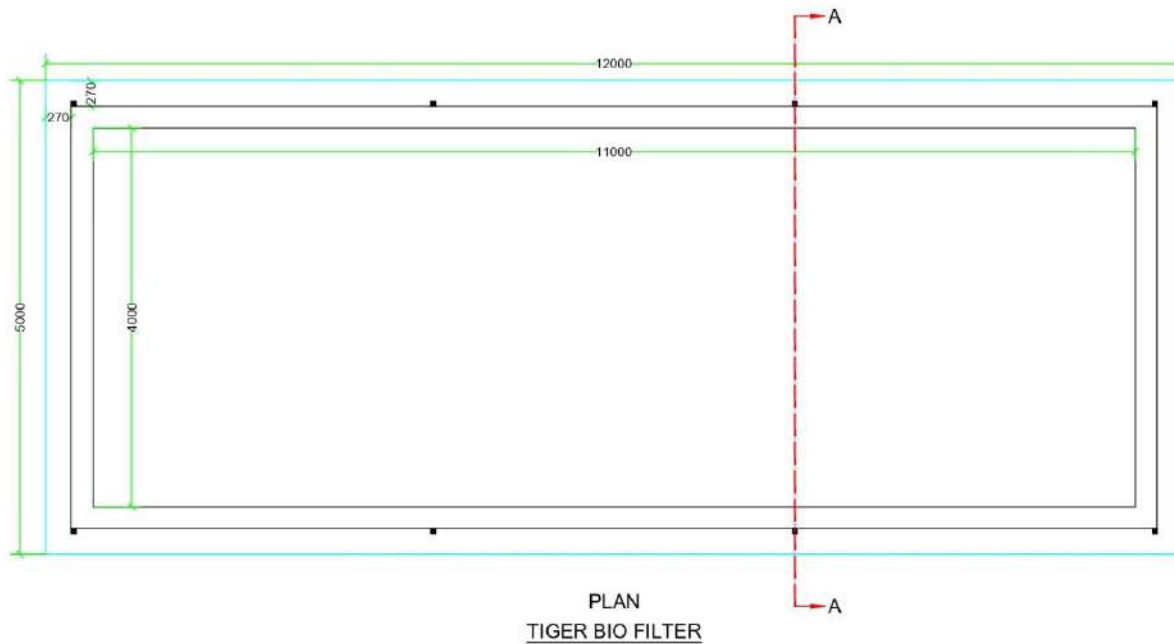
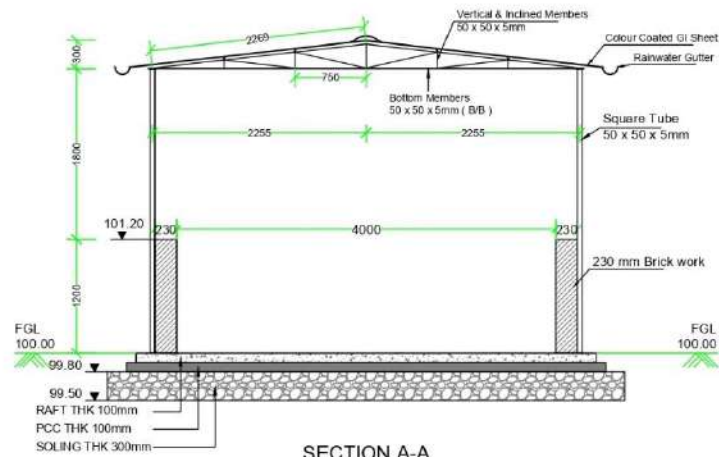
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CLIENT : SWSM, MAHARASHTRA
 DRAWING NAME:
 TIGER BIO FILTER

PROJECT CODE : TBF-	DRAWING NO : D-04/TBF/01	DATE : JUNE-2021
DRAWN BY : L.D.B.	CHECKED BY : S.B.	SCALE : NTS.

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500 KLD SEWAGE TREATMENT PLANT
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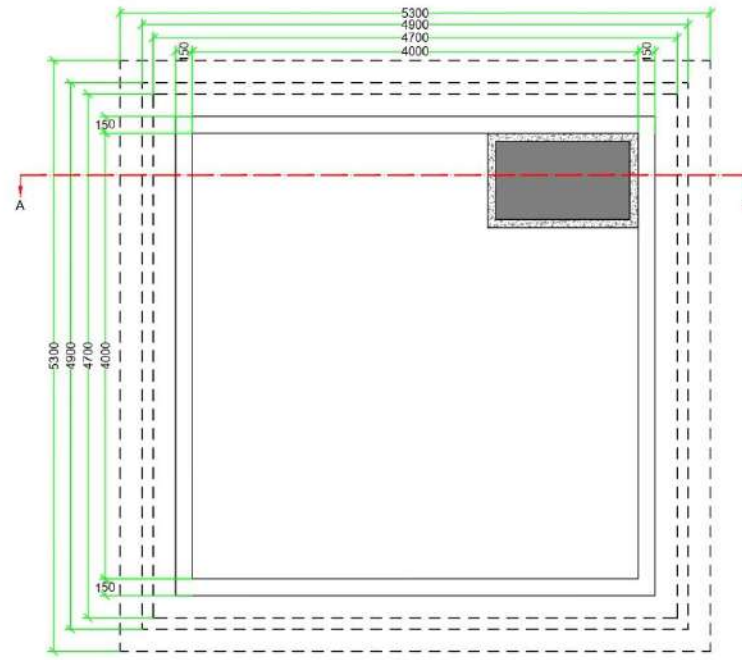
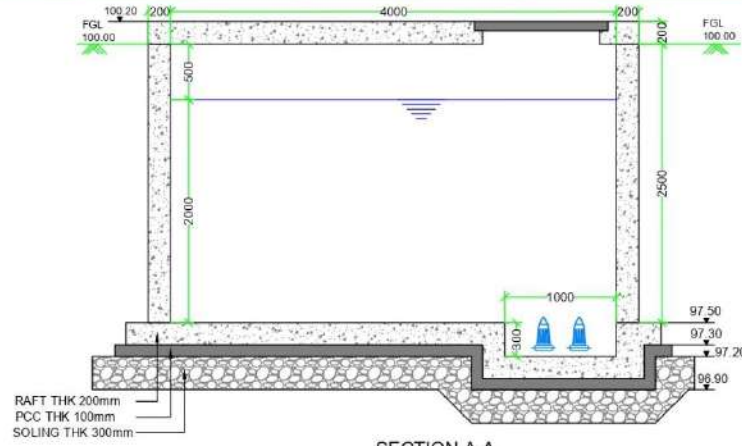
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DRAWING NAME:
TIGER BIO FILTER

PROJECT CODE : TBF-	DRAWING NO : D-04/TBF/02	DATE : JUNE-2021
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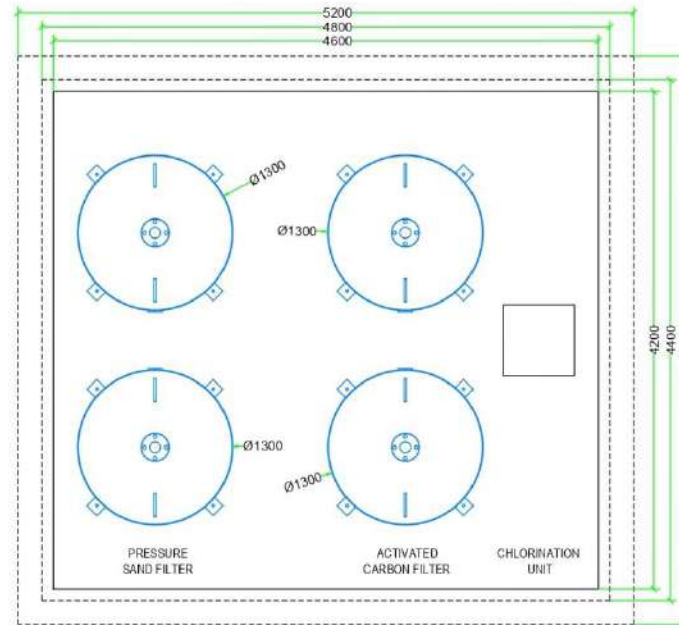
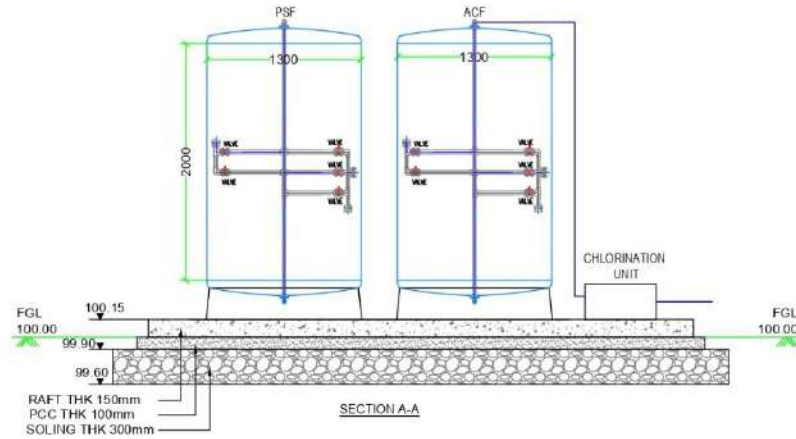
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DATE	REMARKS	SIGNATURE

CLIENT : SWSM, MAHARASHTRA
DRAWING NAME:
FILTER FEED TANK

PROJECT CODE : TBF-	DRAWING NO : D-05/FF T/01	DATE: JUNE-2021
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PLAN
PRESSURE SAND FILTER,
ACTIVATED CARBON FILTER & CHLORINATION UNIT

PROJECT NAME
500 KLD SEWAGE TREATMENT PLANT
BASED ON TIGER BIO FILTER
TECHNOLOGY.

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DRAWING NAME
PRESSURE SAND FILTER,
ACTIVATED CARBON FILTER
& CHLORINATION UNIT

PROJECT CODE : TBF-	DRAWING NO : D-06PSF,ACF&CLU01	DATE : JUNE-2021
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**750 KLD STP
BASED ON TBF TECHNOLOGY**

PROCESS CALCULATIONS
TIGER BIO FILTER OF 750 KLD CAPACITY

Design flow	=	750.00	KLD
	=	0.750	MLD
Peak flow factor	=	3.00	
1 SCREEN CHANNELS: MANUAL			
No. of Manual Screen	=	1	No.
Average Flow	=	0.75	MLD
Peak Flow Factor	=	3.00	
Design Flow	=	Peak Flow	
	=	2.25	MLD
	=	93.75	m ³ /hr
	=	0.026	m ³ /sec
Average Flow	=	0.75	MLD
	=	31.250	m ³ /hr
	=	0.009	m ³ /sec
Design Flow in each Screen	=	0.026	m ³ /sec
		1	No.
	=	0.026	m ³ /sec
Average Flow in each Screen	=	0.009	m ³ /sec
		1	No.
	=	0.009	m ³ /sec
Maximum Velocity through Screen at Peak Flow	=	1.2	m/sec
Minimum Velocity through Screen at Average Flow	=	0.6	m/sec
Clear Area of Opening through Screen for Peak Flow	=	0.026	m ³ /sec
		1.2	m/sec
	=	0.022	m ²
Clear Area of Opening through Screen for Average Flow	=	0.009	m ³ /sec
		0.6	m/sec
	=	0.015	m ²
Considering maximum Area of Opening through Screen	=	0.022	m ²
Clear Spacing of Bars	=	10	mm

Thickness of Bars	=	5	mm	
Gross Area of Screen	=	$0.022 \times (10+5) / 10$		
	=	0.033	m ²	
Assuming Depth of Screen Channel	=	300.00	mm	
Gross Width of Screen	=	$0.033 / 0.3$		
	=	0.110	m	
No. of Bars	=	(Gross Width of Screen / Center to Center Spacing of Bars) - 1		
	=	$0.11 / ((10+5) / 1000) - 1$		
	=	1		
	=	6.3	Nos.	
Say	=	7	Nos.	
Width of Screen provided	=	(Number of Bars+1) x Clear Spacing + (Number of Bars x Bar Thickness)		
	=	$(7+1) \times 10 + (7 \times 5)$		
	=	115	mm	
Width Say	=	0.50	m	
Liquid Depth of Screen Channel provided	=	0.30	m	
L:B	=	6.00		
Length of Screen Channel provided	=	3.00	m	
Freeboard provided	=	1.00	m	Invert Depth of incoming sewer
Total Depth of Screen Chamber	=	1.30	m	
Velocity in Channel at Average Flow	=	Average Flow / Cross Sectional Area of Screen Channel		
	=	$0.009 / ((0.5 \times 0.3) / 1000 \times 1000)$		
	=	0.060	m/sec	
	>	0.300	m/sec	
Head Loss across Screen				
Head Loss across Screen	=	$0.0728 (V^2 - v^2)$		
V = Velocity through Screen at Peak Flow	=	Peak Flow through Screen Channel / Clear Area of Opening through Screen		
	=	1.083	m/sec	
v = Velocity in approach Channel at Peak Flow	=	Peak Flow through Screen Channel / Cross Sectional Area of Screen Channel		
	=	0.8	m/sec	
Head Loss across Screen at Peak Flow	=	0.040	m	
Head Loss across Screen at 50% Clogged Condition				
Velocity through Screen at 50% Clogged Condition at Peak Flow	=	2.167	m/sec	
Head Loss across screen at 50% Clogged Condition at Peak Flow	=	0.297	m	
	>	0.300	m/sec	OK

2 CONVENTIONAL GRIT CHAMBER: MANUAL

No. of Grit Chamber	=	1	
Average Flow	=	0.75	MLD
Peak Flow Factor	=	3.00	
Design Flow	=	Peak Flow	
Peak Flow	=	2.25	MLD
	=	2250	m ³ /day
	=	94	m ³ /hr
	=	0.026	m ³ /sec
Design Flow to each Grit Chamber	=	2250/1	
	=	2250	m ³ /day
	=	94	m ³ /hr
	=	0.026	m ³ /sec
According to CPHEEO Manual			
Particle Size	=	0.15	mm
Specific Gravity	=	2.65	
Surface Overflow Rate for 100% removal efficiency in an ideal Grit Chamber	=	Settling Velocity of the minimum size of Particles to be removed	
	=	1.5	m/s
	=	1296	m ³ /m ² /day
Considering Efficiency of removal of desired Particles, $\eta = 75\%$ and Measure of Settling Basin Performance, $n = 1/8$ for very good performance	=	75%	
	=	0.125	
Design Overflow Rate	=	857	m ³ /m ² /day
Surface Overflow Rate for 0.15 mm dia. Particle Size with Specific Gravity $S_s > 2.65$ Table 5.6	=	1555	m ³ /m ² /day
Considering Design Overflow Rate	=	960	m ³ /m ² /day
Area of Grit Chamber required	=	2250	m ³ /day
	=	960	m ³ /m ² /day
	=	2.34	m ²
L:B ratio	=	3	
Length of Chamber provided	=	4.00	m
Width of Chamber provided	=	0.90	m
Hydraulic Retention Time (HRT) in Grit Chamber at Peak Flow	=	60	sec
Volume of Grit Chamber required	=	0.026x60	
	=	1.56	m ³
Depth required in Grit Chamber	=	1.56 / (4x0.9)	

	=	0.43	m
Say	=	0.50	m
Grit Storage Depth	=	0.30	m
Total Liquid Depth required	=	0.80	m
Length of Grit Pit	=	0.50	m
Width of Grit Pit	=	0.50	m
Depth of Grit Pit	=	0.30	m
Free Board	=	1.30	m

3 RAW SEWAGE SUMP (WET WELL)

No. of Units	=	1	No.
Average Flow	=	0.75	MLD
	=	31.250	m ³ /hr
	=	0.0087	m ³ /sec
Peak Flow Factor	=	3.00	
Design Flow	=	Peak Flow	
	=	2.25	MLD
	=	94	m ³ /hr
	=	0.026	m ³ /sec
Hydraulic Retention Time (HRT) at Average Flow	=	120	min
Volume required	=	0.0087 x 120 x 60	
	=	63	m ³
Hydraulic Retention Time (HRT) at Peak Flow	=	Volume / Average Flow	
	=	40	min
	<	30	min
Total Volume of Wet Well	=	63	m ³
Side Water Depth (SWD) provided	=	2.00	m
Plan Area of Wet Well	=	31.32	m ²
Length/width of Sump required	=	5.60	m
Length/width of Sump provided	=	5.60	m
Volume of Sump provided	=	62.72	m ³
Length of Pump Pit	=	1.00	m
Width of Pump Pit	=	0.50	m
Depth of Pump Pit	=	0.30	m
Free Board	=	1.30	m

3.1 DESIGN STATEMENT-RSS E&M

Design Considerations

Design flow	=	0.75	MLD
	=	750.00	Cum/Day
Peak flow factor	=	3.00	

Pumping machinery

Friction factor for Fittings in Pressure Mains

Elbow 90 degrees	=	20
Friction Factor for each	=	1
Friction factor for all	=	20
Elbow 45 degrees	=	0
Friction Factor for each	=	0.75
Friction factor for all	=	0
Elbow 22 degrees	=	0
Friction Factor for each	=	0.5
Friction factor for all	=	0
Tee 90 degrees	=	0
Friction Factor for each	=	1.5
Friction factor for all	=	0
Tee in straight pipe	=	13
Friction Factor for each	=	0.3
Friction factor for all	=	3.9
Gate valve open	=	1
Friction Factor for each	=	0.4
Friction factor for all	=	0.4
Swing check	=	1
Friction Factor for each	=	2.5
Friction factor for all	=	2.5
Total friction factor	=	26.8

Stage	low	ave	peak
Average flow, cum / day	=	750.00	
Proportion	=	0.6	2
Design flow, cum / day	=	450	1500
Hazen Williams C	=	140	140
Desired velocity, m/s	=	0.6	1.5
Number of Pumping hours	=	16.0	16.0
Area needed, sqm	=	0.0130	0.0174
Dia needed, m	=	0.129	0.149
Dia needed, mm	=	129	149
Dia provided, mm (User)	=	140	140
Radius, m	=	0.070	0.070
Radius power 0.63	=	0.187	0.187
S power 0.54	=	0.027	0.067
S	=	0.001	0.007
Slope 1 in	=	803.8	147.3
length, m	=	55	55
Friction in pipeline, m	=	0.1	0.4
Velocity head, m	=	0.018	0.115
Friction factor in fittings	=	26.8	26.8
Friction in fittings, m	=	0.5	3.1
Static lift, m	=	4.5	4.5
Total head, m	=	5.0	7.6
Efficiency of pumpset	=	0.8	0.8
Discharge, lps	=	7.8	26.0

Discharge, Cum/Hr	=	28.1	46.9	93.8
Kw required	=	1.208	2.017	4.034
HP required	=	2.0	3.0	5.5
Number of Pumps	=	2	2	2

4 TIGER BIO FILTER

DESIGN STATEMENT-TBF1- 50 KLD

Number of pumping hours	=	16	Hrs	
Number of BMF tanks provided	=	15	Nos	
Design flow to each tank	=	50.00	Cum/day	
	=	3.13	Cum/ Hr for 16 Hr	
	=	0.87	lps	
Inlet BOD	=	250.00	mg/l	
Inlet TSS	=	400.00	mg/l	
BOD load applied	=	12.5	kg/day	
BOD uptake rate	=	0.1	Kg of BOD / Kg of worms	(0.5 - 1.0)
Worms required	=	125	Kg worms	
Sewage application rate	=	1.85	Cum/Sqm/day	(1 - 2 Cum/Sqm/day)
Area required	=	27.03	Sqm	
Area Provided	=	28	Sqm	
Area of each crate	=	0.4	Sqm	
Number of crates	=	70	Nos	
say	=	72	Nos	
Crate in longitudinal direction	=	18	Nos	
Crate in travers direction	=	4	Nos	
crates provided	=	72	Nos	OK
Width provided	=	4.00	m	
Length required	=	11.00	m	
Depth provided	=	1.2	m	

5 TERTIARY TREATMENT UNIT

Design Considerations

Design flow	=	0.75	MLD
	=	750.00	Cum/Day
Peak flow factor	=	3.00	

5.1 FILTER FEED TANK

Number of FFT provided	=	1	Nos
Number of operating hours	=	16	Hrs
Design flow	=	750.00	Cum/Day
	=	46.88	Cum/Hr
	=	0.01302	Cum/Sec
Hydraulic Retention time	=	60	min
Volume required	=	46.88	Cum
Depth	=	2.00	m

Civil Tanks

Area	=	23.44	Sqm
Length/Width required	=	4.84	m
Length/Width provided	=	5.00	m
Freeboard provided	=	0.50	m
Volume Provided	=	50.00	Cum

DESIGN STATEMENT-TTU E&M

Design Considerations

Design flow	=	0.75	MLD
	=	750.00	Cum/Day
Peak flow factor	=	3.00	

Pumping machinery

Friction factor for Fittings in Pressure Mains

Elbow 90 degrees	=	5
Friction Factor for each	=	1
Friction factor for all	=	5
Elbow 45 degrees	=	0
Friction Factor for each	=	0.75
Friction factor for all	=	0
Elbow 22 degrees	=	0
Friction Factor for each	=	0.5
Friction factor for all	=	0
Tee 90 degrees	=	0
Friction Factor for each	=	1.5
Friction factor for all	=	0
Tee in straight pipe	=	5
Friction Factor for each	=	0.3
Friction factor for all	=	1.5
Gate valve open	=	1
Friction Factor for each	=	0.4
Friction factor for all	=	0.4
Swing check	=	1
Friction Factor for each	=	2.5
Friction factor for all	=	2.5
Total friction factor	=	9.4

Stage	low	ave	peak	
Average flow, cum / day	=	750.00		
Proportion	=	0.6	2	
Design flow, cum / day	=	450	1500	
Hazen Williams C	=	140	140	
Desired velocity, m/s	=	0.8	1.5	
Number of Pumping hours	=	16.0	16.0	
Area needed, sqm	=	0.0098	0.0130	0.0174
Dia needed, m	=	0.112	0.129	0.149
Dia needed, mm	=	112	129	149
Dia provided, mm (User)	=	140	140	140
Radius, m	=	0.070	0.070	0.070
Radius power 0.63	=	0.187	0.187	0.187

S power 0.54	=	0.036	0.045	0.067
S	=	0.002	0.003	0.007
Slope 1 in length, m	=	471.8	312.1	147.3
Friction in pipeline, m	=	0.1	0.1	0.2
Velocity head, m	=	0.033	0.051	0.115
Friction factor in fittings	=	9.4	9.4	9.4
Friction in fittings, m	=	0.3	0.5	1.1
Static lift, m	=	10.0	10.0	10.0
Total head, m	=	10.3	10.5	11.1
Efficiency of pumpset	=	0.8	0.8	0.8
Discharge, lps	=	7.8	13.0	26.0
Discharge, Cum/Hr	=	28.1	46.9	93.8
Kw required	=	2.072	3.458	6.915
HP provided	=	3.0	5.0	9.5
Number of Pumps	=	2	2	2

5.2 PRESSURE SAND FILTER

Number of unit provided	=	2	Nos.
Designed @ 16 hrs working for flow of	=	23.44	m ³ /h
Loading rate	=	12.00	m ³ /m ² /h
Area of DMF	=	1.95	m ²
Dia of DMF	=	1.58	m
Provided	=	1.600	m
Backwash water			
Backwash velocity	=	15.00	m/hr
backwash flowrate	=	29.71	m ³ /h
Backwash volume for 20 mins	=	9.90	m ³

5.3 ACTIVATED CARBON FILTER

Number of unit provided	=	2	Nos.
Designed @ 16 hrs working for flow of	=	23.44	m ³ /h
Loading rate	=	12.00	m ³ /m ² /h
Area of ACF	=	1.95	m ²
Dia of ACF	=	1.58	m
Provided	=	1.600	m
Backwash water			
Backwash velocity	=	15.00	m/hr
backwash flowrate	=	29.71	m ³ /h
Backwash volume for 20 mins	=	9.90	m ³

5.4 CHLORINE DOSING SYSTEM NaOCl DOSING SYSTEM

Average Flow	=	46.88	m ³ /hr
Design Chlorine Dosage (Max)	=	3	mg/l
Concentration of Chlorine in commercially available NaOCl	=	10%	

Design NaOCl Dosage	=	30	mg/l
Operating hours	=	16.0	hr
Quantity of NaOCl required	=	$46.875 \times 30 \times 16 / 1000$	
	=	22.50	Kg/day
Design Strength of NaOCl Solution	=	100%	
Volume of NaOCl Solution	=	$22.5 / (1 \times 1000)$	
	=	0.030	m ³
No. of Dosing Tanks provided	=	1	Nos.
Volume of each Dosing Tank	=	$0.03 / 1$	
	=	0.03	m ³
No. of Working NaOCl Dosing Pump provided	=	1	No.
Capacity of each NaOCl Dosing Pump required	=	$\frac{\text{Total Volume of NaOCl Solution}}{\text{(No. of Dosing pumps)}}$	
	=	$0.03 / (1 \times 16)$	
	=	0.002	m ³ /hr
	=	2.00	LPH
Capacity of each NaOCl Dosing Pump provided	=	2.00	LPH
No. of Standby NaOCl Dosing Pump provided	=	1	No.

SIZING DETAILS (CIVIL)
TIGER BIO FILTER OF 750 KLD CAPACITY

S I. N o	Unit name	N o s	Leng th	Widt h	Height			Soling		PCC		Raft		RCC Wall thk	Bric k Wall thk	Slab Thk	Steel - HCR M/ Kg/C
					SW	FB	Tota	offs	Thk	offs	Thk	offs	Thk				
		N	m	m	m	m	m	m	m	m	m	m	m	m	m		
1	Screen Chamber	1	3.0	0.5	0.3	1.0	1.3	0.2	0.3	0.1	0.1	0.2	0.1	0.1			80
2	Grit Chamber	1	4.0	0.9	0.8	1.3	2.1	0.2	0.3	0.1	0.1	0.2	0.2	0.1			80
3	Raw Sewage Sump	1	5.6	5.6	2.0	1.3	3.3	0.2	0.3	0.1	0.1	0.2	0.3	0.2		0.2	100
4	TBF Bed 50 KLD	1	11.0	4.0			1.2	0.2	0.3	0.1	0.1	0.2	0.1		0.2		60
5	Filter Feed tank	1	5.0	5.0	2.0	0.5	2.5	0.2	0.3	0.1	0.1	0.2	0.2	0.2		0.2	100
6	Filter Platform	1	4.8	4.4				0.2	0.3	0.1	0.1	0.2	0.1				60

Assumptions

Incoming Sewer Invert 1.0 m Below Ground level

Method of excavation Mechanical means

Underground strata		soil	Muru m	Soft roc	har d	Tota l
0.0 to 1.5 m	=	25	25	25	25	100
1.5 m to 3.0 m	=	25	25	25	25	100
3.0 to 4.5 m	=	25	25	25	25	100
4.5 to 6.0	=	25	25	25	25	100

**TIGER BIO FILTER OF 750 KLD CAPACITY
BILL OF QUANTITIES**

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
1	Excavation for foundation / pipe trenches in earth, soils of all types, sand, gravel and soft murum, including removing the excavated material upto a distance of 50 metres and lifts as below, stacking and spreading as directed, normal dewatering, preparing the bed for foundation and excluding backfilling, etc. complete. (Bd-A-1/259)				
	0.0 to 1.5 m	207.29	Cum	150.00	31,093.50
	1.5 to 3.0 m	56.75	Cum	164.00	9,307.00
	3.0 to 4.5 m	20.20	Cum	178.00	3,595.60
	4.5 to 6.0 m	0.00	Cum	192.00	0.00
	MJP/ SSR/ 2021-22 / Section E / Excavation Item No.1/ Page no. 42				
2	Excavation for foundation / pipe trenches in hard murum and boulders, W.B.M. road including removing the excavated material upto a distance of 50 M beyond the area and lifts as below, stacking and spreading as directed by Engineer-in-charge, normal dewatering, preparing the bed for foundation and excluding backfilling, etc. complete. (Bd-A-3/259)			8.00	
	0.0 to 1.5 m	207.29	Cum	192.00	39,799.70
	1.5 to 3.0 m	56.75	Cum	206.00	11,690.50
	3.0 to 4.5 m	20.20	Cum	220.00	4,444.00
	4.5 to 6.0 m	0.00	Cum	234.00	0.00
	MJP/ SSR/ 2021-22/ Section E/ Excavation Item No.3, Page no. 42				
3	Excavation for foundation / pipe trenches in soft rock and old cement and lime masonry foundation asphalt road including removing the excavated material upto a distance of 50 M beyond the area and lifts as below, stacking as directed by Engineer-in-charge, normal dewatering, preparing the bed for foundation and excluding backfilling, etc. complete. (Bd-A- 4/259)				
	0.0 to 1.5 m	207.29	Cum	572.00	118,569.90
	1.5 to 3.0 m	56.75	Cum	597.00	33,879.80
	3.0 to 4.5 m	20.20	Cum	622.00	12,564.40
	4.5 to 6.0 m	0.00	Cum	647.00	0.00
	MJP/ SSR/ 2021-22 / Section E/ Excavation Item No.5, Page no. 42				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
4	Excavation for foundation / pipe trenches in hard rock and concrete road by chiselling, wedging, line drilling by mechanical means or by all means other than blasting including trimming and levelling the bed, removing the excavated material upto a distance of 50 metres beyond the area and lifts as below, stacking as directed by Engineer-in-charge, normal dewatering, excluding backfilling, etc. complete by all means. (Bd-A-6/259)				
	0.0 to 1.5 m	207.29	Cum	1,017.00	210,814.00
	1.5 to 3.0 m	56.75	Cum	1,042.00	59,133.50
	3.0 to 4.5 m	20.20	Cum	1,067.00	21,553.40
	4.5 to 6.0 m	0.00	Cum	1,092.00	0.00
	MJP/ SSR/ 2021-22 / Section E/ Excavation Item No.7, Page no. 43				
5	Providing dry trap/ granite/ quartzite/ gneiss, rubble stone soling in 15 cm to 20 cm thick layers including hand packing and compacting, etc. complete. (Bd-A-12/264)	346.47	Cum	1,175.00	407,102.30
	MJP/ SSR/ 2021-22 / Section E/ Excavat				
6	Providing and laying in situ Cement Concrete M- 15 of trap/ granite / quartzite / gneiss metal for foundation and bedding including bailing out water, form work, compaction, curing, etc. complete. (Cement 5.90 bags / cum) Spec. No. - Bd E /1 Page No. 287 and B- 7, Page No. 38	103.89	Cum	5,640.00	585,939.60
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.1, Page no.49				
7	Providing and laying in situ Cement Concrete of trap/ granite / quartzite / gneiss metal for RCC work in foundation like raft, grillage, strip foundation and footing of RCC columns and steel stanchions including normal dewatering, form work, compaction, finishing and curing, etc. complete. (By weigh batching and mix design for M250 and M-300 only. Use of L&T, A.C.C., Ambuja, Birla Gold, Manikgad, Rajashree, etc. cement is permitted.) (Excluding M.S. or Tor reinforcement)	111.33	Cum	7,448.00	829,185.90
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE/ Item No.2, Page no. 49				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
8	Providing and casting in situ C.C. of trap / granite/ quartzite / gneiss metal of approved quality for RCC works as per detailed drawings and designs or as directed by Engineer-in- charge including normal dewatering, centering, form work, compaction, finishing the formed surfaces with C.M. 1:3 of sufficient minimum thickness to give a smooth and even surface wherever necessary or roughening if special finish is to be provided and curing, etc. complete. (By weigh batching and mix design for M-250 and M-300 only. Use of L&T, A.C.C., Ambuja, Birla Gold, Manikgad, Rajashree, etc. cement is permitted.) (Excluding M.S. or Tor reinforcement)	1.28	Cum	8,624.00	11,038.80
	For Beams / Braces / Lintels In RCC M-300				
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.4, Page no. 50				
9	Providing and casting in situ C.C. of trap / granite/ quartzite / gneiss metal of approved quality for RCC works as per detailed drawings and designs or as directed by Engineer-in- charge including normal dewatering, centering, form work, compaction, finishing the formed surfaces with C.M. 1:3 of sufficient minimum thickness to give a smooth and even surface wherever necessary or roughening if special finish is to be provided and curing, etc. complete. (By weigh batching and mix design for M-250 and M-300 only. Use of L&T, A.C.C., Ambuja, Birla Gold, Manikgad, Rajashree, etc. cement is permitted.) (Excluding M.S. or Tor reinforcement)	12.82	Cum	9,247.00	118,546.60
	Slabs / Landings / Vertical Walls / Waist Slabs / Steps for Staircase In RCC M-300				
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.5, / Page no. 50				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
10	Providing and casting in situ C.C. of trap / granite/ quartzite / gneiss metal of approved quality for RCC works as per detailed drawings and designs or as directed by Engineer-in- charge including normal dewatering, centering, form work, compaction, finishing the formed surfaces with C.M. 1:3 of sufficient minimum thickness to give a smooth and even surface wherever necessary or roughening if special finish is to be provided and curing, etc. complete. (By weigh batching and mix design for M-250 and M-300 only. Use of L&T, A.C.C., Ambuja, Birla Gold, Manikgad, Rajashree, etc. cement is permitted.) (Excluding M.S. or Tor reinforcement)	36.48	Cum	9,218.00	336,272.70
	Chajjas / Parapets / Curtain Walls /Partition Walls / Pardies In RCC M-300				
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.6 / Page no. 51				
11	Providing and fixing in position steel bar reinforcement of various diameters for RCC piles, caps, footings, foundations, slabs, beams, columns, canopies, staircases, newels, chajjas, lintels, pardies, copings, fins, arches, etc. as per detailed designs, drawings and schedules; including cutting, bending, hooking the bars, binding with wires or tack welding and supporting as required, etc. complete (including cost of binding wire). (Bd-F-17/306)				
	c) Corrosion Resistant Steel (Fe 500)	12.59	MT	70,658.00	889,584.30
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.8 / Page no. 52				
12	Providing and fixing mild steel grill work for windows/ ventilators of 20 Kg/Sqm. As per drawings including necessary welding and painting with one coat of anticorrosive paint and two coats of oil painting, etc. complete. (Bd-U- 1/537)	9.80	Sqm	1,895.00	18,571.00
	MJP/ SSR/ 2021-22 / SECTION - F : IRON AND STRUCTURAL STEEL WORK Item No.1 / Page				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
13	Providing structural steel work in rolled stanchions fixed with connecting plates or angle cleats as in main and cross beams, hip and jack rafters, purlins connecting to truss members and like as per detailed designs and drawings or as directed by Engineer-in-charge including cutting, fabricating, hoisting, erecting, fixing in position, making riveted / bolted / welded connections and one coat of anticorrosive paint and over it two coats of oil painting, etc. complete. (Bd-C- 3/275)	11.21	MT	71,286.00	798,802.50
	MJP/ SSR/ 2021-22 / SECTION - F :: IRON AND STRUCTURAL STEEL WORK Item No.3,				
14	Providing and fixing corrugated galvanised iron sheets of 0.63 mm thick (24B .W .G.) for roofing without wind tiles including fastening with galvanised iron screws and bolts , lead and bitumen washers as per drawing etc. complete. (Weight of 5.5 kg/sq.m.).	1131.00	Sqm	777.00	878,787.00
	PWD / SSR 2020-21 / Roofing and Ceiling SSR Item No.38.04 Reference No. Bd.R.5, Page No. 453 Item No.1133, Page no. 224				
15	Providing fly ash brick masonry with conventional / I.S. type bricks in cement mortar 1:6 in superstructure including striking joints, raking out joints, watering and scaffolding etc. Complete	223.05	Cum	6,305.00	1,406,330.30
	PWD / SSR 2020-21 / Brick Masonry SSR Item No.27.13 Reference No. As director by engineer incharge and BDG- 2 and 5 Item No.893, Page no. 190				
16	Providing internal cement plaster 12 mm thick in single coat in cement mortar 1:5 without neeru finish to concrete or brick surfaces, in all positions including scaffolding and curing etc. complete.	1224.75	Sqm	257.00	314,760.80
	PWD / SSR 2020-21 / Plastering and Pointing SSR Item No. 32.03 Reference No. Bd. L.2 Page No. 368 Item No.950, Page no. 201				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
17	Providing rough cast cement plaster externally in two coats to concrete, brick or stone masonry surfaces in all positions with base coat of 12 to 15 mm thick in C.M. 1:4 and rough cast treatment 12 mm thick in proportion 1:11 / 2:3 including scaffolding and fourteen days curing complete.	712.50	Sqm	529.00	376,912.50
	PWD / SSR 2020-21 / Plastering and Pointing SSR Item No. 32.12 Reference No. Bd.L.8 Page No. 370 Item No.957, Page no. 201				
18	Providing and applying white-wash in two coats on old / new plastered or masonry surfaces and asbestos cement sheets including scaffolding and preparing the surface by brushing and brooming down etc. complete.	712.50	Sqm	10.00	7,125.00
	PWD / SSR 2020-21 / Colouring SSR Item No. 36.03 Reference No. Bd. P. I Page No. 411				
19	Providing and applying colour-wash of approved colour and shade in one coat to new surface including scaffolding, brushing and brooming down (excluding base coats of white wash) etc. complete.	712.50	Sqm	8.00	5,700.00
	PWD / SSR 2020-21 / Colouring SSR Item No. 36.04 Reference No. Bd. P.2 Page No. 412				
20	Dewatering the excavated trenches and pools of water in the building trenches / pipeline trenches, well works by using pumps and other devices including disposing off water to safe distance as directed by Engineer-in-charge (including cost of machinery, labour, fuel), etc. complete. (Bd-A-9/261)	96.00	HP/ Hr.	77.00	7,392.00
	MJP/ SSR/ 2021-22 / Section E/ Excav				
21	Refilling the trenches with available excavated stuff with soft material first over pipeline and then hard material in 15 cm layers with all leads and lifts including consolidation, surcharging, etc. complete.	369.87	Cum	84.00	31,069.10
	MJP/ SSR/ 2021-22 / Section E/ Excav				
22	Transportation as per STATEMENT VI Including loading, unloading and stacking Earth (4.8 Cum) lead 15 Km	1073.60	Cum	604.45	648,937.60

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
	Electromechanical Items				
23	Screen (Manual) of size 1.8 m length x 0.5 m width of SS 304 MOC and Manual hand rake for cleaning screen of SS handle 1 m in length and cleaning area of 6 nos 5 mm SS rod of total length 200 mm straight and 50 mm of 90 degree bend.	0.90	Sqm	35,000.00	31,500.00
24	Grit pump				
	Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below				
	MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION - Pumps, Page no. 6, 7 of size 1.8 m length				
	1 HP (Up to 9000 LPH)	1.00	No	68,654.00	68,654.00
25	Raw Sewage Pumps				
	Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below				
	MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION -				
	7.5 HP (Up to 72000 LPH)	2.00	Nos	109,079.00	218,158.00
26	TTU Feed pumps				
	Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below				
	MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION -				
	7.5 HP (Up to 72000 LPH)	2.00	Nos	109,079.00	218,158.00
27	Pressure Sand Filter of FRP / MSEP vessel with suitable thickness to withstand a water pressure including MPV or 5 Valve system and PVC / UPVC / MSEP interconnecting and underdrain piping including fittings, with standard filter media layer with minimum depth of filter sand 1.0 m supported by gravels. The piping arrangement should provide sufficient pressure for backwash operations and avoid loss of sand during backwash operation. Suitable openings to be provided to ease addition and removal the media.				
	Dia 1.6 m x 2 m minimum height	2.00	Nos	454,000.00	908,000.00

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
28	Activated Carbon Filter of FRP / MSEP vessel with suitable thickness to withstand a water pressure including MPV or 5 Valve system and PVC / UPVC / MSEP interconnecting and underdrain piping including fittings, with standard filter media layer with minimum depth of Activated Carbon 1.0 m supported by gravels. The piping arrangement should provide sufficient pressure for backwash operations and avoid loss of Activated carbon during backwash operation. Suitable openings to be provided to ease addition and				
	Dia 1.6 m x 2 m minimum height	2.00	Nos	454,000.00	908,000.00
29	NaOCl Chlorinator Pump Diaphragm Type / peristaltic type / Solenoid Max Flow Rate Upto 10LPH Power Source Electric Phase Single Material PP / PTFE(Teflon) Voltage 230 Volt Frequency				
	Mixing Tank of 100 Ltrs capacity	100.00	Ltrs	8.00	800.00
	Dosing Pump	2.00	Nos	15,000.00	30,000.00
30	Control Panel				
	Design, Supply, Installing, Commissioning & Testing of Master PLC control monitoring and communication panel as per IEC 61131 at Pure Water Sump suitable for monitoring and control of pure water Pumps. Pressure Transmitters, Level Transmitter, PH Transmitter, Turbidity Transmitter ,for all pumps installed.	1.00	No	50,041.00	50,041.00
	MJP/ MECH/ ELECT / SSR/ 2021-22/ SECTION 19 - SA [SCADA & AUTOMATION]				
31	Supplying and erecting Fully Automatic Star Delta starter to operate squirrel cage induction motor working on 380- 440 Volt, 3 phase, 50 Hz with no volt coil, over load element, and ON - OFF push buttons, with necessary material and connected to supply, etc complete. Starter with original sheet steel encloser.				
	> 7.5 HP & Up to 12.5 HP	6.00	nos	7,150.00	42,900.00

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
	MJP /MECH/ ELECT/ SSR/ 2021-22 SECTION 10 - LG [L.T. SWITCHGEAR AND PROTECTION] Item no. LG 3 Page no. 27				
32	Main power supply cable 3 core PVC insulated, PVC sheathed copper conductor flat submersible cable Supplying and erecting, Flat flexible submersible cable with, Copper Conductor, PVC insulated, and PVC sheathed.				
	3 core 16 sq mm	25.00	m	549.00	13,725.00
33	Power cables Aluminium conductor 4 Core, XLPE / PVC insulated & armoured cable Supplying and erecting, XLPE / PVC insulated, armoured cable 1100 V grade with ISI mark Four core, solid / stranded aluminium conductor with 6 mm thick 25 mm width M.S. spacer with G.I. Earth wire 6 sq mm, complete erected on wall / on pole with 25 X 3 mm M.S. clamps or in provided trench in an approved				
	4 Core 6 sq mm	140.00	m	137.00	19,180.00
	MJP MECH/ ELECT/ SSR/ 2021-22 SECTION 12 - CB [L.T. CABLE] Item no. CB 6 Page				
34	Control Cables Copper conductor PVC insulated, Unarmoured control cable Supplying and erecting Un-armoured control cable with ISI mark stranded / solid copper conductor 1.1 kV grade complete erected on wall / panel or in provided trench in an approved manner.				
	4 core 2.5 sq mm	140.00	m	137.00	19,180.00
	MJP MECH/ ELECT/ SSR/ 2021-22/ SECTION 12 - CB [L.T. CABLE] Item no. CB 8-				

Plumbing Items					
Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
35	Providing and supplying in standard lengths ISI mark rigid unplasticised PVC pipes suitable for potable water with solvent cement joints including cost of couplers, as per IS specification no. 4985 / 1988 excluding GST levied by GOI and GOM in all respect, including transportation, freight charges, inspection charges, loading, unloading, conveyance to the departmental stores and stacking the same in closed shed duly protected from sun rays and rains including cost of jointing material i.e. solvent cement, etc. complete (selffit type to be jointed with cement solvent).				
	1) 10% of cost of pipes shall be considered for cost of PVC specials for estimate purpose only. 2) One coupler and required cement solvent shall be provided with each full length pipe cost of which is included in rates below.				
	MJP/ SSR/ 2021-22 / SECTION – I(II) P.V.C. PIPES, Page no.77				
1	Raw Sewage pump to TBF Distribution				
a	Main header				
	140 mm.	55.00	m	693.00	38,115.00
	PVC Specials- 10%				3,811.50
b	Distribution				
	110 mm.	75.00	m	428.00	32,100.00
	PVC Specials- 10%				3,210.00
2	TBF collection to FFT (gravity)				
a	Main header				
	140 mm.	150.00	m	693.00	103,950.00
	PVC Specials- 10%				10,395.00
b	collection tributary				
	75 mm.	25.00	m	211.00	5,275.00
	PVC Specials- 10%				527.50
3	TTU Plumbing				
	140 mm.	30.00	m	693.00	20,790.00
	PVC Specials- 10%				2,079.00
4	TBF distribution				
	63 mm.	75.00	m	149.00	11,175.00
	PVC Specials- 10%				1,117.50
36	Labour				
	Plumber	20.00	days	641.00	12,820.00
	Helper	60.00	days	579.00	34,740.00

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
	MJP/ SSR/ 2021-22 / SECTION - B LABOUR & MACHINERY , Page no. 14				
37	Providing double flange sluice valve confirming for IS- 14846 including worn gear arrangements as per test pressure, stainless steel spindle, caps, including inspection charges, transportation upto departmental store, unloading, stacking excluding GST levied by GOI & GOM in all respect etc. complete.				
	Sluice valves - PN -1 (Without by pass)				
	Raw Sewage pump				
	150 mm.	2.00	Nos	10,251.00	20,502.00
	Filter Feed Pump				
	150 mm.	2.00	Nos	10,251.00	20,502.00
	MJP/ SSR/ 2021-22 / SECTION - I(XII) : PIPES APPURTENANCES , Page no. 132				
38	Providing and supplying ISI mark CI D/F reflux valves (non-return valves) of following dia including railway freight, inspection charges, unloading from railway wagon, loading into truck, transportation upto departmental stores, unloading, stacking excluding GST levied by GOI & GOM in all respect etc. complete. Reflux valves as per I.S.5312 Part I (1984)				
	Without by pass arrangement -PN -1				
	Raw Sewage pump				
	150 mm.	2.00	Nos	9,876.00	19,752.00
	Filter Feed Pump				
	150 mm.	2.00	Nos	9,876.00	19,752.00
	MJP/ SSR/ 2021-22 / SECTION - I(XII) : PIPES APPURTENANCES , Page no. 131				
	Bio media Items				
39	Supplying of Specially designed container for holding Filter media including Lightweight Expanded Clay Aggregates size (8-30 mm) and Bio media including mixture of woodchips Vermicompost, cocopeat and bacterial culture with special worms per designed quantity including transportation & fixing in position as directed etc. complete.	1080.00	Nos	4,750.00	5,130,000.00
	Market rate				
40	Rapid sand Gravity filter sand At Source (Godhara, Gokak, Kanhan,	102.73	Cum	1,730.00	177,722.90
	MJP/ SSR/ 2021-22 / SECTION- A MATERIALS				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
41	Trasnsportation Godhara to Pune distance by Road 660 Km.	102.73	Cum	11,031.37	1,133,252.70
	MJP/ SSR/ 2021-22 / SECTION - C : TRANSPORTATION Page no.				
42	Stone Aggregate 20 mm	102.73	Cum	900.00	92,457.00
	MJP/ SSR/ 2021-22 / SECTION- A MATERIALS				
43	Transportation as per STATEMENT VI Including loading, unloading and stacking				
	Manure or sludge (5.52 Cum) lead 25 Km	396.75	Cum	747.48	296,562.70
	MJP/ SSR/ 2021-22 / SECTION - C : TRANSPORTATION Page no.				
NET TOTAL Rs.					17,947,408.10

MEASUREMENT SHEET - SCREEN CHAMBER, GRIT CHAMBER AND RAW SEWAGE SUMP

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
Screen And Grit chamber							
1	Excavation				2.70		
A	0.0 to 1.5 m	1	7.20	3.10	1.5	33.48	Cum
	soil					8.37	Cum
	Murum					8.37	Cum
	Soft rock					8.37	Cum
	hard rock					8.37	Cum
B	1.5 to 3.0 m	1	7.2	3.10	1.2	26.79	Cum
	soil					6.7	Cum
	Murum					6.7	Cum
	Soft rock					6.7	Cum
	hard rock					6.7	Cum
C	3.0 to 4.5 m	1	6.2	2.60	0	0	Cum
	soil					0	Cum
	Murum					0	Cum
	Soft rock					0	Cum
	hard rock					0	Cum
D	4.5 to 6.0 m	1	6.2	2.60	0	0	Cum
	soil					0	Cum
	Murum					0	Cum
	Soft rock					0	Cum
	hard rock					0	Cum
2	Soling						
	Screen	1	4.20	1.20	0.30	1.52	Cum
	Grit	1	5.20	0.90	0.30	1.41	Cum
	extra for grit chamber	1	1.00	0.60	0.30	0.18	Cum
					Total for grit	1.59	Cum
3	PCC M20						
	Screen	1	3.80	1.00	0.10	0.38	Cum
	Grit	1	4.80	0.90	0.10	0.44	Cum
		1	1.00	0.40	0.20	0.08	Cum
	Internal slope	1	Area	0.31	0.90	0.28	Cum
	Internal slope	1	Area	0.16	0.90	0.14	Cum
					Total for grit	0.94	Cum
4	Raft M30						
	Screen	1	3.60	0.90	0.15	0.49	Cum
	Grit	1	4.60	0.90	0.20	0.83	Cum
		1	1.00	0.30	0.20	0.06	Cum
					Total for grit	0.89	Cum
5	RCC Wall						
	Screen						
	Long Wall	2	3.20	0.10	1.50	0.96	Cum

MEASUREMENT SHEET - SCREEN CHAMBER, GRIT CHAMBER AND RAW SEWAGE SUMP

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	Short Wall	2	0.70	0.10	1.50	0.21	Cum
				Total for screen		1.17	Cum
	Grit						
	Long Wall (extra than screen chamber)	1	1.00	0.10	2.30	0.23	Cum
	Short Wall	2	0.90	0.10	2.30	0.42	Cum
				Total for grit		0.65	Cum
6	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	80	Cum	3.2	0.26	MT
7	Fabrication work in Frame and Grating for Access						
	Screen	1	3.20	0.70		2.24	Sqm
	Grit	1	4.20	1.00		4.2	Sqm
					Total	6.44	Sqm
8	Removing excess excavated material out of site						
	Screen chamber	1	3.20	0.70	1.30	2.92	Cum
	Grit Chamber	1	4.20	0.90	2.10	7.94	Cum
	soling, PCC, Raft volume					5.39	Cum
	Total Volume					16.25	Cum
	bulkage @ 40%					22.75	Cum
9	Refilling and compaction						
	Total Excavation					60.27	Cum
	Deduction for tank volume, soling, PCC, Raft					16.25	Cum
	Refilling and compaction volume					44.02	Cum

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	Raw Sewage Sump						
1	Excavation				4.00		
A	0.0 to 1.5 m	1	9.7	9.70	1.5	141.14	Cum
	soil					35.29	Cum
	Murum					35.29	Cum
	Soft rock					35.29	Cum
	hard rock					35.29	Cum
B	1.5 to 3.0 m	1	8.70	8.70	1.5	113.54	Cum
	soil					28.39	Cum
	Murum					28.39	Cum
	Soft rock					28.39	Cum
	hard rock					28.39	Cum
C	3.0 to 4.5 m	1	8.70	8.70	1	75.69	Cum

MEASUREMENT SHEET - SCREEN CHAMBER, GRIT CHAMBER AND RAW SEWAGE SUMP

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	soil					18.93	Cum
	Murum					18.93	Cum
	Soft rock					18.93	Cum
	hard rock					18.93	Cum
D	4.5 to 6.0 m	1	7.70	7.70	0	0	Cum
	soil					0	Cum
	Murum					0	Cum
	Soft rock					0	Cum
	hard rock					0	Cum
2	Soling						
	RSS	1	7.10	7.10	0.30	15.13	Cum
3	PCC M20						
	RSS	1	6.70	6.70	0.10	4.49	Cum
4	Raft M30						
	RSS	1	6.50	6.50	0.30	12.68	Cum
5	RCC Wall						
	Long Wall	2	6.10	0.25	3.50	10.68	Cum
	Short Wall	2	5.60	0.25	3.50	9.8	Cum
					Total	20.48	Cum
6	Beams						
	Beam 1	1	5.60	0.2	0.3	0.34	Cum
	Beam 2	1	5.60	0.2	0.3	0.34	Cum
					Total	0.68	Cum
7	Slab	1	6.10	6.10	0.2	7.45	Cum
	Deduction for manhole	-2	1.20	0.70	0.2	-0.34	Cum
					Total	7.11	Cum
8	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	100	Cum	40.95	4.1	MT
9	Fabrication work in Frame and Grating for Access						
	RSS	2	1.20	0.70		1.68	Sqm
10	Removing excess excavated material out of site						
	RSS	1	6.10	6.10	3.30	122.8	Cum
	soling, PCC, Raft volume					32.3	Cum
	Total Volume					155.1	Cum
	bulkage @ 40%					217.14	Cum
11	Refilling and compaction						

MEASUREMENT SHEET - SCREEN CHAMBER, GRIT CHAMBER AND RAW SEWAGE SUMP

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	Total Excavation					330.37	Cum
	Deduction for tank volume, soling, PCC, Raft					155.1	Cum
	Refilling and compaction volume					175.27	Cum
12	Dewatering						
	12 Days x 4 hours/day	days	12	hours / day	4	48	Hrs

MEASUREMENT SHEET - TIGER BIO FILTER

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	TIGER BIO FILTER						
1	Excavation				0.50		
A	0.0 to 1.5 m	1	12.66	5.66	0.5	35.83	Cum
	soil					8.96	Cum
	Murum					8.96	Cum
	Soft rock					8.96	Cum
	hard rock					8.96	Cum
2	Soling						
	TBF	1	12.46	5.46	0.30	20.41	Cum
3	PCC M20						
	TBF	1	12.06	5.06	0.10	6.11	Cum
4	Raft M30						
	TBF	1	11.86	4.86	0.10	5.77	Cum
5	Brick Wall						
	TBF						
	Long Wall	2	11.46	0.23	1.20	6.33	Cum
	Short Wall	2	4.00	0.23	1.20	2.21	Cum
	Crate Support Wall	5	11.00	0.23	0.50	6.33	Cum
						Total for T	14.87
							Cum
6	Plaster						
	Internal						
	Crate Support Wall						
	Long Wall	6	11.00		0.50	33	Sqm
	Wall top	5	11.00		0.23	12.65	Sqm
	Long Wall	2	11.00		1.20	26.4	Sqm
	Short Wall	2	4.00		1.20	9.6	Sqm
						Total	81.65
							Sqm
	External						
	Long Wall	2	11.46		1.20	27.51	Sqm
	Short Wall	2	4.46		1.20	10.71	Sqm
	Wall Top	1	30.92	0.3		9.28	Sqm
						Total	47.50
							Sqm
7	External-white-wash	1				47.50	Sqm
8	External-colour-wash	1				47.50	Sqm
9	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	60	Cum	5.77	0.35	MT
10	Removing excess excavated material out of site						
	soling, PCC, Raft volume					32.29	Cum
	Total Volume					32.29	Cum
	bulkage @ 40%					45.21	Cum

MEASUREMENT SHEET - TIGER BIO FILTER

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
11	Refilling and compaction						
	Total Excavation					35.83	Cum
	Deduction for tank volume, soling, PCC, Raft					32.29	Cum
	Refilling and compaction volume					3.54	Cum
12	MS Fabricated Shed						
	TBF-II Shed in Fabrication work Shed Size-12 m X 5 m x		12.00	5.00	3.00		
	for column 50*50*5 Unit Weight 6.97 kg/m	10	3.00	6.97	kg/m	209.10	KG
	for truss 50*50*3 Unit Weight 3.71 kg/m	5	5.00	3.71	kg/m	92.75	KG
	for principle rafter 50*50*3 Unit Weight	10	2.90	3.71	kg/m	107.59	KG
	for strut rafter 50*50*3 Unit Weight 3.71 kg/m	10	0.20	3.71	kg/m	7.42	KG
	for central strut rafter 50*50*3 Unit Weight	5	0.30	3.71	kg/m	5.57	KG
	for bottom frame below truss 50*50*3 Unit Weight 3.71 kg/m	1	34.00	3.71	kg/m	126.14	KG
	for perlin 30*30*3 Unit Weight 2.51 kg/m	5	13.00	2.51	kg/m	163.15	KG
	for Base Plate 150*150*10 mm	20	0.15	0.15	0.010	35.33	KG
					Total Wei	747.04	Kg
						0.75	MT
13	corrugated galvanised iron sheets	2	13.00	2.90		75.4	Sqm

MEASUREMENT SHEET - FILTER FEED TANK

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
8	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	100	Cum	27.46	2.75	MT
9	Fabrication work in Frame and Grating for Access						
	FFT	2	1.20	0.70		1.68	Sqm
10	Removing excess excavated material out of site						
	FFT	1	5.50	5.50	2.50	75.63	Cum
	soling, PCC, Raft volume					23.38	Cum
	Total Volume					99.01	Cum
	bulkage @ 40%					138.62	Cum
11	Refilling and compaction						
	Total Excavation					190.11	Cum
	Deduction for tank volume, soling, PCC, Raft					99.01	Cum
	Refilling and compaction volume					91.1	Cum
12	Dewatering						
	12 Days x 4 hours/day	days	12	hours/day	4	48	Hrs

MEASUREMENT SHEET - FILTER PLATFORM

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	FILTER PLATFORM						
1	Excavation				0.55		
A	0.0 to 1.5 m	1	6.0	5.60	0.55	18.48	Cum
	soil					4.62	Cum
	Murum					4.62	Cum
	Soft rock					4.62	Cum
	hard rock					4.62	Cum
2	Soling						
	Filter Platform	1	5.80	5.40	0.30	9.4	Cum
3	PCC M20						
	Filter Platform	1	5.40	5.00	0.10	2.7	Cum
4	Raft M30						
	Filter Platform	1	5.20	4.80	0.15	3.75	Cum
5	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	60	Cum	3.75	0.23	MT
6	Removing excess excavated material out of site						
	soling and PCC volume					12.1	Cum
	Total Volume					12.1	Cum
	bulkage @ 40%					16.94	Cum
7	Refilling and compaction						
	Total Excavation					18.48	Cum
	Deduction for tank volume, soling, PCC, Raft					12.1	Cum
	Refilling and compaction volume					6.38	Cum

MEASUREMENT SHEET - ELECTROMECHANICAL WORKS

Sr. No.	Item Description	Nos.	Unit
1	Screen (Manual) of size 1.8 m length x 0.5 m width of SS 304 MOC and Manual hand rake for cleaning screen of SS handle 1 m in length and cleaning area of 6 nos 5 mm SS rod of total length 200 mm straight and 50 mm of 90 degree bend.	1	No
2	Grit pump Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION - Pumps, Page no. 6, 7 of size 1.8 m length x 0.5 m width of SS304 MOC 1 HP (Up to 9000 LPH)	1	No
3	Raw Sewage Pumps Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION - Pumps, Page no. 6, 7 7.5 HP (Up to 72000 LPH)	2	Nos
4	TTU Feed pumps Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION - Pumps, Page no. 6, 7 7.5 HP (Up to 72000 LPH)	2	Nos
5	Pressure Sand Filter of FRP / MSEP vessel with suitable thickness to withstand a water pressure including MPV or 5 Valve system and PVC / UPVC / MSEP interconnecting and underdrain piping including fittings, with standard filter media layer with minimum depth of filter sand 1.0 m supported by gravels. The piping arrangement should provide sufficient pressure for backwash operations and avoid loss of sand during backwash operation. Suitable openings to be provided to ease addition and removal the media. Dia 1.6 m x 2 m minimum height	2	Nos
6	Activated Carbon Filter of FRP / MSEP vessel with suitable thickness to withstand a water pressure including MPV or 5 Valve system and PVC / UPVC / MSEP interconnecting and underdrain piping including fittings, with standard filter media layer with minimum depth of Activated Carbon 1.0 m supported by gravels. The piping arrangement should provide sufficient pressure for backwash operations and avoid loss of Activated carbon during backwash operation. Suitable openings to be provided to ease addition and removal the media. Dia 1.6 m x 2 m minimum height	2	Nos
7	PurAll Tablet Chlorinator + cartridge	0	nos

MEASUREMENT SHEET - ELECTROMECHANICAL WORKS

Sr. No.	Item Description	Nos.	Unit
7	NaOCl Chlorinator Pump Diaphragm Type / peristaltic type / Solenoid Max Flow Rate Upto 10LPH Power Source Electric Phase Single Material PP / PTFE(Teflon) Voltage 230 Volt Frequency 50Hz		
a	Mixing Tank of 100 Ltrs capacity	1	Nos
b	Dosing Pump	2	Nos
8	Control Panel		
	Design, Supply, Installing, Commissioning & Testing of Master PLC control monitoring and communication panel as per IEC 61131 at Pure Water Sump suitable for monitoring and control of pure water Pumps. Pressure Transmitters, Level Transmitter, PH Transmitter, Turbidity Transmitter ,for all pumps installed.		
	Master PLC Panel	1	No
	MJP/ MECH/ ELECT / SSR/ 2021-22/ SECTION 19 - SA [SCADA & AUTOMATION] Item no. 2.7 Page no. 72		
9	Supplying and erecting Fully Automatic Star Delta starter to operate squirrel cage induction motor working on 380- 440 Volt, 3 phase, 50 Hz with no volt coil, over load element, and ON - OFF push buttons, with necessary material and connected to supply, etc complete. Starter with original sheet steel encloser.		
	> 7.5 HP & Up to 12.5 HP	6	nos
	1 nos extra starter considered as spare.		
	MJP /MECH/ ELECT/ SSR/ 2021-22 SECTION 10 - LG [L.T. SWITCHGEAR AND PROTECTION] Item no. LG 3 Page no. 27		
10	Main power supply cable		
	3 core PVC insulated, PVC sheathed copper conductor flat submersible cable		
	Supplying and erecting, Flat flexible submersible cable with, Copper Conductor, PVC insulated, and PVC sheathed.		
	3 core 16 sq mm	25	m
11	Power cables		
	Aluminium conductor 4 Core, XLPE / PVC insulated & armoured cable		
	Supplying and erecting, XLPE / PVC insulated, armoured cable 1100 V grade with ISI mark Four core, solid / stranded aluminium conductor with 6 mm thick 25 mm width M.S. spacer with G.I. Earth wire 6 sq mm, complete erected on wall / on pole with 25 X 3 mm M.S. clamps or in provided trench in an approved manner.		
	4 Core 6 sq mm	140	m
	MJP MECH/ ELECT/ SSR/ 2021-22 SECTION 12 - CB [L.T. CABLE] Item no. CB 6 Page no. 35		
12	Control Cables		
	Copper conductor PVC insulated, Unarmoured control cable		

MEASUREMENT SHEET - ELECTROMECHANICAL WORKS

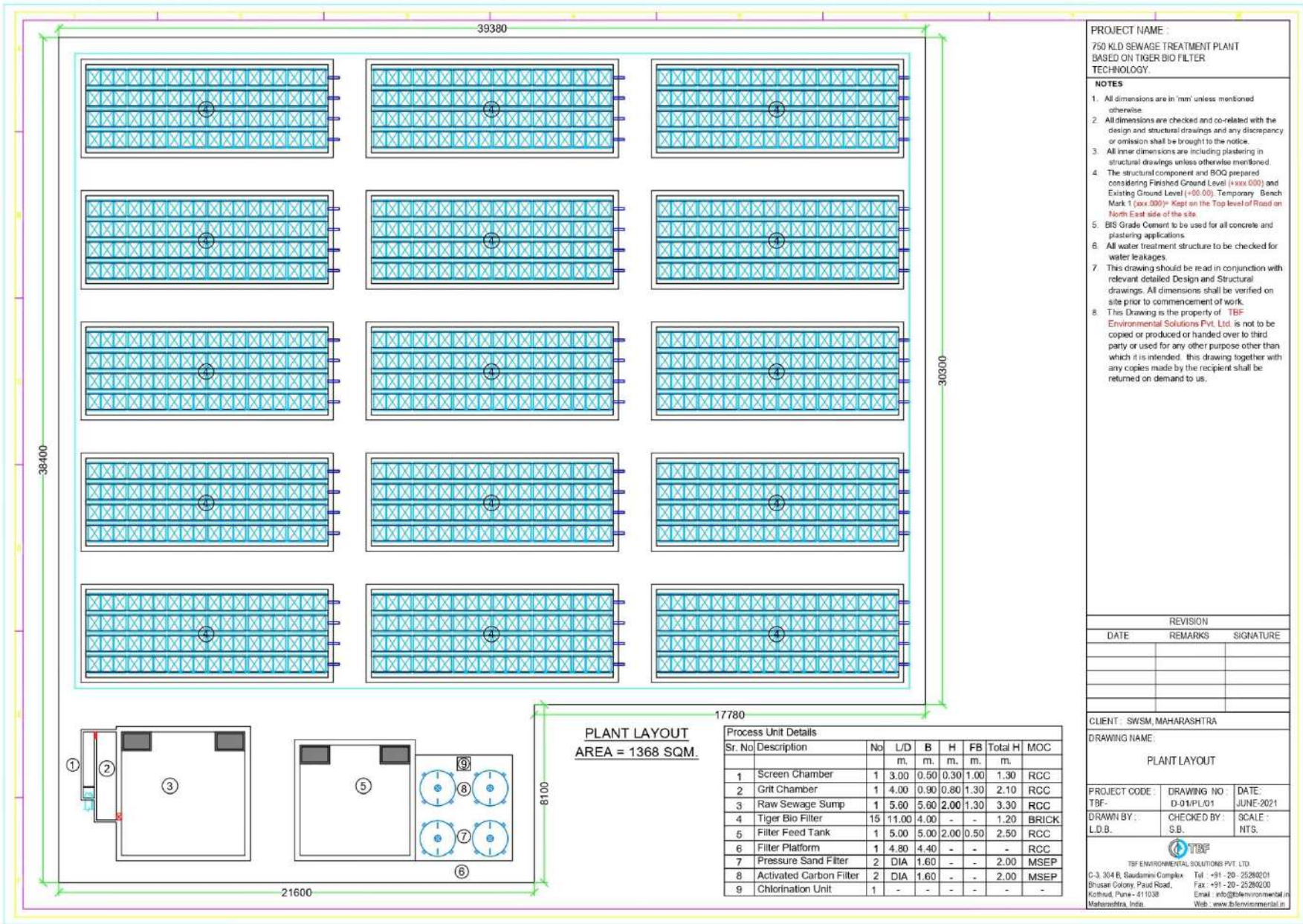
Sr. No.	Item Description	Nos.	Unit
	Supplying and erecting Un-armoured control cable with ISI mark stranded / solid copper conductor 1.1 kV grade complete erected on wall / panel or in provided trench in an approved manner.		
	4 core 2.5 sq mm	140	m
	MJP MECH/ ELECT/ SSR/ 2021-22/ SECTION 12 - CB [L.T. CABLE] Item no. CB 8-2 Page no. 36		

MEASUREMENT SHEET - PLUMBING

Sr. No.	Item Description	Nos.	L (m)	B (m)	Quantity	Unit
	Providing and supplying in standard lengths ISI mark rigid unplasticised PVC pipes suitable for potable water with solvent cement joints including cost of couplers, as per IS specification no. 4985 / 1988 excluding GST levied by GOI and GOM in all respect, including transportation, freight charges, inspection charges, loading, unloading, conveyance to the departmental stores and stacking the same in closed shed duly protected from sun rays and rains including cost of jointing material i.e. solvent cement, etc. complete (selffit type to be jointed with cement solvent).					
	1) 10% of cost of pipes shall be considered for cost of PVC specials for estimate purpose only. 2) One coupler and required cement solvent shall be provided with each full length pipe cost of which is included in rates below.					
	MJP/ SSR/ 2021-22 / SECTION – I(II) P.V.C. PIPES,					
1	Raw Sewage pump to TBF Distribution					
a	Main header	Dia	140			
	140 mm.	1	55		55	m
	PVC Specials- 10%					
b	Distribution					
	110 mm.	1	75		75	m
	PVC Specials- 10%					
2	TBF collection to FFT (gravity)					
a	Main header					
	140 mm.	1	150		150	m
	PVC Specials- 10%					
b	collection tributary					
	75 mm.	1	25		25	m
	PVC Specials- 10%					
3	TTU Plumbing	Dia	140			
	140 mm.	1	30		30	m
	PVC Specials- 10%					
4	TBF distribution			No. of beds		
	63 mm.	1	5	15	75	m
	PVC Specials- 10%					
5	Labour	Nos	Days			
	Plumber	2	10		20	days
	Helper	6	10		60	days
6	Sluice valves					

MEASUREMENT SHEET - PLUMBING

Sr. No.	Item Description	Nos.	L (m)	B (m)	Quantity	Unit
	Providing double flange sluice valve confirming for IS- 14846 including worn gear arrangements as per test pressure, stainless steel spindle, caps, including inspection charges, transportation upto departmental store, unloading, stacking excluding GST levied by GOI & GOM in all respect etc. complete.					
	MJP/ SSR/ 2021-22 / SECTION - I(XII) : PIPES APPURTENANCES , Page no. 132					
	Raw Sewage pump					
	150 mm.	2			2	Nos
	Filter Feed Pump					
	150 mm.	2			2	Nos
7	Reflux valves (non-return valves)					
	Providing and supplying ISI mark CI D/F reflux valves (non-return valves) of following dia including railway freight, inspection charges, unloading from railway wagon, loading into truck, transportation upto departmental stores, unloading, stacking excluding GST levied by GOI & GOM in all respect etc. complete. Reflux valves as per I.S.5312 Part I (1984)					
	MJP/ SSR/ 2021-22 / SECTION - I(XII) : PIPES APPURTENANCES , Page no. 131					
	Raw Sewage pump					
	150 mm.	2			2	Nos
	Filter Feed Pump					
	150 mm.	2			2	Nos



PROJECT NAME :
 750 KLD SEWAGE TREATMENT PLANT
 BASED ON TIGER BIO FILTER
 TECHNOLOGY.

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DATE	REMARKS	SIGNATURE

CLIENT : SWSM, MAHARASHTRA

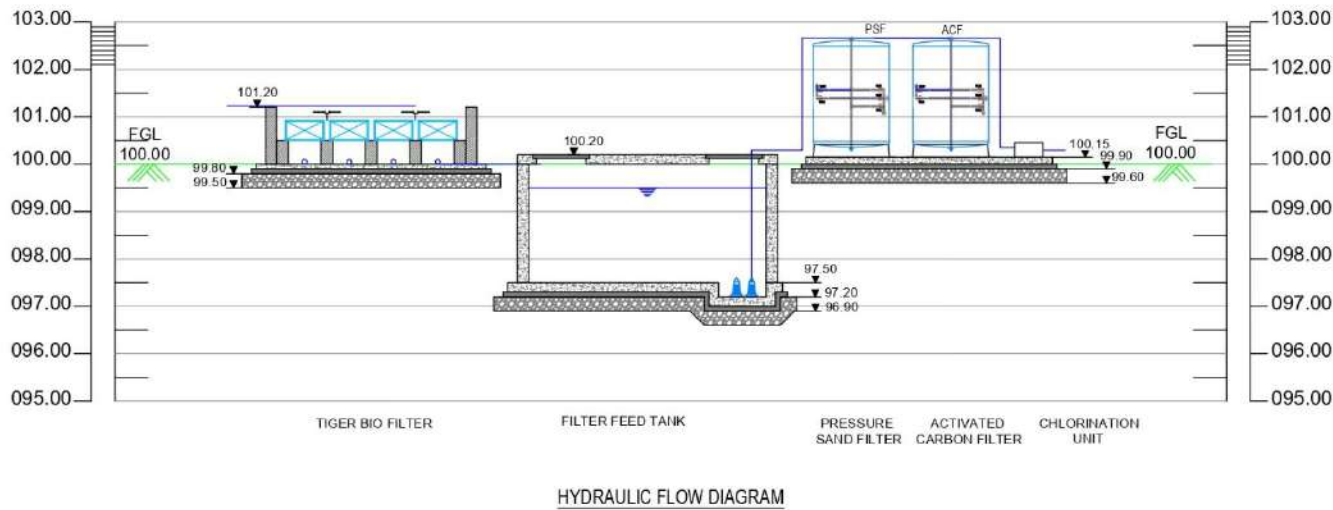
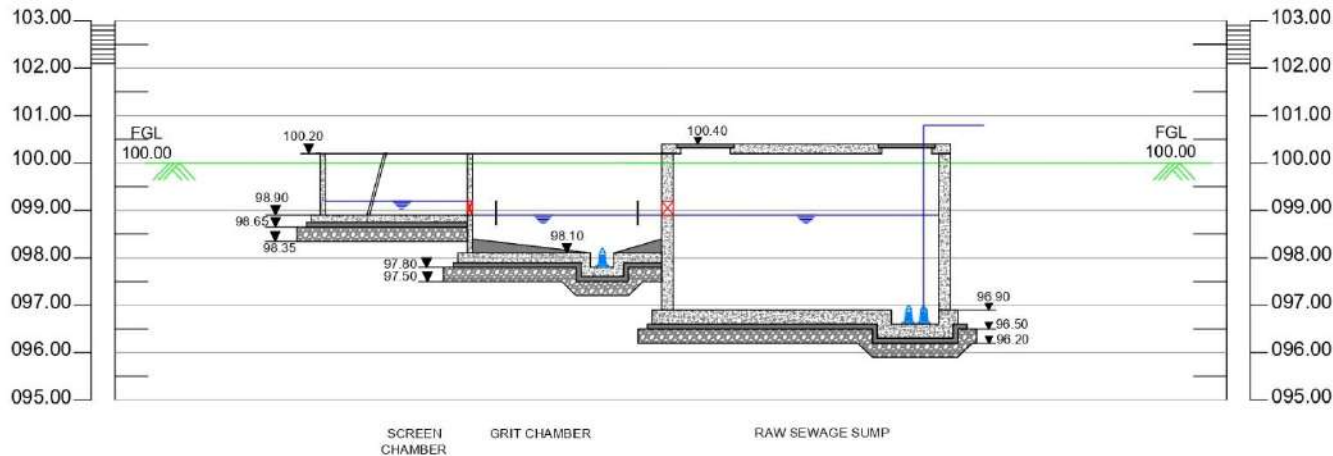
DRAWING NAME :
 PLANT LAYOUT

PROJECT CODE : TBF-	DRAWING NO : D-01/PL/01	DATE : JUNE 2021
DRAWN BY : L.D.B.	CHECKED BY : S.B.	SCALE : NTS.

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PLANT LAYOUT
 AREA = 1368 SQM.

Process Unit Details								
Sr. No	Description	No	L/D m.	B m.	H m.	FB m.	Total H m.	MOC
1	Screen Chamber	1	3.00	0.50	0.30	1.00	1.30	RCC
2	Grit Chamber	1	4.00	0.90	0.80	1.30	2.10	RCC
3	Raw Sewage Sump	1	5.60	5.60	2.00	1.30	3.30	RCC
4	Tiger Bio Filter	15	11.00	4.00	-	-	1.20	BRICK
5	Filter Feed Tank	1	5.00	5.00	2.00	0.50	2.50	RCC
6	Filter Platform	1	4.80	4.40	-	-	-	RCC
7	Pressure Sand Filter	2	DIA	1.60	-	-	2.00	MSEP
8	Activated Carbon Filter	2	DIA	1.60	-	-	2.00	MSEP
9	Chlorination Unit	1	-	-	-	-	-	-



PROJECT NAME :
750 KLD SEWAGE TREATMENT PLANT
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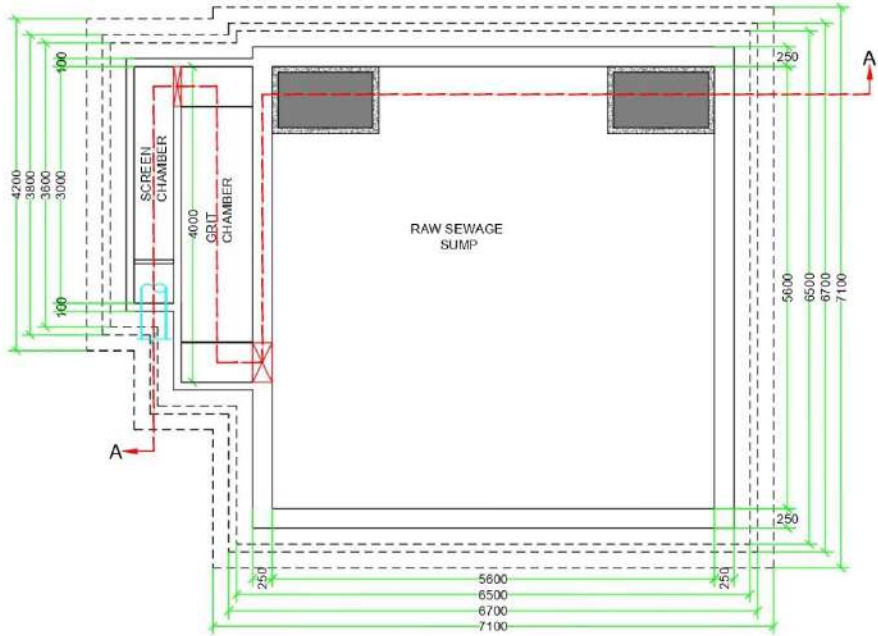
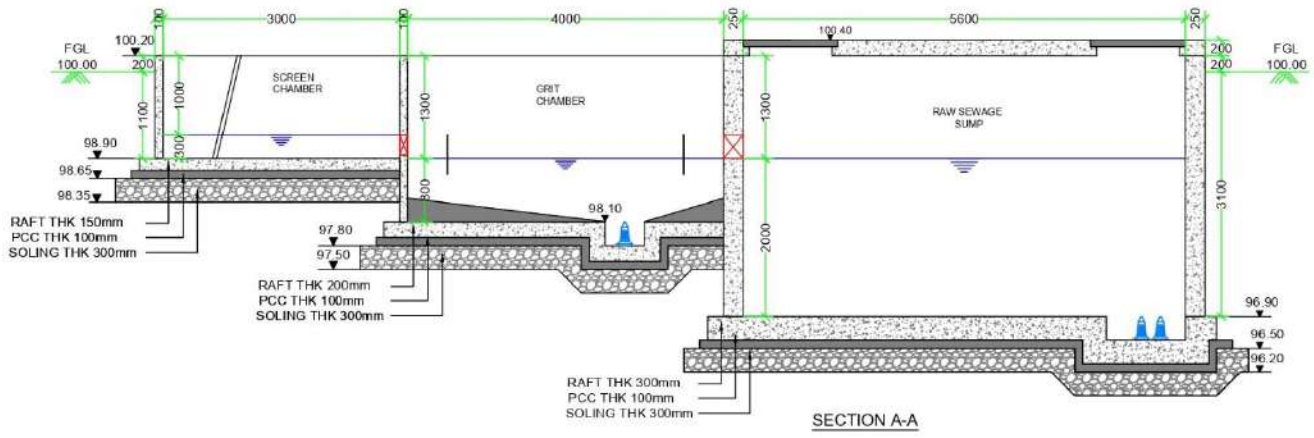
REVISION		
DATE	REMARKS	SIGNATURE

CLIENT : SWSM, MAHARASHTRA
DRAWING NAME :
HYDRAULIC FLOW DIAGRAM

PROJECT CODE : TBF-	DRAWING NO : D-02/HFD/01	DATE : JUNE-2021
DRAWN BY : L.D.B.	CHECKED BY : S.B.	SCALE : NTS.



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PLAN
SCREEN CHAMBER, GRIT CHAMBER & RAW SEWAGE SUMP

PROJECT NAME :
750 KLD SEWAGE TREATMENT PLANT
BASED ON TIGER BIO FILTER
TECHNOLOGY.

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REVISION		
DATE	REMARKS	SIGNATURE

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DRAWING NAME :
SCREEN CHAMBER, GRIT CHAMBER & RAW SEWAGE SUMP

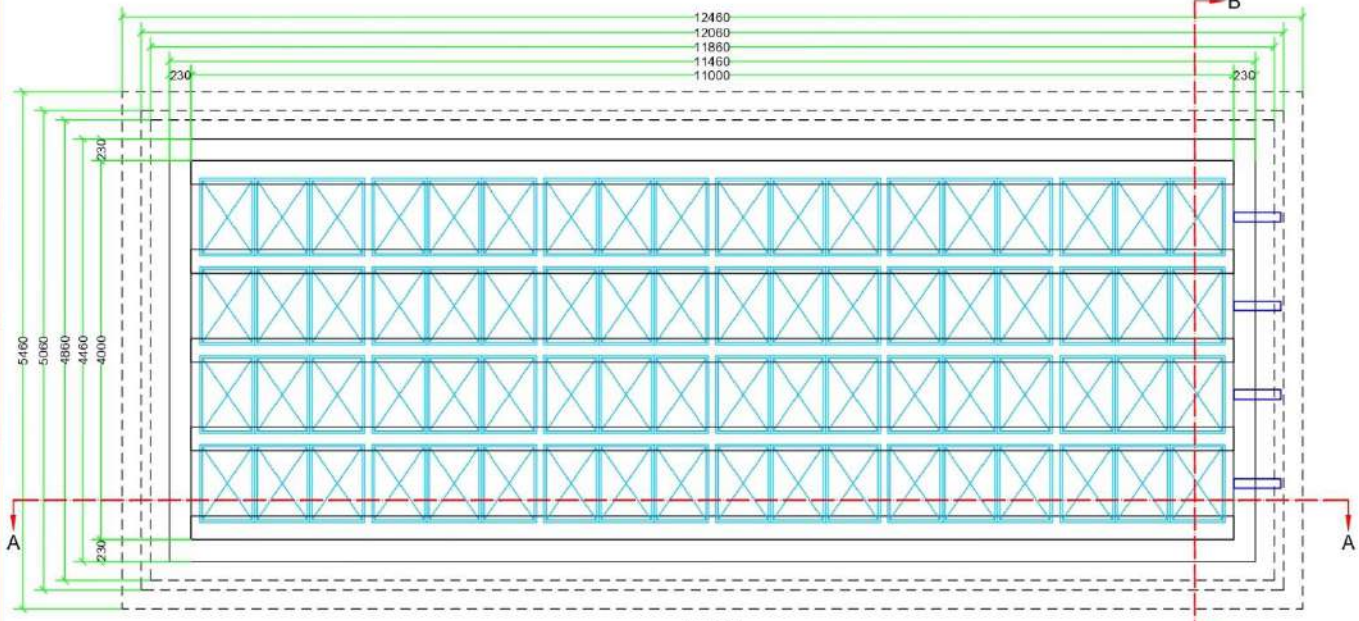
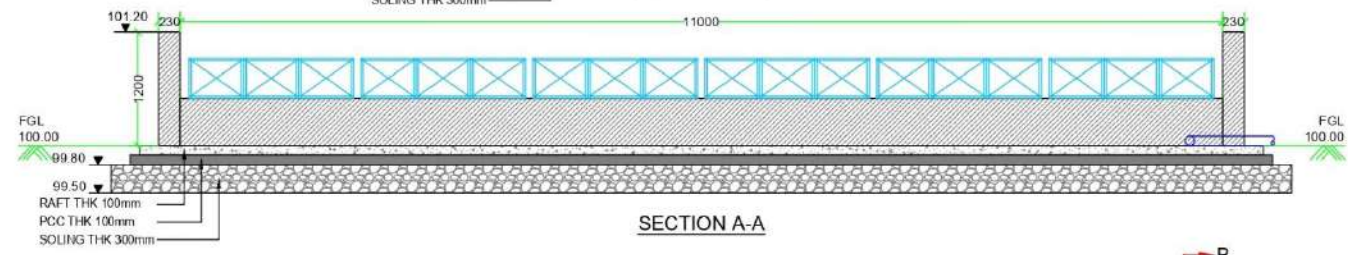
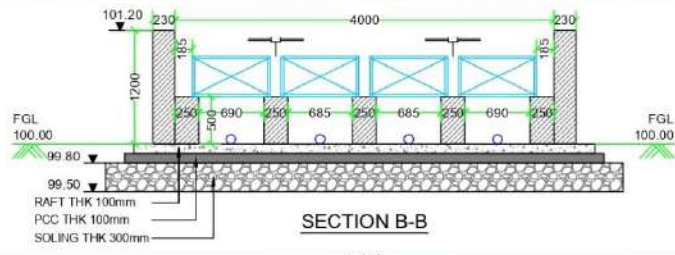
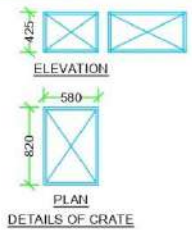
PROJECT CODE : TBF-	DRAWING NO : D.03/SC,GC&RS/S0	DATE : JUNE-2021
DRAWN BY : L.D.B.	CHECKED BY : S.B.	SCALE : NTS.


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PROJECT NAME :
750 KLD SEWAGE TREATMENT PLANT
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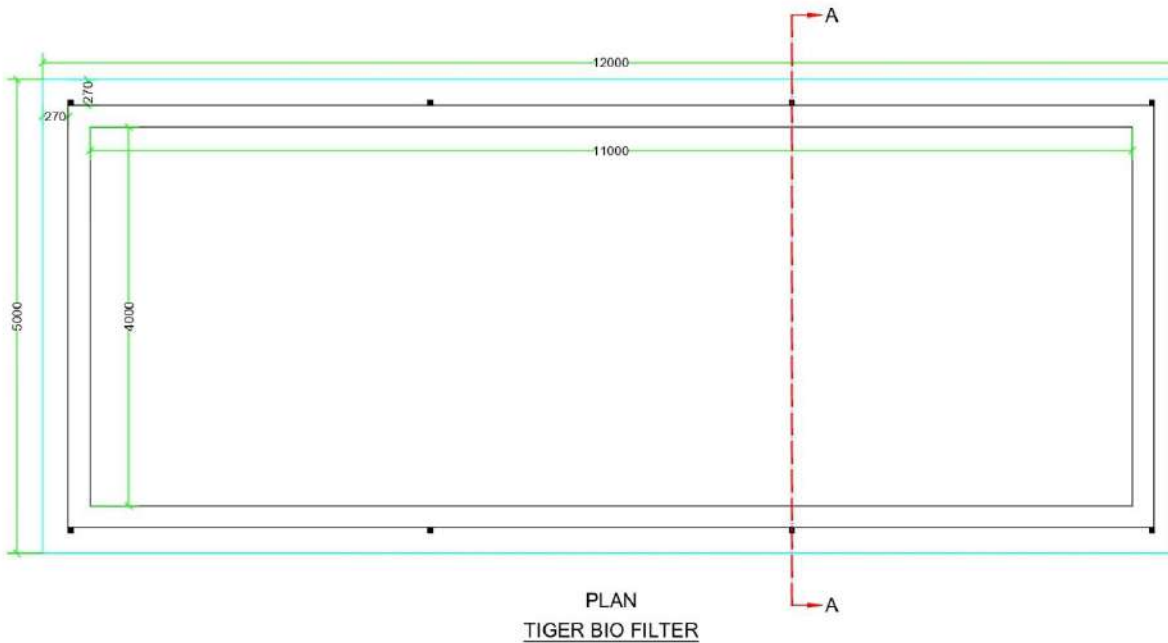
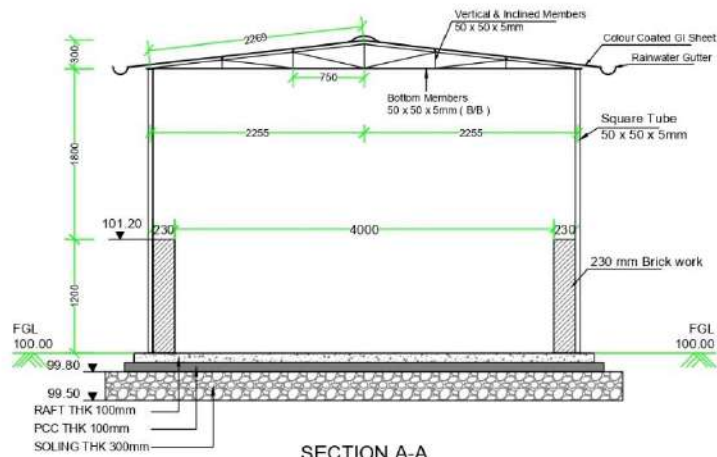
DRAWING NAME :
TIGER BIO FILTER

PROJECT CODE : TBF-	DRAWING NO : D-04/TBF/01	DATE : JUNE 2021
DRAWN BY : L.D.B.	CHECKED BY : S.B.	SCALE : NTS.

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750 KLD SEWAGE TREATMENT PLANT
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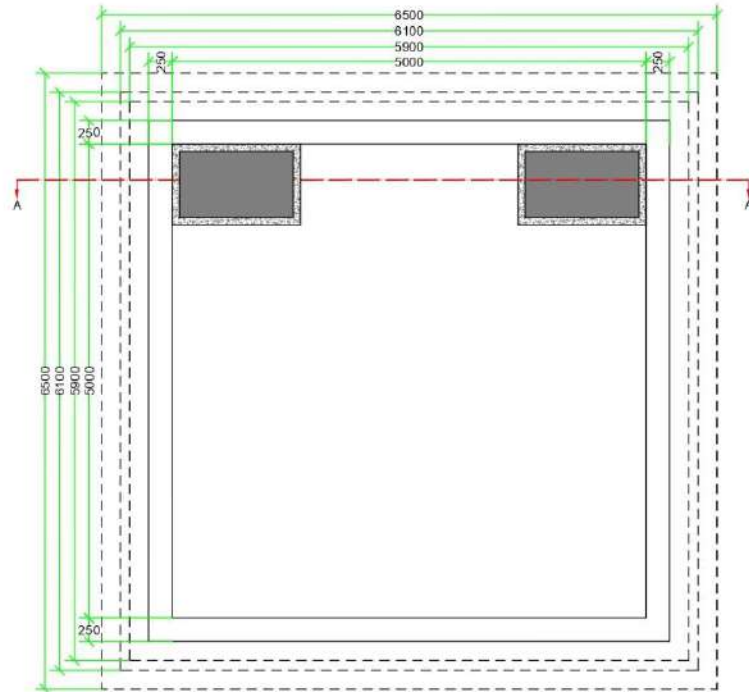
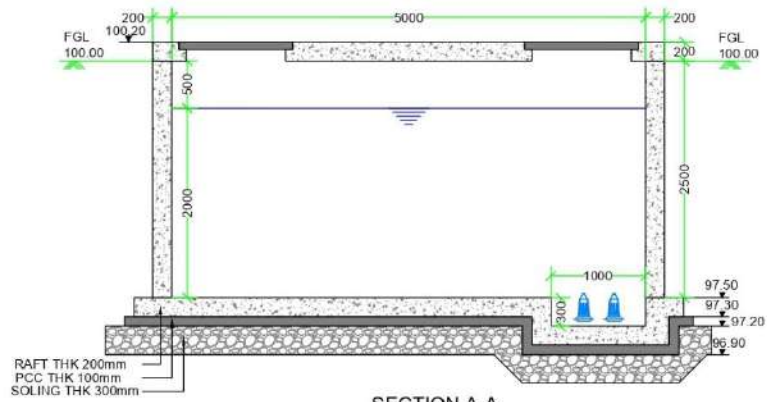
CLIENT : SWSM, MAHARASHTRA

DRAWING NAME:

TIGER BIO FILTER

PROJECT CODE : TBF-	DRAWING NO : D-04/TBF/02	DATE : JUNE-2021
DRAWN BY : L.D.B.	CHECKED BY : S.B.	SCALE : NTS.


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PLAN
FILTER FEED TANK

PROJECT NAME :

750 KLD SEWAGE TREATMENT PLANT
BASED ON TIGER BIO FILTER
TECHNOLOGY.

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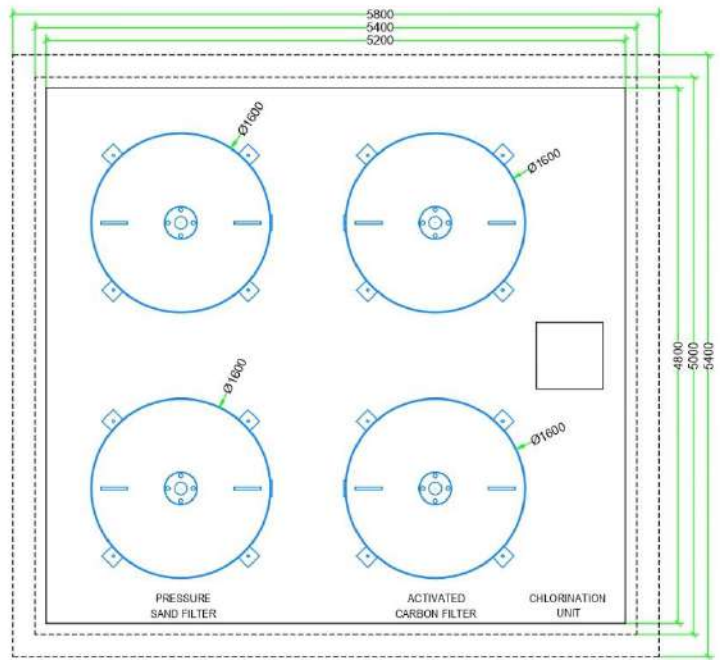
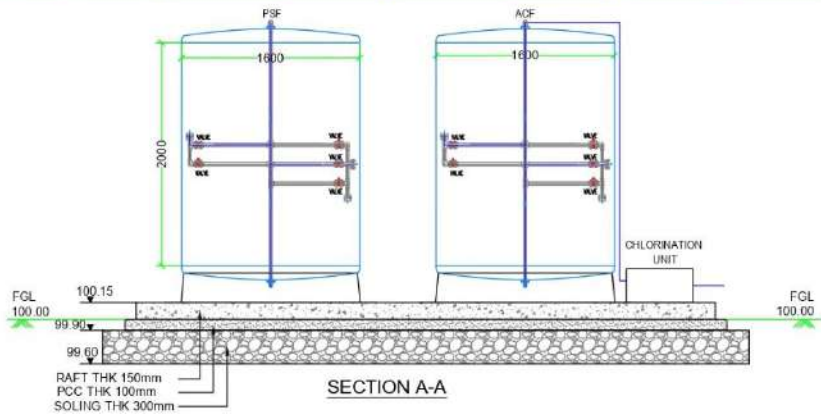
CLIENT : SWSM, MAHARASHTRA

DRAWING NAME:

FILTER FEED TANK

PROJECT CODE : TBF-	DRAWING NO : D-05/FF TAD1	DATE : JUNE-2021
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PLAN
PRESSURE SAND FILTER,
ACTIVATED CARBON FILTER & CHLORINATION UNIT

PROJECT NAME :
750 KLD SEWAGE TREATMENT PLANT
BASED ON TIGER BIO FILTER
TECHNOLOGY.

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REVISION		
DATE	REMARKS	SIGNATURE

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DRAWING NAME:
PRESSURE SAND FILTER,
ACTIVATED CARBON FILTER
& CHLORINATION UNIT

PROJECT CODE : TBF-	DRAWING NO : D-06PSF,ACF&CU01	DATE : JUNE-2021
DRAWN BY : L.D.B.	CHECKED BY : S.B.	SCALE : NTS.

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**1000 KLD STP BASED ON
TBF TECHNOLOGY**

PROCESS CALCULATIONS
TIGER BIO FILTER OF 1000 KLD CAPACITY

Design flow	=	1000.00	KLD
	=	1.000	MLD
Peak flow factor	=	3.00	
1 SCREEN CHANNELS: MANUAL			
No. of Manual Screen	=	1	No.
Average Flow	=	1.00	MLD
Peak Flow Factor	=	3.00	
Design Flow	=	Peak Flow	
	=	3.00	MLD
	=	125.00	m ³ /hr
	=	0.035	m ³ /sec
Average Flow	=	1.00	MLD
	=	41.667	m ³ /hr
	=	0.012	m ³ /sec
Design Flow in each Screen	=	0.035	m ³ /sec
		1	No.
	=	0.035	m ³ /sec
Average Flow in each Screen	=	0.012	m ³ /sec
		1	No.
	=	0.012	m ³ /sec
Maximum Velocity through Screen at Peak Flow	=	1.2	m/sec
Minimum Velocity through Screen at Average Flow	=	0.6	m/sec
Clear Area of Opening through Screen for Peak Flow	=	0.035	m ³ /sec
		1.2	m/sec
	=	0.029	m ²
Clear Area of Opening through Screen for Average Flow	=	0.012	m ³ /sec
		0.6	m/sec
	=	0.020	m ²
Considering maximum Area of Opening through Screen	=	0.029	m ²
Clear Spacing of Bars	=	10	mm

Thickness of Bars	=	5	mm	
Gross Area of Screen	=	$0.029 \times (10+5) / 10$		
	=	0.044	m ²	
Assuming Depth of Screen Channel	=	300.00	mm	
Gross Width of Screen	=	$0.044 / 0.3$		
	=	0.147	m	
No. of Bars	=	$(\text{Gross Width of Screen} / \text{Center to Center Spacing of Bars}) - 1$		
	=	$0.1466666666666667 / ((10+5) / 1000) - 1$		
	=	1		
	=	8.8	Nos.	
Say	=	9	Nos.	
Width of Screen provided	=	$(\text{Number of Bars} + 1) \times \text{Clear Spacing} + (\text{Number of Bars} \times \text{Bar Thickness})$		
	=	$(9+1) \times 10 + (9 \times 5)$		
	=	145	mm	
Width Say	=	0.50	m	
Liquid Depth of Screen Channel provided	=	0.30	m	
L:B	=	6.00		
Length of Screen Channel provided	=	3.00	m	
Freeboard provided	=	1.00	m	Invert Depth of incoming sewer
Total Depth of Screen Chamber	=	1.30	m	
Velocity in Channel at Average Flow	=	$\text{Average Flow} / \text{Cross Sectional Area of Screen Channel}$		
	=	$0.012 / ((0.5 \times 0.3) / 1000 \times 1000)$		
	=	0.080	m/sec	
	>	0.300	m/sec	
Head Loss across Screen				
Head Loss across Screen	=	$0.0728 (V^2 - v^2)$		
V = Velocity through Screen at Peak Flow	=	$\text{Peak Flow through Screen Channel} / \text{Clear Area of Opening through Screen}$		
	=	1.167	m/sec	
v = Velocity in approach Channel at Peak Flow	=	$\text{Peak Flow through Screen Channel} / \text{Cross Sectional Area of Screen Channel}$		
	=	0.8	m/sec	
Head Loss across Screen at Peak Flow	=	0.053	m	
Head Loss across Screen at 50% Clogged Condition				
Velocity through Screen at 50% Clogged Condition at Peak Flow	=	2.333	m/sec	
Head Loss across screen at 50% Clogged Condition at Peak Flow	=	0.350	m	
	>	0.300	m/sec	OK

2 CONVENTIONAL GRIT CHAMBER: MANUAL

No. of Grit Chamber = 1

Average Flow	=	1.00	MLD
Peak Flow Factor	=	3.00	
Design Flow	=	Peak Flow	
Peak Flow	=	3.00	MLD
	=	3000	m ³ /day
	=	125	m ³ /hr
	=	0.035	m ³ /sec
Design Flow to each Grit Chamber	=	3000/1	
	=	3000	m ³ /day
	=	125	m ³ /hr
	=	0.035	m ³ /sec
According to CPHEEO Manual			
Particle Size	=	0.15	mm
Specific Gravity	=	2.65	
Surface Overflow Rate for 100% removal efficiency in an ideal Grit Chamber	=	Settling Velocity of the minimum size of Particles to be removed	
	=	1.5	m/s
	=	1296	m ³ /m ² /day
Considering Efficiency of removal of desired Particles, $\eta = 75\%$	=	75%	
and Measure of Settling Basin Performance, $n = 1/8$ for very good performance	=	0.125	
Design Overflow Rate	=	857	m ³ /m ² /day
Surface Overflow Rate for 0.15 mm dia. Particle Size with Specific Gravity $S_s > 2.65$ Table 5.6	=	1555	m ³ /m ² /day
Considering Design Overflow Rate	=	960	m ³ /m ² /day
Area of Grit Chamber required	=	3000	m ³ /day
		960	m ³ /m ² /day
	=	3.13	m ²
L:B ratio	=	3	
Length of Chamber provided	=	4.50	m
Width of Chamber provided	=	1.10	m
Hydraulic Retention Time (HRT) in Grit Chamber at Peak Flow	=	60	sec
Volume of Grit Chamber required	=	0.035x60	
	=	2.1	m ³
Depth required in Grit Chamber	=	2.1 / (4.5x1.1)	
	=	0.42	m
Say	=	0.50	m
Grit Storage Depth	=	0.30	m

Total Liquid Depth required	=	0.80	m
Length of Grit Pit	=	0.50	m
Width of Grit Pit	=	0.50	m
Depth of Grit Pit	=	0.30	m
Free Board	=	1.30	m

3 RAW SEWAGE SUMP (WET WELL)

No. of Units	=	1	No.
Average Flow	=	1.00	MLD
	=	41.667	m ³ /hr
	=	0.0116	m ³ /sec

Peak Flow Factor	=	3.00	
------------------	---	------	--

Design Flow	=	Peak Flow	
	=	3.00	MLD
	=	125	m ³ /hr
	=	0.035	m ³ /sec

Hydraulic Retention Time (HRT) at Average Flow	=	120	min
--	---	-----	-----

Volume required	=	0.0116 x 120 x 60	
	=	84	m ³

Hydraulic Retention Time (HRT) at Peak Flow	=	Volume / Average Flow	
	=	40	min
	<	30	min

Total Volume of Wet Well	=	84	m ³
--------------------------	---	----	----------------

Side Water Depth (SWD) provided	=	2.00	m
Plan Area of Wet Well	=	41.76	m ²
Length/width of Sump required	=	6.46	m
Length/width of Sump provided	=	6.50	m
Volume of Sump provided	=	84.50	m ³
Length of Pump Pit	=	1.00	m
Width of Pump Pit	=	0.50	m
Depth of Pump Pit	=	0.30	m
Free Board	=	1.30	m

3.1 DESIGN STATEMENT-RSS E&M

Design Considerations

Design flow	=	1.00	MLD
	=	1000.00	Cum/Day
Peak flow factor	=	3.00	

Pumping machinery

Friction factor for Fittings in Pressure Mains

Elbow 90 degrees	=	25		
Friction Factor for each	=	1		
Friction factor for all	=	25		
Elbow 45 degrees	=	0		
Friction Factor for each	=	0.75		
Friction factor for all	=	0		
Elbow 22 degrees	=	0		
Friction Factor for each	=	0.5		
Friction factor for all	=	0		
Tee 90 degrees	=	0		
Friction Factor for each	=	1.5		
Friction factor for all	=	0		
Tee in straight pipe	=	15		
Friction Factor for each	=	0.3		
Friction factor for all	=	4.5		
Gate valve open	=	1		
Friction Factor for each	=	0.4		
Friction factor for all	=	0.4		
Swing check	=	1		
Friction Factor for each	=	2.5		
Friction factor for all	=	2.5		
Total friction factor	=	32.4		
Stage		low	ave	peak
Average flow, cum / day	=		1000.00	
Proportion	=	0.6	1	2
Design flow, cum / day	=	600	1000	2000
Hazen Williams C	=	140	140	140
Desired velocity, m/s	=	0.6	1.0	1.5
Number of Pumping hours	=	16.0	16.0	16.0
Area needed, sqm	=	0.0174	0.0174	0.0231
Dia needed, m	=	0.149	0.149	0.172
Dia needed, mm	=	149	149	172
Dia provided, mm (User)	=	160	160	160
Radius, m	=	0.080	0.080	0.080
Radius power 0.63	=	0.204	0.204	0.204
S power 0.54	=	0.025	0.041	0.062
S	=	0.001	0.003	0.006
Slope 1 in	=	939.3	364.7	172.1
length, m	=	65	65	65
Friction in pipeline, m	=	0.1	0.2	0.4
Velocity head, m	=	0.018	0.051	0.115
Friction factor in fittings	=	32.4	32.4	32.4
Friction in fittings, m	=	0.6	1.7	3.7
Static lift, m	=	4.5	4.5	4.5
Total head, m	=	5.1	6.2	8.2
Efficiency of pumpset	=	0.8	0.8	0.8
Discharge, lps	=	10.4	17.4	34.7
Discharge, Cum/Hr	=	37.5	62.5	125.0
Kw required	=	1.613	2.688	5.375
HP required	=	2.5	4.0	7.5
Number of Pumps	=	2	2	2

4 TIGER BIO FILTER

DESIGN STATEMENT-TBF1- 50 KLD

Number of pumping hours	=	16	Hrs	
Number of BMF tanks provided	=	20	Nos	
Design flow to each tank	=	50.00	Cum/day	
	=	3.13	Cum/ Hr for 16 Hr	
	=	0.87	lps	
Inlet BOD	=	250.00	mg/l	
Inlet TSS	=	400.00	mg/l	
BOD load applied	=	12.5	kg/day	
BOD uptake rate	=	0.1	Kg of BOD / Kg of worms	(0.5 - 1.0)
Worms required	=	125	Kg worms	
Sewage application rate	=	1.85	Cum/Sqm/day	(1 - 2 Cum/Sq m/day)
Area required	=	27.03	Sqm	
Area Provided	=	28	Sqm	
Area of each crate	=	0.4	Sqm	
Number of crates	=	70	Nos	
say	=	72	Nos	
Crate in longitudinal direction	=	18	Nos	
Crate in travers direction	=	4	Nos	
crates provided	=	72	Nos	OK
Width provided	=	4.00	m	
Length required	=	11.00	m	
Depth provided	=	1.2	m	

5 TERTIARY TREATMENT UNIT

Design Considerations

Design flow	=	1.00	MLD	
	=	1000.00	Cum/Day	
Peak flow factor	=	3.00		

5.1 FILTER FEED TANK

Number of FFT provided	=	1	Nos	
Number of operating hours	=	16	Hrs	
Design flow	=	1000.00	Cum/Day	
	=	62.50	Cum/Hr	
	=	0.01736	Cum/Sec	
Hydraulic Retention time	=	60	min	
Volume required	=	62.50	Cum	
Depth	=	2.00	m	
Civil Tanks				
Area	=	31.25	Sqm	
Length/Width required	=	5.59	m	
Length/Width provided	=	6.00	m	
Freeboard provided	=	0.50	m	

Volume Provided		72.00	Cum
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DESIGN STATEMENT-TTU E&M

Design Considerations

Design flow	=	1.00	MLD
	=	1000.00	Cum/Day
Peak flow factor	=	3.00	

Pumping machinery

Friction factor for Fittings in Pressure Mains

Elbow 90 degrees	=	8
Friction Factor for each	=	1
Friction factor for all	=	8
Elbow 45 degrees	=	0
Friction Factor for each	=	0.75
Friction factor for all	=	0
Elbow 22 degrees	=	0
Friction Factor for each	=	0.5
Friction factor for all	=	0
Tee 90 degrees	=	0
Friction Factor for each	=	1.5
Friction factor for all	=	0
Tee in straight pipe	=	8
Friction Factor for each	=	0.3
Friction factor for all	=	2.4
Gate valve open	=	1
Friction Factor for each	=	0.4
Friction factor for all	=	0.4
Swing check	=	1
Friction Factor for each	=	2.5
Friction factor for all	=	2.5
Total friction factor	=	13.3

Stage		low	ave	peak
Average flow, cum / day	=		1000.00	
Proportion	=	0.6	1	2
Design flow, cum / day	=	600	1000	2000
Hazen Williams C	=	140	140	140
Desired velocity, m/s	=	0.8	1.0	1.5
Number of Pumping hours	=	16.0	16.0	16.0
Area needed, sqm	=	0.0130	0.0174	0.0231
Dia needed, m	=	0.129	0.149	0.172
Dia needed, mm	=	129	149	172
Dia provided, mm (User)	=	160	160	160
Radius, m	=	0.080	0.080	0.080
Radius power 0.63	=	0.204	0.204	0.204
S power 0.54	=	0.033	0.041	0.062
S	=	0.002	0.003	0.006
Slope 1 in length, m	=	551.4	364.7	172.1
	=	30	30	30

Friction in pipeline, m	=	0.1	0.1	0.2
Velocity head, m	=	0.033	0.051	0.115
Frction factor in fittings	=	13.3	13.3	13.3
Friction in fittings, m	=	0.4	0.7	1.5
Static lift, m	=	10.0	10.0	10.0
Total head, m	=	10.4	10.7	11.5
Efficiency of pumpset	=	0.8	0.8	0.8
Discharge, lps	=	10.4	17.4	34.7
Discharge, Cum/Hr	=	37.5	62.5	125.0
Kw required	=	2.765	4.608	9.215
HP provided	=	4.0	6.5	12.5
Number of Pumps	=	2	2	2

5.2 PRESSURE SAND FILTER

Number of unit provided	=	2	Nos.
Designed @ 16 hrs working for flow of	=	31.25	m3/h
Loading rate	=	12.00	m3/m2/h
Area of DMF	=	2.60	m2
Dia of DMF	=	1.82	m
Provided	=	1.900	m
Backwash water			
Backwash velocity	=	15.00	m/hr
backwash flowrate	=	40.74	m3/h
Backwash volume for 20 mins	=	13.58	m3

5.3 ACTIVATED CARBON FILTER

Number of unit provided	=	2	Nos.
Designed @ 16 hrs working for flow of	=	31.25	m3/h
Loading rate	=	12.00	m3/m2/h
Area of ACF	=	2.60	m2
Dia of ACF	=	1.82	m
Provided	=	1.900	m
Backwash water			
Backwash velocity	=	15.00	m/hr
backwash flowrate	=	40.74	m3/h
Backwash volume for 20 mins	=	13.58	m3

5.4 CHLORINE DOSING SYSTEM NaOCl DOSING SYSTEM

Average Flow	=	62.50	m3/hr
Design Chlorine Dosage (Max)	=	3	mg/l
Concentration of Chlorine in commercially available NaOCl	=	10%	
Design NaOCl Dosage	=	30	mg/l
Operating hours	=	16.0	hr

Quantity of NaOCl required	=	$62.5 \times 30 \times 16 / 1000$	
	=	30.00	Kg/day
	=		
Design Strength of NaOCl Solution	=	100%	
Volume of NaOCl Solution	=	$30 / (1 \times 1000)$	
	=	0.030	m ³
	=		
No. of Dosing Tanks provided	=	1	Nos.
	=		
Volume of each Dosing Tank	=	$0.03 / 1$	
	=	0.03	m ³
	=		
	=	100	Litres
	=		
No. of Working NaOCl Dosing Pump provided	=	1	No.
Capacity of each NaOCl Dosing Pump required	=	$\frac{\text{Total Volume of NaOCl Solution}}{\text{(No. of Dosing pumps)}}$	
	=	$0.03 / (1 \times 16)$	
	=	0.002	m ³ /hr
	=		
	=	2.00	LPH
	=		
Capacity of each NaOCl Dosing Pump provided	=	2.00	LPH
	=		
No. of Standby NaOCl Dosing Pump provided	=	1	No.

SIZING DETAILS (CIVIL)
TIGER BIO FILTER OF 1000 KLD CAPACITY

S I. N o	Unit name	N o s	Leng th	Widt h	Height			Soling		PCC		Raft		RCC Wall thk	Bric k Wall thk	Slab Thk	Steel - HCR M/ Kg/C
					SW	FB	Tota	offs	Thk	offs	Thk	offs	Thk				
		N	m	m	m	m	m	m	m	m	m	m	m	m	m		
1	Screen Chamber	1	3.0	0.5	0.3	1.0	1.3	0.2	0.3	0.1	0.1	0.2	0.1	0.1		80	
2	Grit Chamber	1	4.5	1.1	0.8	1.3	2.1	0.2	0.3	0.1	0.1	0.2	0.2	0.1		80	
3	Raw Sewage Sump	1	6.5	6.5	2.0	1.3	3.3	0.2	0.3	0.1	0.1	0.2	0.3	0.2	0.2	100	
4	TBF Bed 50 KLD	2	11.0	4.0			1.2	0.2	0.3	0.1	0.1	0.2	0.1		0.2	60	
5	Filter Feed tank	1	6.0	6.0	2.0	0.5	2.5	0.2	0.3	0.1	0.1	0.2	0.3	0.2	0.2	100	
6	Filter Platform	1	5.4	5.0				0.2	0.3	0.1	0.1	0.2	0.1			80	

Assumptions

Incoming Sewer Invert 1.0 m Below Ground level

Method of excavation Mechanical means

Underground strata		soil	Muru m	Soft roc	hard	Total
0.0 to 1.5 m	=	25	25	25	25	100
1.5 m to 3.0 m	=	25	25	25	25	100
3.0 to 4.5 m	=	25	25	25	25	100
4.5 to 6.0	=	25	25	25	25	100

**TIGER BIO FILTER OF 1000 KLD CAPACITY
BILL OF QUANTITIES**

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
1	Excavation for foundation / pipe trenches in earth, soils of all types, sand, gravel and soft murum, including removing the excavated material upto a distance of 50 metres and lifts as below, stacking and spreading as directed, normal dewatering, preparing the bed for foundation and excluding backfilling, etc. complete. (Bd-A-1/259)				
	0.0 to 1.5 m	267.98	Cum	150.00	40,197.00
	1.5 to 3.0 m	70.26	Cum	164.00	11,522.70
	3.0 to 4.5 m	28.31	Cum	178.00	5,039.20
	4.5 to 6.0 m	0.00	Cum	192.00	0.00
	MJP/ SSR/ 2021-22 / Section E / Excavation Item No.1/ Page no. 42				
2	Excavation for foundation / pipe trenches in hard murum and boulders, W.B.M. road including removing the excavated material upto a distance of 50 M beyond the area and lifts as below, stacking and spreading as directed by Engineer-in-charge, normal dewatering, preparing the bed for foundation and excluding backfilling, etc. complete. (Bd-A-3/259)			8.00	
	0.0 to 1.5 m	267.98	Cum	192.00	51,452.20
	1.5 to 3.0 m	70.26	Cum	206.00	14,473.60
	3.0 to 4.5 m	28.31	Cum	220.00	6,228.20
	4.5 to 6.0 m	0.00	Cum	234.00	0.00
	MJP/ SSR/ 2021-22/ Section E/ Excavation Item No.3, Page no. 42				
3	Excavation for foundation / pipe trenches in soft rock and old cement and lime masonry foundation asphalt road including removing the excavated material upto a distance of 50 M beyond the area and lifts as below, stacking as directed by Engineer-in-charge, normal dewatering, preparing the bed for foundation and excluding backfilling, etc. complete. (Bd-A- 4/259)				
	0.0 to 1.5 m	267.98	Cum	572.00	153,284.60
	1.5 to 3.0 m	70.26	Cum	597.00	41,945.30
	3.0 to 4.5 m	28.31	Cum	622.00	17,608.90
	4.5 to 6.0 m	0.00	Cum	647.00	0.00
	MJP/ SSR/ 2021-22 / Section E/ Excavation Item No.5, Page no. 42				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
4	Excavation for foundation / pipe trenches in hard rock and concrete road by chiselling, wedging, line drilling by mechanical means or by all means other than blasting including trimming and levelling the bed, removing the excavated material upto a distance of 50 metres beyond the area and lifts as below, stacking as directed by Engineer-in-charge, normal dewatering, excluding backfilling, etc. complete by all means. (Bd-A-6/259)				
	0.0 to 1.5 m	267.98	Cum	1,017.00	272,535.70
	1.5 to 3.0 m	70.26	Cum	1,042.00	73,211.00
	3.0 to 4.5 m	28.31	Cum	1,067.00	30,206.80
	4.5 to 6.0 m	0.00	Cum	1,092.00	0.00
	MJP/ SSR/ 2021-22 / Section E/ Excavation Item No.7, Page no. 43				
5	Providing dry trap/ granite/ quartzite/ gneiss, rubble stone soling in 15 cm to 20 cm thick layers including hand packing and compacting, etc. complete. (Bd-A-12/264)	459.70	Cum	1,175.00	540,147.50
	MJP/ SSR/ 2021-22 / Section E/ Excavat				
6	Providing and laying in situ Cement Concrete M- 15 of trap/ granite / quartzite / gneiss metal for foundation and bedding including bailing out water, form work, compaction, curing, etc. complete. (Cement 5.90 bags / cum) Spec. No. - Bd E /1 Page No. 287 and B- 7, Page No. 38	138.16	Cum	5,640.00	779,222.40
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.1, Page no.49				
7	Providing and laying in situ Cement Concrete of trap/ granite / quartzite / gneiss metal for RCC work in foundation like raft, grillage, strip foundation and footing of RCC columns and steel stanchions including normal dewatering, form work, compaction, finishing and curing, etc. complete. (By weigh batching and mix design for M250 and M-300 only. Use of L&T, A.C.C., Ambuja, Birla Gold, Manikgad, Rajashree, etc. cement is permitted.) (Excluding M.S. or Tor reinforcement)	157.76	Cum	7,448.00	1,174,996.50
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE/ Item No.2, Page no. 49				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
8	Providing and casting in situ C.C. of trap / granite/ quartzite / gneiss metal of approved quality for RCC works as per detailed drawings and designs or as directed by Engineer-in- charge including normal dewatering, centering, form work, compaction, finishing the formed surfaces with C.M. 1:3 of sufficient minimum thickness to give a smooth and even surface wherever necessary or roughening if special finish is to be provided and curing, etc. complete. (By weigh batching and mix design for M-250 and M-300 only. Use of L&T, A.C.C., Ambuja, Birla Gold, Manikgad, Rajashree, etc. cement is permitted.) (Excluding M.S. or Tor reinforcement)	3.00	Cum	8,624.00	25,872.00
	For Beams / Braces / Lintels In RCC M-300				
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.4, Page no. 50				
9	Providing and casting in situ C.C. of trap / granite/ quartzite / gneiss metal of approved quality for RCC works as per detailed drawings and designs or as directed by Engineer-in- charge including normal dewatering, centering, form work, compaction, finishing the formed surfaces with C.M. 1:3 of sufficient minimum thickness to give a smooth and even surface wherever necessary or roughening if special finish is to be provided and curing, etc. complete. (By weigh batching and mix design for M-250 and M-300 only. Use of L&T, A.C.C., Ambuja, Birla Gold, Manikgad, Rajashree, etc. cement is permitted.) (Excluding M.S. or Tor reinforcement)	17.57	Cum	9,247.00	162,469.80
	Slabs / Landings / Vertical Walls / Waist Slabs / Steps for Staircase In RCC M-300				
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.5, / Page no. 50				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
10	Providing and casting in situ C.C. of trap / granite/ quartzite / gneiss metal of approved quality for RCC works as per detailed drawings and designs or as directed by Engineer-in- charge including normal dewatering, centering, form work, compaction, finishing the formed surfaces with C.M. 1:3 of sufficient minimum thickness to give a smooth and even surface wherever necessary or roughening if special finish is to be provided and curing, etc. complete. (By weigh batching and mix design for M-250 and M-300 only. Use of L&T, A.C.C., Ambuja, Birla Gold, Manikgad, Rajashree, etc. cement is permitted.) (Excluding M.S. or Tor reinforcement)	43.64	Cum	9,218.00	402,273.60
	Chajjas / Parapets / Curtain Walls /Partition Walls / Pardies In RCC M-300				
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.6 / Page no. 51				
11	Providing and fixing in position steel bar reinforcement of various diameters for RCC piles, caps, footings, foundations, slabs, beams, columns, canopies, staircases, newels, chajjas, lintels, pardies, copings, fins, arches, etc. as per detailed designs, drawings and schedules; including cutting, bending, hooking the bars, binding with wires or tack welding and supporting as required, etc. complete (including cost of binding wire). (Bd-F-17/306)				
	c) Corrosion Resistant Steel (Fe 500)	17.48	MT	70,658.00	1,235,101.90
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.8 / Page no. 52				
12	Providing and fixing mild steel grill work for windows/ ventilators of 20 Kg/Sqm. As per drawings including necessary welding and painting with one coat of anticorrosive paint and two coats of oil painting, etc. complete. (Bd-U- 1/537)	12.00	Sqm	1,895.00	22,740.00
	MJP/ SSR/ 2021-22 / SECTION - F : IRON AND STRUCTURAL STEEL WORK Item No.1 / Page				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
13	Providing structural steel work in rolled stanchions fixed with connecting plates or angle cleats as in main and cross beams, hip and jack rafters, purlins connecting to truss members and like as per detailed designs and drawings or as directed by Engineer-in-charge including cutting, fabricating, hoisting, erecting, fixing in position, making riveted / bolted / welded connections and one coat of anticorrosive paint and over it two coats of oil painting, etc. complete. (Bd-C- 3/275)	14.94	MT	71,286.00	1,065,069.90
	MJP/ SSR/ 2021-22 / SECTION - F :: IRON AND STRUCTURAL STEEL WORK Item No.3,				
14	Providing and fixing corrugated galvanised iron sheets of 0.63 mm thick (24B .W .G.) for roofing without wind tiles including fastening with galvanised iron screws and bolts , lead and bitumen washers as per drawing etc. complete. (Weight of 5.5 kg/sq.m.).	1508.00	Sqm	777.00	1,171,716.00
	PWD / SSR 2020-21 / Roofing and Ceiling SSR Item No.38.04 Reference No. Bd.R.5, Page No. 453 Item No.1133, Page no. 224				
15	Providing fly ash brick masonry with conventional / I.S. type bricks in cement mortar 1:6 in superstructure including striking joints, raking out joints, watering and scaffolding etc. Complete	297.40	Cum	6,305.00	1,875,107.00
	PWD / SSR 2020-21 / Brick Masonry SSR Item No.27.13 Reference No. As director by engineer incharge and BDG- 2 and 5 Item No.893, Page no. 190				
16	Providing internal cement plaster 12 mm thick in single coat in cement mortar 1:5 without neeru finish to concrete or brick surfaces, in all positions including scaffolding and curing etc. complete.	1633.00	Sqm	257.00	419,681.00
	PWD / SSR 2020-21 / Plastering and Pointing SSR Item No. 32.03 Reference No. Bd. L.2 Page No. 368 Item No.950, Page no. 201				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
17	Providing rough cast cement plaster externally in two coats to concrete, brick or stone masonry surfaces in all positions with base coat of 12 to 15 mm thick in C.M. 1:4 and rough cast treatment 12 mm thick in proportion 1:11 / 2:3 including scaffolding and fourteen days curing complete.	950.00	Sqm	529.00	502,550.00
	PWD / SSR 2020-21 / Plastering and Pointing SSR Item No. 32.12 Reference No. Bd.L.8 Page No. 370 Item No.957, Page no. 201				
18	Providing and applying white-wash in two coats on old / new plastered or masonry surfaces and asbestos cement sheets including scaffolding and preparing the surface by brushing and j brooming down etc. complete.	950.00	Sqm	10.00	9,500.00
	PWD / SSR 2020-21 / Colouring SSR Item No. 36.03 Reference No. Bd. P. I Page No. 411				
19	Providing and applying colour-wash of approved colour and shade in one coat to new surface including scaffolding, brushing and brooming down (excluding base coats of white wash) etc. complete.	950.00	Sqm	8.00	7,600.00
	PWD / SSR 2020-21 / Colouring SSR Item No. 36.04 Reference No. Bd. P.2 Page No. 412				
20	Dewatering the excavated trenches and pools of water in the building trenches / pipeline trenches, well works by using pumps and other devices including disposing off water to safe distance as directed by Engineer-in-charge (including cost of machinery, labour, fuel), etc. complete. (Bd-A-9/261)	144.00	HP/ Hr.	77.00	11,088.00
	MJP/ SSR/ 2021-22 / Section E/ Excav				
21	Refilling the trenches with available excavated stuff with soft material first over pipeline and then hard material in 15 cm layers with all leads and lifts including consolidation, surcharging, etc. complete.	433.66	Cum	84.00	36,427.50
	MJP/ SSR/ 2021-22 / Section E/ Excav				
22	Transportation as per STATEMENT VI Including loading, unloading and stacking Earth (4.8 Cum) lead 15 Km	1445.15	Cum	604.45	873,521.00

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
	Electromechanical Items				
23	Screen (Manual) of size 1.8 m length x 0.5 m width of SS 304 MOC and Manual hand rake for cleaning screen of SS handle 1 m in length and cleaning area of 6 nos 5 mm SS rod of total length 200 mm straight and 50 mm of 90 degree bend.	0.90	Sqm	35,000.00	31,500.00
24	Grit pump				
	Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below				
	MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION - Pumps, Page no. 6, 7 of size 1.8 m length				
	1 HP (Up to 9000 LPH)	1.00	No	68,654.00	68,654.00
25	Raw Sewage Pumps				
	Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below				
	MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION -				
	7.5 HP (Up to 72000 LPH)	2.00	Nos	109,079.00	218,158.00
26	TTU Feed pumps				
	Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below				
	MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION -				
	7.5 HP (Up to 72000 LPH)	2.00	Nos	109,079.00	218,158.00
27	Pressure Sand Filter of FRP / MSEP vessel with suitable thickness to withstand a water pressure including MPV or 5 Valve system and PVC / UPVC / MSEP interconnecting and underdrain piping including fittings, with standard filter media layer with minimum depth of filter sand 1.0 m supported by gravels. The piping arrangement should provide sufficient pressure for backwash operations and avoid loss of sand during backwash operation. Suitable openings to be provided to ease addition and removal the media.				
	Dia 1.9 m x 2 m minimum height	2.00	Nos	620,000.00	1,240,000.00

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
28	Activated Carbon Filter of FRP / MSEP vessel with suitable thickness to withstand a water pressure including MPV or 5 Valve system and PVC / UPVC / MSEP interconnecting and underdrain piping including fittings, with standard filter media layer with minimum depth of Activated Carbon 1.0 m supported by gravels. The piping arrangement should provide sufficient pressure for backwash operations and avoid loss of Activated carbon during backwash operation. Suitable openings to be provided to ease addition and removal the media.				
	Dia 1.9 m x 2 m minimum height	2.00	Nos	620,000.00	1,240,000.00
29	NaOCl Chlorinator Pump Diaphragm Type / peristaltic type / Solenoid Max Flow Rate Upto 10LPH Power Source Electric Phase Single Material PP / PTFE(Teflon) Voltage 230 Volt Frequency				
	Mixing Tank of 100 Ltrs capacity	100.00	Ltrs	8.00	800.00
	Dosing Pump	2.00	Nos	15,000.00	30,000.00
30	Control Panel				
	Design, Supply, Installing, Commissioning & Testing of Master PLC control monitoring and communication panel as per IEC 61131 at Pure Water Sump suitable for monitoring and control of pure water Pumps. Pressure Transmitters, Level Transmitter, PH Transmitter, Turbidity Transmitter ,for all pumps installed.	1.00	No	50,041.00	50,041.00
	MJP/ MECH/ ELECT / SSR/ 2021-22/ SECTION 19 - SA [SCADA & AUTOMATION]				
31	Supplying and erecting Fully Automatic Star Delta starter to operate squirrel cage induction motor working on 380- 440 Volt, 3 phase, 50 Hz with no volt coil, over load element, and ON - OFF push buttons, with necessary material and connected to supply, etc complete. Starter with original sheet steel encloser.				
	> 7.5 HP & Up to 12.5 HP	6.00	nos	7,150.00	42,900.00

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
	MJP /MECH/ ELECT/ SSR/ 2021-22 SECTION 10 - LG [L.T. SWITCHGEAR AND PROTECTION] Item no. LG 3 Page no. 27				
32	Main power supply cable				
	3 core PVC insulated, PVC sheathed copper conductor flat submersible cable				
	Supplying and erecting, Flat flexible submersible cable with, Copper Conductor, PVC insulated, and PVC sheathed.				
	3 core 16 sq mm	35.00	m	549.00	19,215.00
33	Power cables				
	Aluminium conductor 4 Core, XLPE / PVC insulated & armoured cable				
	Supplying and erecting, XLPE / PVC insulated, armoured cable 1100 V grade with ISI mark Four core, solid / stranded aluminium conductor with 6 mm thick 25 mm width M.S. spacer with G.I. Earth wire 6 sq mm, complete erected on wall / on pole with 25 X 3 mm M.S. clamps or in provided trench in an approved				
	4 Core 6 sq mm	160.00	m	137.00	21,920.00
	MJP MECH/ ELECT/ SSR/ 2021-22 SECTION 12 - CB [L.T. CABLE] Item no. CB 6 Page				
34	Control Cables				
	Copper conductor PVC insulated, Unarmoured control cable				
	Supplying and erecting Un-armoured control cable with ISI mark stranded / solid copper conductor 1.1 kV grade complete erected on wall / panel or in provided trench in an approved manner.				
	4 core 2.5 sq mm	160.00	m	137.00	21,920.00
	MJP MECH/ ELECT/ SSR/ 2021-22/ SECTION 12 - CB [L.T. CABLE] Item no. CB 8-				
	Plumbing Items				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
35	Providing and supplying in standard lengths ISI mark rigid unplasticised PVC pipes suitable for potable water with solvent cement joints including cost of couplers, as per IS specification no. 4985 / 1988 excluding GST levied by GOI and GOM in all respect, including transportation, freight charges, inspection charges, loading, unloading, conveyance to the departmental stores and stacking the same in closed shed duly protected from sun rays and rains including cost of jointing material i.e. solvent cement, etc. complete (selffit type to be jointed with cement solvent).				
	1) 10% of cost of pipes shall be considered for cost of PVC specials for estimate purpose only. 2) One coupler and required cement solvent shall be provided with each full length pipe cost of which is included in rates below.				
	MJP/ SSR/ 2021-22 / SECTION – I(II) P.V.C. PIPES, Page no.77				
1	Raw Sewage pump to TBF Distribution				
a	Main header				
	160 mm.	65.00	m	906.00	58,890.00
	PVC Specials- 10%				5,889.00
b	Distribution				
	110 mm.	85.00	m	428.00	36,380.00
	PVC Specials- 10%				3,638.00
2	TBF collection to FFT (gravity)				
a	Main header				
	140 mm.	180.00	m	693.00	124,740.00
	PVC Specials- 10%				12,474.00
b	collection tributary				
	75 mm.	35.00	m	211.00	7,385.00
	PVC Specials- 10%				738.50
3	TTU Plumbing				
	160 mm.	30.00	m	906.00	27,180.00
	PVC Specials- 10%				2,718.00
4	TBF distribution				
	75 mm.	100.00	m	211.00	21,100.00
	PVC Specials- 10%				2,110.00
36	Labour				
	Plumber	30.00	days	641.00	19,230.00
	Helper	70.00	days	579.00	40,530.00

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
	MJP/ SSR/ 2021-22 / SECTION - B LABOUR & MACHINERY , Page no. 14				
37	Providing double flange sluice valve confirming for IS- 14846 including worn gear arrangements as per test pressure, stainless steel spindle, caps, including inspection charges, transportation upto departmental store, unloading, stacking excluding GST levied by GOI & GOM in all respect etc. complete.				
	Sluice valves - PN -1 (Without by pass)				
	Raw Sewage pump				
	200 mm.	2.00	Nos	18,581.00	37,162.00
	Filter Feed Pump				
	200 mm.	2.00	Nos	18,581.00	37,162.00
	MJP/ SSR/ 2021-22 / SECTION - I(XII) : PIPES APPURTENANCES , Page no. 132				
38	Providing and supplying ISI mark CI D/F reflux valves (non-return valves) of following dia including railway freight, inspection charges, unloading from railway wagon, loading into truck, transportation upto departmental stores, unloading, stacking excluding GST levied by GOI & GOM in all respect etc. complete. Reflux valves as per I.S.5312 Part I (1984)				
	Without by pass arrangement -PN -1				
	Raw Sewage pump				
	200 mm.	2.00	Nos	17,751.00	35,502.00
	Filter Feed Pump				
	200 mm.	2.00	Nos	17,751.00	35,502.00
	MJP/ SSR/ 2021-22 / SECTION - I(XII) : PIPES APPURTENANCES , Page no. 131				
	Bio media Items				
39	Supplying of Specially designed container for holding Filter media including Lightweight Expanded Clay Aggregates size (8-30 mm) and Bio media including mixture of woodchips Vermicompost, cocopeat and bacterial culture with special worms per designed quantity including transportation & fixing in position as directed etc. complete.	1440.00	Nos	4,750.00	6,840,000.00
	Market rate				
40	Rapid sand Gravity filter sand At Source (Godhara, Gokak, Kanhan,	136.98	Cum	1,730.00	236,975.40
	MJP/ SSR/ 2021-22 / SECTION- A MATERIALS				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
41	Trasnsportation Godhara to Pune distance by Road 660 Km.	136.98	Cum	11,031.37	1,511,077.10
	MJP/ SSR/ 2021-22 / SECTION - C : TRANSPORTATION Page no.				
42	Stone Aggregate 20 mm	136.98	Cum	900.00	123,282.00
	MJP/ SSR/ 2021-22 / SECTION- A MATERIALS				
43	Transportation as per STATEMENT VI Including loading, unloading and stacking				
	Manure or sludge (5.52 Cum) lead 25 Km	529.00	Cum	747.48	395,417.00
	MJP/ SSR/ 2021-22 / SECTION - C : TRANSPORTATION Page no.				
NET TOTAL Rs.					23,851,137.30

MEASUREMENT SHEET - SCREEN CHAMBER, GRIT CHAMBER AND RAW SEWAGE SUMP

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	Short Wall	2	0.80	0.15	1.50	0.36	Cum
				Total for screen		1.85	Cum
	Grit						
	Long Wall (extra than screen chamber)	1	1.50	0.15	2.30	0.52	Cum
	Short Wall	2	1.10	0.15	2.30	0.76	Cum
				Total for grit		1.28	Cum
6	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	80	Cum	4.95	0.4	MT
7	Fabrication work in Frame and Grating for Access						
	Screen	1	3.30	0.80		2.64	Sqm
	Grit	1	4.80	1.25		6	Sqm
					Total	8.64	Sqm
8	Removing excess excavated material out of site						
	Screen chamber	1	3.30	0.80	1.30	3.44	Cum
	Grit Chamber	1	4.80	1.10	2.10	11.09	Cum
	soling, PCC, Raft volume					6.89	Cum
	Total Volume					21.42	Cum
	bulkage @ 40%					29.99	Cum
9	Refilling and compaction						
	Total Excavation					71.61	Cum
	Deduction for tank volume, soling, PCC, Raft					21.42	Cum
	Refilling and compaction volume					50.19	Cum

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	Raw Sewage Sump						
1	Excavation				4.05		
A	0.0 to 1.5 m	1	10.6	10.60	1.5	168.54	Cum
	soil					42.14	Cum
	Murum					42.14	Cum
	Soft rock					42.14	Cum
	hard rock					42.14	Cum
B	1.5 to 3.0 m	1	9.60	9.60	1.5	138.24	Cum
	soil					34.56	Cum
	Murum					34.56	Cum
	Soft rock					34.56	Cum
	hard rock					34.56	Cum
C	3.0 to 4.5 m	1	9.60	9.60	1.05	96.77	Cum

MEASUREMENT SHEET - SCREEN CHAMBER, GRIT CHAMBER AND RAW SEWAGE SUMP

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	soil					24.2	Cum
	Murum					24.2	Cum
	Soft rock					24.2	Cum
	hard rock					24.2	Cum
D	4.5 to 6.0 m	1	8.60	8.60	0	0	Cum
	soil					0	Cum
	Murum					0	Cum
	Soft rock					0	Cum
	hard rock					0	Cum
2	Soling						
	RSS	1	8.00	8.00	0.30	19.2	Cum
3	PCC M20						
	RSS	1	7.60	7.60	0.10	5.78	Cum
4	Raft M30						
	RSS	1	7.40	7.40	0.35	19.17	Cum
5	RCC Wall						
	Long Wall	2	7.00	0.25	3.50	12.25	Cum
	Short Wall	2	6.50	0.25	3.50	11.38	Cum
					Total	23.63	Cum
6	Beams						
	Beam 1	2	6.50	0.2	0.3	0.78	Cum
	Beam 2	2	6.50	0.2	0.3	0.78	Cum
					Total	1.56	Cum
7	Slab	1	7.00	7.00	0.2	9.8	Cum
	Deduction for manhole	-2	1.20	0.70	0.2	-0.34	Cum
					Total	9.46	Cum
8	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	100	Cum	53.82	5.39	MT
9	Fabrication work in Frame and Grating for Access						
	RSS	2	1.20	0.70		1.68	Sqm
10	Removing excess excavated material out of site						
	RSS	1	7.00	7.00	3.30	161.7	Cum
	soling, PCC, Raft volume					44.15	Cum
	Total Volume					205.85	Cum
	bulkage @ 40%					288.19	Cum
11	Refilling and compaction						

MEASUREMENT SHEET - SCREEN CHAMBER, GRIT CHAMBER AND RAW SEWAGE SUMP

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	Total Excavation					403.55	Cum
	Deduction for tank volume, soling, PCC, Raft					205.85	Cum
	Refilling and compaction volume					197.7	Cum
12	Dewatering						
	18 Days x 4 hours/day	days	18	hours / day	4	72	Hrs

MEASUREMENT SHEET - TIGER BIO FILTER

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	TIGER BIO FILTER						
1	Excavation				0.50		
A	0.0 to 1.5 m	1	12.66	5.66	0.5	35.83	Cum
	soil					8.96	Cum
	Murum					8.96	Cum
	Soft rock					8.96	Cum
	hard rock					8.96	Cum
2	Soling						
	TBF	1	12.46	5.46	0.30	20.41	Cum
3	PCC M20						
	TBF	1	12.06	5.06	0.10	6.11	Cum
4	Raft M30						
	TBF	1	11.86	4.86	0.10	5.77	Cum
5	Brick Wall						
	TBF						
	Long Wall	2	11.46	0.23	1.20	6.33	Cum
	Short Wall	2	4.00	0.23	1.20	2.21	Cum
	Crate Support Wall	5	11.00	0.23	0.50	6.33	Cum
						Total for T	14.87
							Cum
6	Plaster						
	Internal						
	Crate Support Wall						
	Long Wall	6	11.00		0.50	33	Sqm
	Wall top	5	11.00		0.23	12.65	Sqm
	Long Wall	2	11.00		1.20	26.4	Sqm
	Short Wall	2	4.00		1.20	9.6	Sqm
						Total	81.65
							Sqm
	External						
	Long Wall	2	11.46		1.20	27.51	Sqm
	Short Wall	2	4.46		1.20	10.71	Sqm
	Wall Top	1	30.92	0.3		9.28	Sqm
						Total	47.50
							Sqm
7	External-white-wash	1				47.50	Sqm
8	External-colour-wash	1				47.50	Sqm
9	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	60	Cum	5.77	0.35	MT
10	Removing excess excavated material out of site						
	soling, PCC, Raft volume					32.29	Cum
	Total Volume					32.29	Cum
	bulkage @ 40%					45.21	Cum

MEASUREMENT SHEET - TIGER BIO FILTER

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
11	Refilling and compaction						
	Total Excavation					35.83	Cum
	Deduction for tank volume, soling, PCC, Raft					32.29	Cum
	Refilling and compaction volume					3.54	Cum
12	MS Fabricated Shed						
	TBF-II Shed in Fabrication work Shed Size-12 m X 5 m x		12.00	5.00	3.00		
	for column 50*50*5 Unit Weight 6.97 kg/m	10	3.00	6.97	kg/m	209.10	KG
	for truss 50*50*3 Unit Weight 3.71 kg/m	5	5.00	3.71	kg/m	92.75	KG
	for principle rafter 50*50*3 Unit Weight	10	2.90	3.71	kg/m	107.59	KG
	for strut rafter 50*50*3 Unit Weight 3.71 kg/m	10	0.20	3.71	kg/m	7.42	KG
	for central strut rafter 50*50*3 Unit Weight	5	0.30	3.71	kg/m	5.57	KG
	for bottom frame below truss 50*50*3 Unit Weight 3.71 kg/m	1	34.00	3.71	kg/m	126.14	KG
	for perlin 30*30*3 Unit Weight 2.51 kg/m	5	13.00	2.51	kg/m	163.15	KG
	for Base Plate 150*150*10 mm	20	0.15	0.15	0.010	35.33	KG
					Total Wei	747.04	Kg
						0.75	MT
13	corrugated galvanised iron sheets	2	13.00	2.90		75.4	Sqm

MEASUREMENT SHEET - FILTER FEED TANK

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
8	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	100	Cum	43.1	4.31	MT
9	Fabrication work in Frame and Grating for Access						
	FFT	2	1.20	0.70		1.68	Sqm
10	Removing excess excavated material out of site						
	FFT	1	6.50	6.50	2.50	105.63	Cum
	soling, PCC, Raft volume					38.6	Cum
	Total Volume					144.23	Cum
	bulkage @ 40%					201.93	Cum
11	Refilling and compaction						
	Total Excavation					251.57	Cum
	Deduction for tank volume, soling, PCC, Raft					144.23	Cum
	Refilling and compaction volume					107.34	Cum
12	Dewatering						
	18 Days x 4 hours/day	days	18	hours/day	4	72	Hrs

MEASUREMENT SHEET - FILTER PLATFORM

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	FILTER PLATFORM						
1	Excavation				0.55		
A	0.0 to 1.5 m	1	6.6	6.20	0.55	22.51	Cum
	soil					5.63	Cum
	Murum					5.63	Cum
	Soft rock					5.63	Cum
	hard rock					5.63	Cum
2	Soling						
	Filter Platform	1	6.40	6.00	0.30	11.52	Cum
3	PCC M20						
	Filter Platform	1	6.00	5.60	0.10	3.36	Cum
4	Raft M30						
	Filter Platform	1	5.80	5.40	0.15	4.7	Cum
5	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	80	Cum	4.7	0.38	MT
6	Removing excess excavated material out of site						
	soling and PCC volume					14.88	Cum
	Total Volume					14.88	Cum
	bulkage @ 40%					20.84	Cum
7	Refilling and compaction						
	Total Excavation					22.51	Cum
	Deduction for tank volume, soling, PCC, Raft					14.88	Cum
	Refilling and compaction volume					7.63	Cum

MEASUREMENT SHEET - ELECTROMECHANICAL WORKS

Sr. No.	Item Description	Nos.	Unit
1	Screen (Manual) of size 1.8 m length x 0.5 m width of SS 304 MOC and Manual hand rake for cleaning screen of SS handle 1 m in length and cleaning area of 6 nos 5 mm SS rod of total length 200 mm straight and 50 mm of 90 degree bend.	1	No
2	Grit pump Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION - Pumps, Page no. 6, 7 of size 1.8 m length x 0.5 m width of SS304 MOC 1 HP (Up to 9000 LPH)	1	No
3	Raw Sewage Pumps Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION - Pumps, Page no. 6, 7 7.5 HP (Up to 72000 LPH)	2	Nos
4	TTU Feed pumps Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION - Pumps, Page no. 6, 7 7.5 HP (Up to 72000 LPH)	2	Nos
5	Pressure Sand Filter of FRP / MSEP vessel with suitable thickness to withstand a water pressure including MPV or 5 Valve system and PVC / UPVC / MSEP interconnecting and underdrain piping including fittings, with standard filter media layer with minimum depth of filter sand 1.0 m supported by gravels. The piping arrangement should provide sufficient pressure for backwash operations and avoid loss of sand during backwash operation. Suitable openings to be provided to ease addition and removal the media. Dia 1.9 m x 2 m minimum height	2	Nos
6	Activated Carbon Filter of FRP / MSEP vessel with suitable thickness to withstand a water pressure including MPV or 5 Valve system and PVC / UPVC / MSEP interconnecting and underdrain piping including fittings, with standard filter media layer with minimum depth of Activated Carbon 1.0 m supported by gravels. The piping arrangement should provide sufficient pressure for backwash operations and avoid loss of Activated carbon during backwash operation. Suitable openings to be provided to ease addition and removal the media. Dia 1.9 m x 2 m minimum height	2	Nos
7	PurAll Tablet Chlorinator + cartridge	0	nos

MEASUREMENT SHEET - ELECTROMECHANICAL WORKS

Sr. No.	Item Description	Nos.	Unit
7	NaOCl Chlorinator Pump Diaphragm Type / peristaltic type / Solenoid Max Flow Rate Upto 10LPH Power Source Electric Phase Single Material PP / PTFE(Teflon) Voltage 230 Volt Frequency 50Hz		
a	Mixing Tank of 100 Ltrs capacity	1	Nos
b	Dosing Pump	2	Nos
8	Control Panel		
	Design, Supply, Installing, Commissioning & Testing of Master PLC control monitoring and communication panel as per IEC 61131 at Pure Water Sump suitable for monitoring and control of pure water Pumps. Pressure Transmitters, Level Transmitter, PH Transmitter, Turbidity Transmitter ,for all pumps installed.		
	Master PLC Panel	1	No
	MJP/ MECH/ ELECT / SSR/ 2021-22/ SECTION 19 - SA [SCADA & AUTOMATION] Item no. 2.7 Page no. 72		
9	Supplying and erecting Fully Automatic Star Delta starter to operate squirrel cage induction motor working on 380- 440 Volt, 3 phase, 50 Hz with no volt coil, over load element, and ON - OFF push buttons, with necessary material and connected to supply, etc complete. Starter with original sheet steel encloser.		
	> 7.5 HP & Up to 12.5 HP	6	nos
	1 nos extra starter considered as spare.		
	MJP /MECH/ ELECT/ SSR/ 2021-22 SECTION 10 - LG [L.T. SWITCHGEAR AND PROTECTION] Item no. LG 3 Page no. 27		
10	Main power supply cable		
	3 core PVC insulated, PVC sheathed copper conductor flat submersible cable		
	Supplying and erecting, Flat flexible submersible cable with, Copper Conductor, PVC insulated, and PVC sheathed.		
	3 core 16 sq mm	35	m
11	Power cables		
	Aluminium conductor 4 Core, XLPE / PVC insulated & armoured cable		
	Supplying and erecting, XLPE / PVC insulated, armoured cable 1100 V grade with ISI mark Four core, solid / stranded aluminium conductor with 6 mm thick 25 mm width M.S. spacer with G.I. Earth wire 6 sq mm, complete erected on wall / on pole with 25 X 3 mm M.S. clamps or in provided trench in an approved manner.		
	4 Core 6 sq mm	160	m
	MJP MECH/ ELECT/ SSR/ 2021-22 SECTION 12 - CB [L.T. CABLE] Item no. CB 6 Page no. 35		
12	Control Cables		
	Copper conductor PVC insulated, Unarmoured control cable		

MEASUREMENT SHEET - ELECTROMECHANICAL WORKS

Sr. No.	Item Description	Nos.	Unit
	Supplying and erecting Un-armoured control cable with ISI mark stranded / solid copper conductor 1.1 kV grade complete erected on wall / panel or in provided trench in an approved manner.		
	4 core 2.5 sq mm	160	m
	MJP MECH/ ELECT/ SSR/ 2021-22/ SECTION 12 - CB [L.T. CABLE] Item no. CB 8-2 Page no. 36		

MEASUREMENT SHEET - PLUMBING

Sr. No.	Item Description	Nos.	L (m)	B (m)	Quantity	Unit
	Providing and supplying in standard lengths ISI mark rigid unplasticised PVC pipes suitable for potable water with solvent cement joints including cost of couplers, as per IS specification no. 4985 / 1988 excluding GST levied by GOI and GOM in all respect, including transportation, freight charges, inspection charges, loading, unloading, conveyance to the departmental stores and stacking the same in closed shed duly protected from sun rays and rains including cost of jointing material i.e. solvent cement, etc. complete (selffit type to be jointed with cement solvent).					
	1) 10% of cost of pipes shall be considered for cost of PVC specials for estimate purpose only. 2) One coupler and required cement solvent shall be provided with each full length pipe cost of which is included in rates below.					
	MJP/ SSR/ 2021-22 / SECTION – I(II) P.V.C. PIPES,					
1	Raw Sewage pump to TBF Distribution					
a	Main header	Dia	160			
	160 mm.	1	65		65	m
	PVC Specials- 10%					
b	Distribution					
	110 mm.	1	85		85	m
	PVC Specials- 10%					
2	TBF collection to FFT (gravity)					
a	Main header					
	140 mm.	1	180		180	m
	PVC Specials- 10%					
b	collection tributary					
	75 mm.	1	35		35	m
	PVC Specials- 10%					
3	TTU Plumbing	Dia	160			
	160 mm.	1	30		30	m
	PVC Specials- 10%					
4	TBF distribution			No. of beds		
	75 mm.	1	5	20	100	m
	PVC Specials- 10%					
5	Labour	Nos	Days			
	Plumber	3	10		30	days
	Helper	7	10		70	days
6	Sluice valves					

MEASUREMENT SHEET - PLUMBING

Sr. No.	Item Description	Nos.	L (m)	B (m)	Quantity	Unit
	Providing double flange sluice valve confirming for IS- 14846 including worn gear arrangements as per test pressure, stainless steel spindle, caps, including inspection charges, transportation upto departmental store, unloading, stacking excluding GST levied by GOI & GOM in all respect etc. complete.					
	MJP/ SSR/ 2021-22 / SECTION - I(XII) : PIPES APPURTENANCES , Page no. 132					
	Raw Sewage pump					
	200 mm.	2			2	Nos
	Filter Feed Pump					
	200 mm.	2			2	Nos
7	Reflux valves (non-return valves)					
	Providing and supplying ISI mark CI D/F reflux valves (non-return valves) of following dia including railway freight, inspection charges, unloading from railway wagon, loading into truck, transportation upto departmental stores, unloading, stacking excluding GST levied by GOI & GOM in all respect etc. complete. Reflux valves as per I.S.5312 Part I (1984)					
	MJP/ SSR/ 2021-22 / SECTION - I(XII) : PIPES APPURTENANCES , Page no. 131					
	Raw Sewage pump					
	200 mm.	2			2	Nos
	Filter Feed Pump					
	200 mm.	2			2	Nos



PLANT LAYOUT
AREA = 1805 SQM.

Process Unit Details								
Sr. No	Description	No	L/D	B	H	FB	Total H	MOC
			m.	m.	m.	m.	m.	
1	Screen Chamber	1	3.00	0.50	0.30	1.00	1.30	RCC
2	Grit Chamber	1	4.50	1.10	0.80	1.30	2.10	RCC
3	Raw Sewage Sump	1	6.50	6.50	2.00	1.30	3.30	RCC
4	Tiger Bio Filter	20	11.00	4.00	-	-	1.20	BRICK
5	Filter Feed Tank	1	6.00	6.00	2.00	0.50	2.50	RCC
6	Filter Platform	1	5.40	5.00	-	-	-	RCC
7	Pressure Sand Filter	2	DIA	1.90	-	-	2.00	MSEP
8	Activated Carbon Filter	2	DIA	1.90	-	-	2.00	MSEP
9	Chlorination Unit	1	-	-	-	-	-	-

PROJECT NAME :

1000 KLD SEWAGE TREATMENT PLANT
 BASED ON TIGER BIO FILTER
 TECHNOLOGY.

NOTES

- All dimensions are in 'mm' unless mentioned otherwise.
- All dimensions are checked and co-related with the design and structural drawings and any discrepancy or omission shall be brought to the notice.
- All linear dimensions are including plastering in structural drawings unless otherwise mentioned.
- The structural component and BOQ prepared considering Finished Ground Level (+00.00) and Existing Ground Level (+00.00). Temporary Bench Mark 1 (+00.00) Kept on the Top level of Road on North East side of the site.
- BIS Grade Cement to be used for all concrete and plastering applications.
- All water treatment structure to be checked for water leakages.
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REVISION		
DATE	REMARKS	SIGNATURE

CLIENT : SWSM, MAHARASHTRA

DRAWING NAME :

PLANT LAYOUT

PROJECT CODE : TBF-	DRAWING NO : D-01/PL/01	DATE : JUNE-2021
DRAWN BY : L.D.B.	CHECKED BY : S.B.	SCALE : NTS.


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 Web : www.tbfenvironmental.in

PROJECT NAME :
 1000 KLD SEWAGE TREATMENT PLANT
 BASED ON TIGER BIO FILTER
 TECHNOLOGY.

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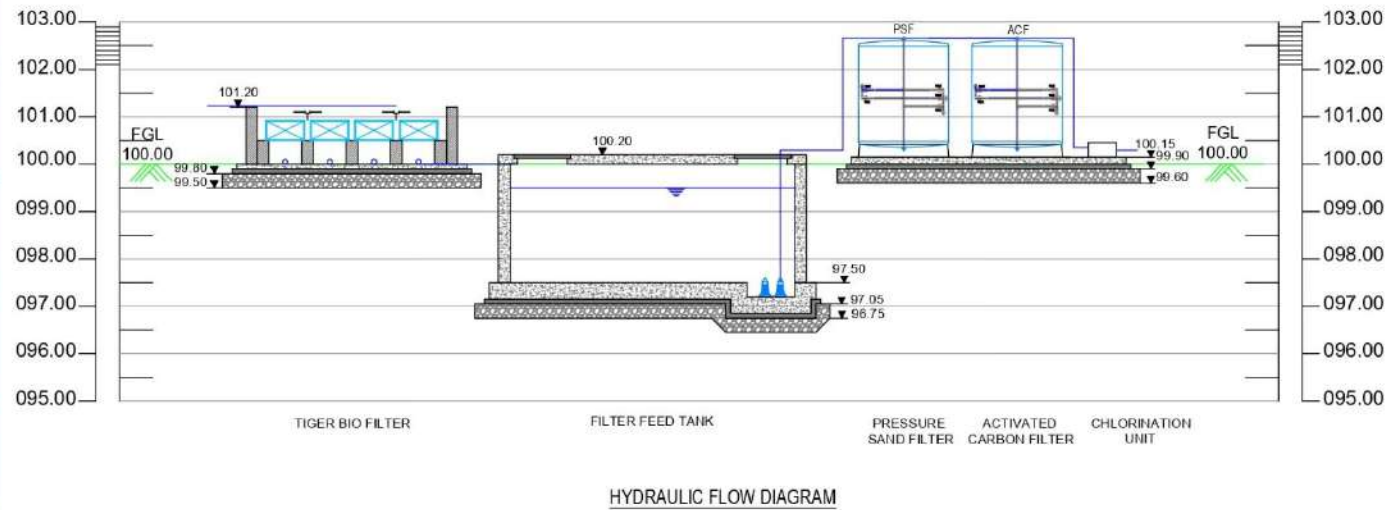
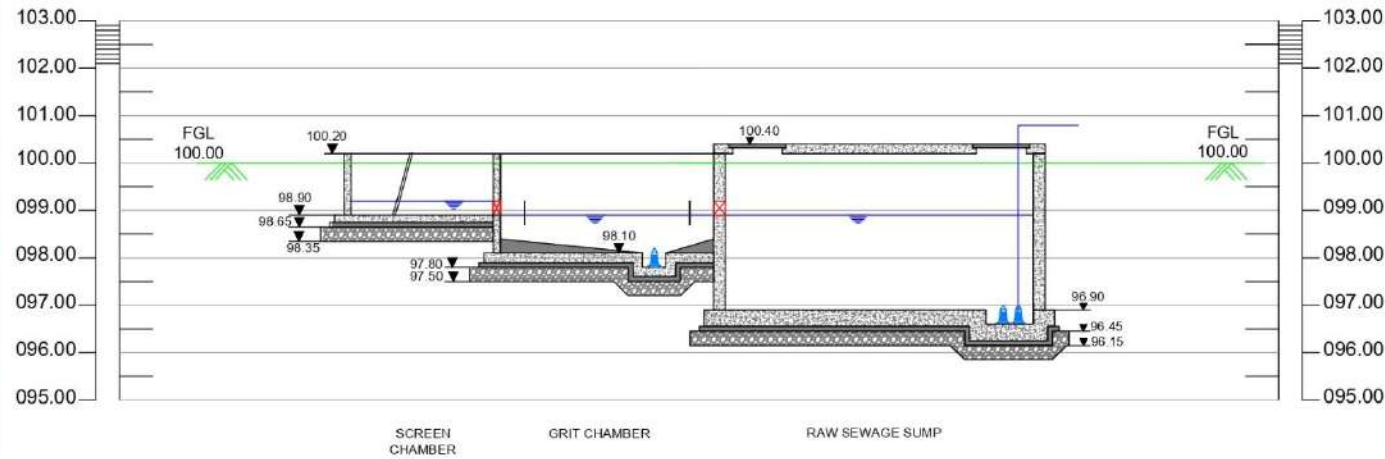
DRAWING NAME :
 HYDRAULIC FLOW DIAGRAM

PROJECT CODE : TBF-	DRAWING NO : D-02/HFD/01	DATE : JUNE-2021
DRAWN BY : L.D.B.	CHECKED BY : S.B.	SCALE : NTS.

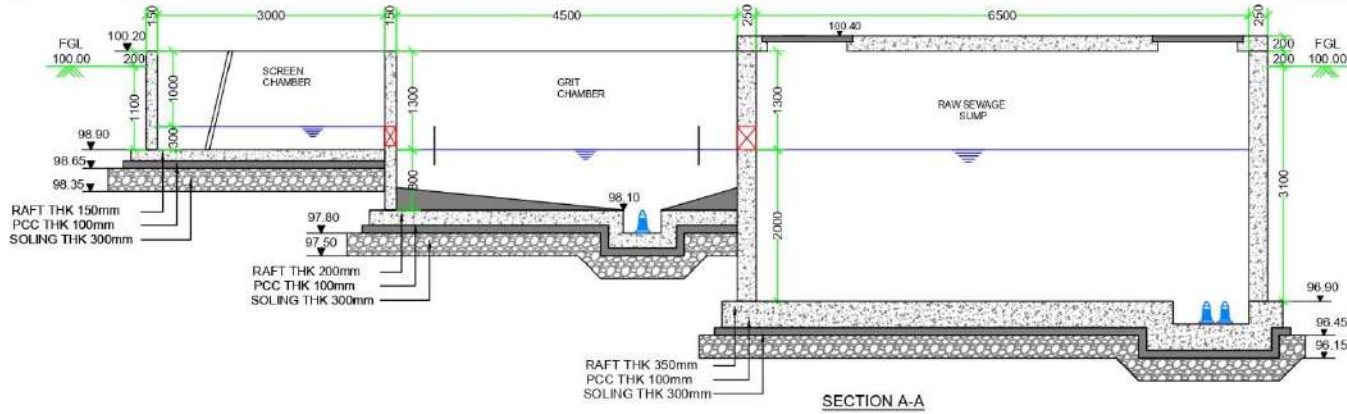


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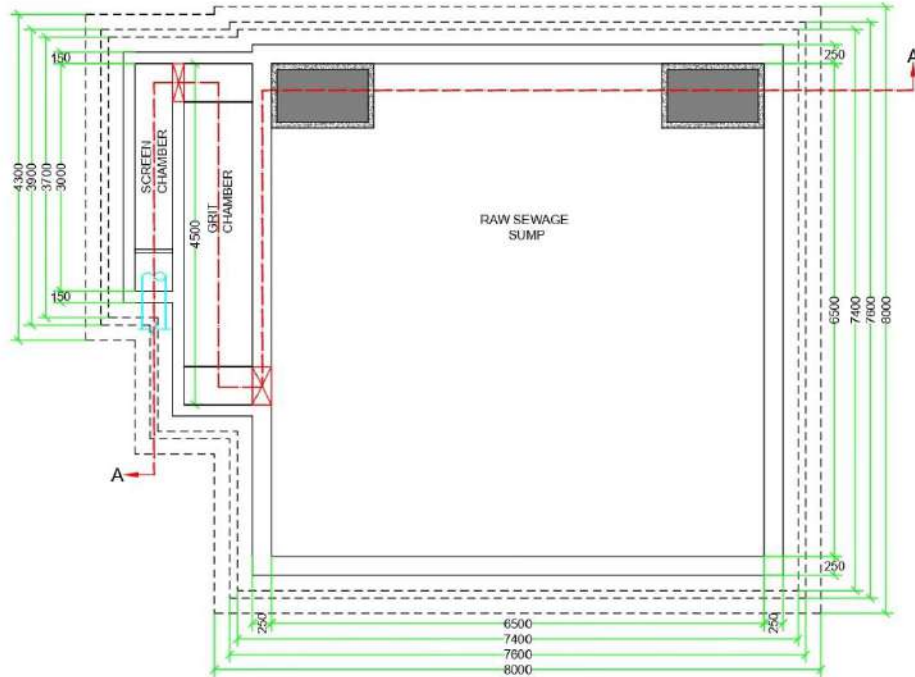
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HYDRAULIC FLOW DIAGRAM



SECTION A-A



PLAN

SCREEN CHAMBER, GRIT CHAMBER & RAW SEWAGE SLUMP

PROJECT NAME :

1000 KLD SEWAGE TREATMENT PLANT
BASED ON TIGER BIO FILTER
TECHNOLOGY.

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DRAWING NAME :

SCREEN CHAMBER, GRIT CHAMBER
& RAW SEWAGE SLUMP

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PROJECT NAME :
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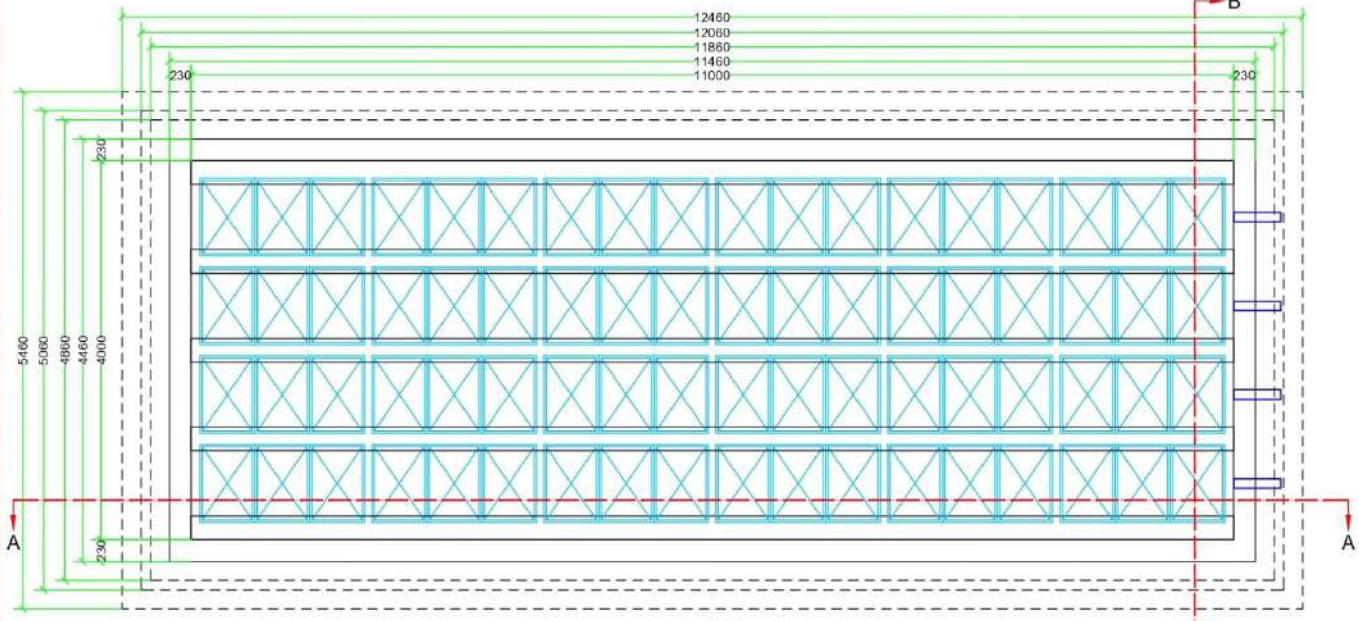
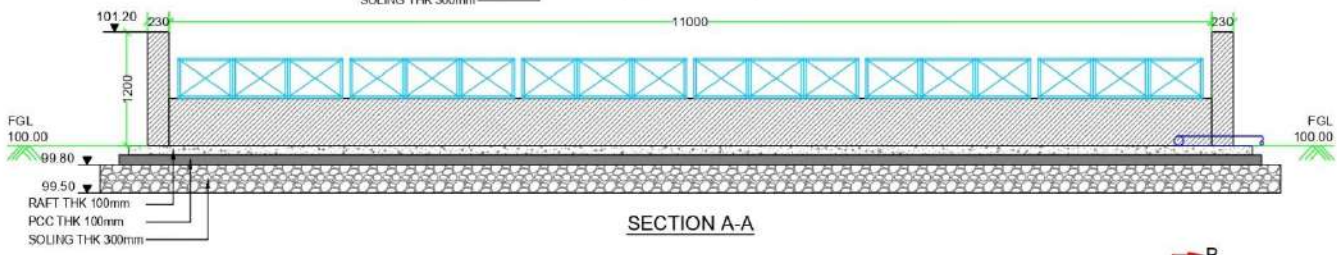
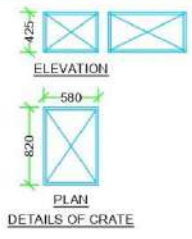
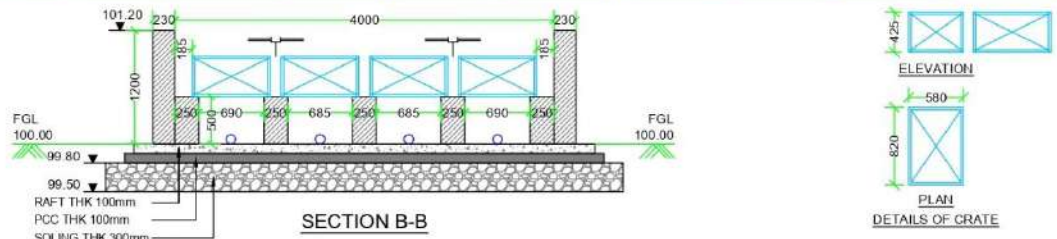
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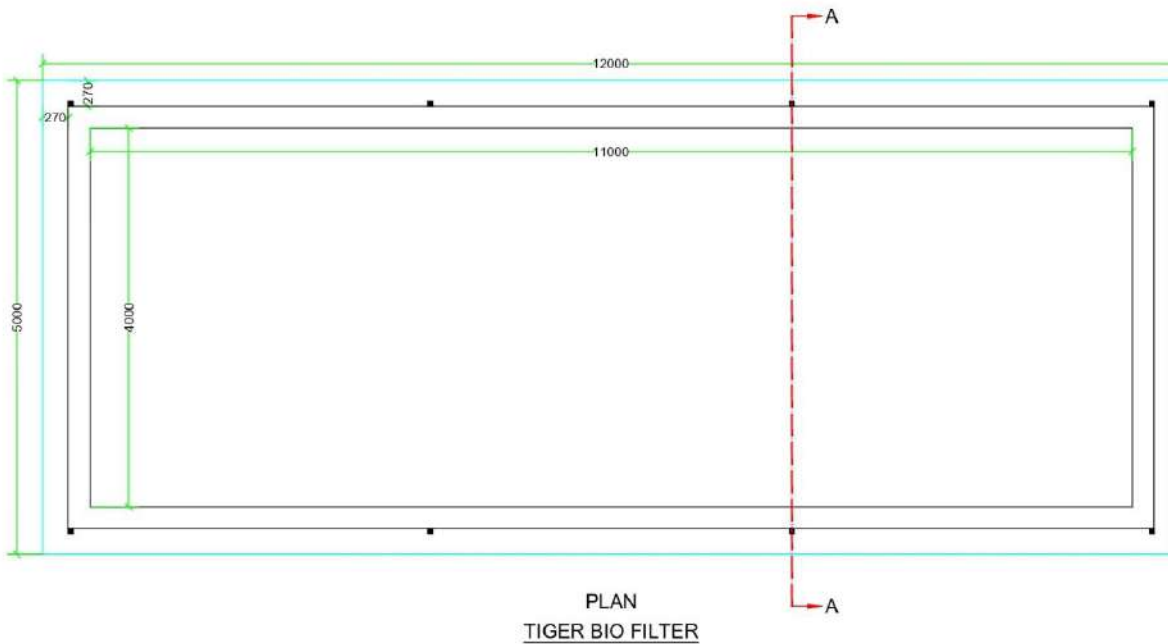
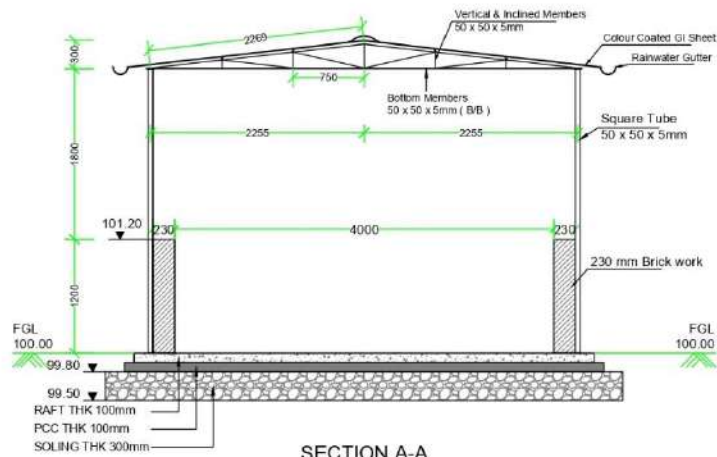
CLIENT : SWSM, MAHARASHTRA
 DRAWING NAME :
 TIGER BIO FILTER

PROJECT CODE : TBF-	DRAWING NO : D-04/TBF/01	DATE : JUNE 2021
DRAWN BY : L.D.B.	CHECKED BY : S.B.	SCALE : NTS.

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PLAN
 TIGER BIO FILTER



PROJECT NAME :

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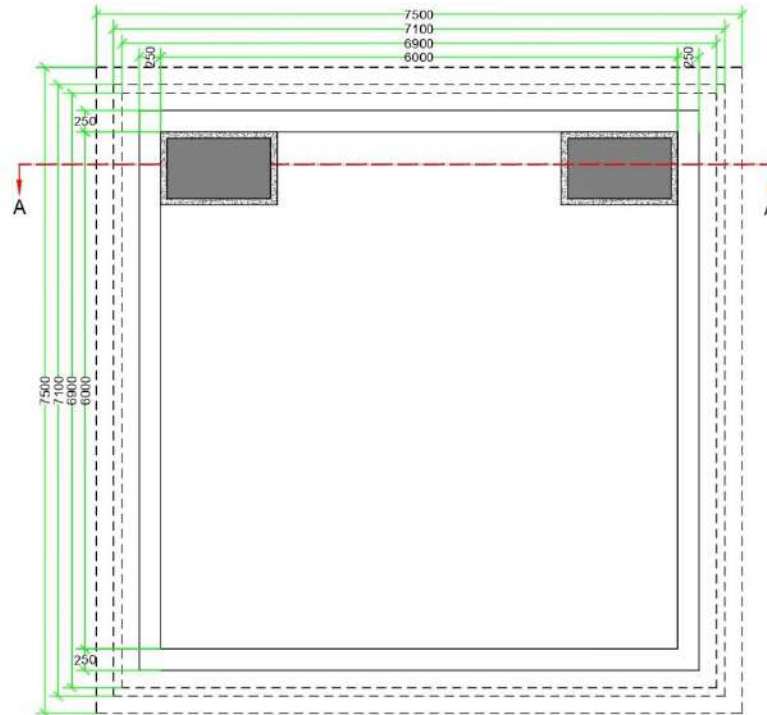
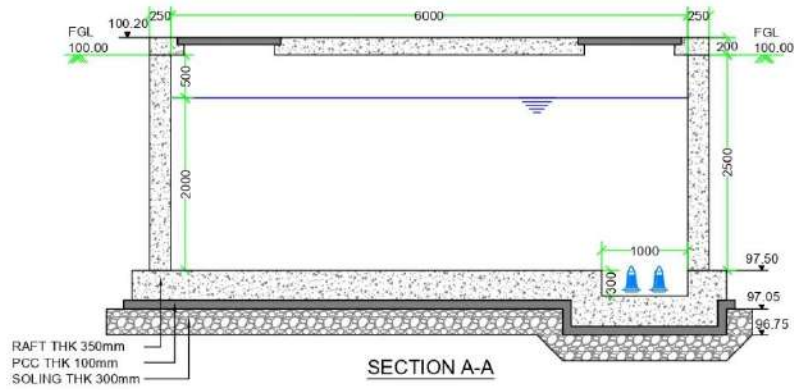
CLIENT : SWSM, MAHARASHTRA

DRAWING NAME:

TIGER BIO FILTER

PROJECT CODE : TBF-	DRAWING NO : D-04/TBF/02	DATE : JUNE-2021
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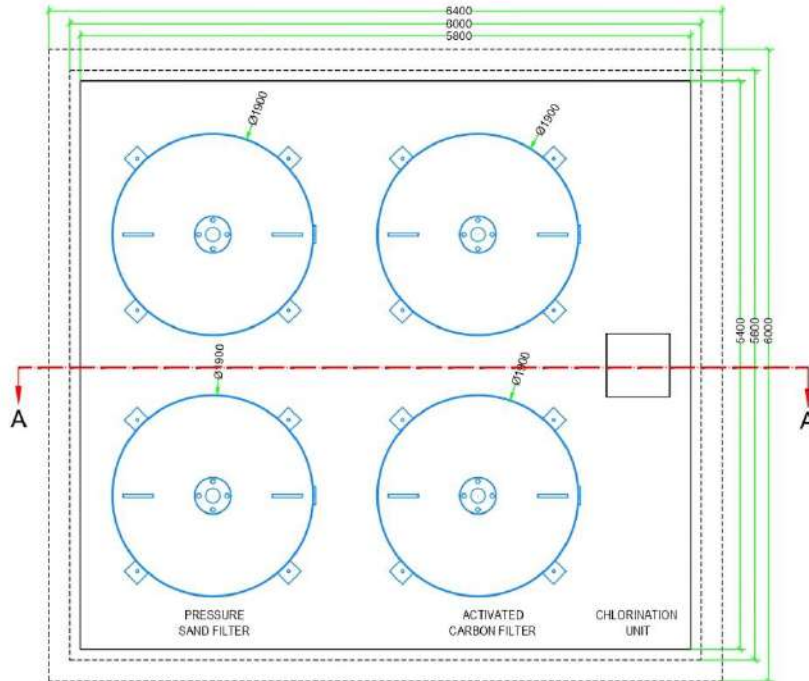
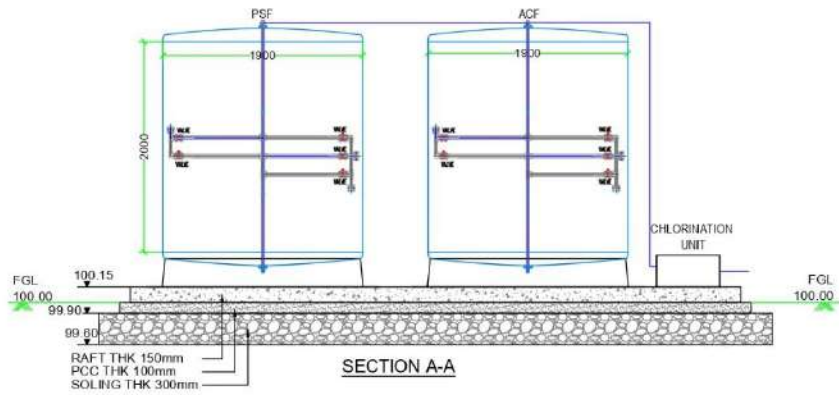
CLIENT : SWSM, MAHARASHTRA

DRAWING NAME:

FILTER FEED TANK

PROJECT CODE : TBF-	DRAWING NO : D-05/FF TAD1	DATE : JUNE-2021
DRAWN BY : L.D.B.	CHECKED BY : S.B.	SCALE : NTS.


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PLAN
PRESSURE SAND FILTER,
ACTIVATED CARBON FILTER & CHLORINATION UNIT

PROJECT NAME :

1000 KLD SEWAGE TREATMENT PLANT
BASED ON TIGER BIO FILTER
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ACTIVATED CARBON FILTER
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**1250 KLD STP BASED ON
TBF TECHNOLOGY**

PROCESS CALCULATIONS
TIGER BIO FILTER OF 1250 KLD CAPACITY

Design flow	=	1250.00	KLD
	=	1.250	MLD
Peak flow factor	=	3.00	

1 SCREEN CHANNELS: MANUAL

No. of Manual Screen	=	1	No.
Average Flow	=	1.25	MLD
Peak Flow Factor	=	3.00	
Design Flow	=	Peak Flow	
	=	3.75	MLD
	=	156.25	m ³ /hr
	=	0.043	m ³ /sec
 Average Flow	=	1.25	MLD
	=	52.083	m ³ /hr
	=	0.014	m ³ /sec
 Design Flow in each Screen	=	0.043	m ³ /sec
		1	No.
	=	0.043	m ³ /sec
 Average Flow in each Screen	=	0.014	m ³ /sec
		1	No.
	=	0.014	m ³ /sec
 Maximum Velocity through Screen at Peak Flow	=	1.2	m/sec
Minimum Velocity through Screen at Average Flow	=	0.6	m/sec
 Clear Area of Opening through Screen for Peak Flow	=	0.043	m ³ /sec
		1.2	m/sec
	=	0.036	m ²
 Clear Area of Opening through Screen for Average Flow	=	0.014	m ³ /sec
		0.6	m/sec
	=	0.023	m ²
 Considering maximum Area of Opening through Screen	=	0.036	m ²
Clear Spacing of Bars	=	10	mm

Thickness of Bars	=	5	mm	
Gross Area of Screen	=	$0.036 \times (10+5) / 10$		
	=	0.054	m ²	
Assuming Depth of Screen Channel	=	300.00	mm	
Gross Width of Screen	=	$0.054 / 0.3$		
	=	0.180	m	
No. of Bars	=	(Gross Width of Screen / Center to Center Spacing of Bars) - 1		
	=	$0.18 / ((10+5) / 1000) - 1$		
	=	1		
	=	11.0	Nos.	
Say	=	11	Nos.	
Width of Screen provided	=	(Number of Bars+1) x Clear Spacing + (Number of Bars x Bar Thickness)		
	=	$(11+1) \times 10 + (11 \times 5)$		
	=	175	mm	
Width Say	=	0.50	m	
Liquid Depth of Screen Channel provided	=	0.30	m	
L:B	=	8.00		
Length of Screen Channel provided	=	4.00	m	
Freeboard provided	=	1.00	m	Invert Depth of incoming sewer
Total Depth of Screen Chamber	=	1.30	m	
Velocity in Channel at Average Flow	=	Average Flow / Cross Sectional Area of Screen Channel		
	=	$0.014 / ((0.5 \times 0.3) / 1000 \times 1000)$		
	=	0.093	m/sec	
	>	0.300	m/sec	

Head Loss across Screen

Head Loss across Screen	=	$0.0728 (V^2 - v^2)$		
V = Velocity through Screen at Peak Flow	=	Peak Flow through Screen Channel / Clear Area of Opening through Screen		
	=	1.194	m/sec	
v = Velocity in approach Channel at Peak Flow	=	Peak Flow through Screen Channel / Cross Sectional Area of Screen Channel		
	=	0.8	m/sec	
Head Loss across Screen at Peak Flow	=	0.058	m	

Head Loss across Screen at 50% Clogged Condition

Velocity through Screen at 50% Clogged Condition at Peak Flow	=	2.389	m/sec	
Head Loss across screen at 50% Clogged Condition at Peak Flow	=	0.369	m	
	>	0.300	m/sec	OK

2 CONVENTIONAL GRIT CHAMBER: MANUAL

No. of Grit Chamber	=	1		
---------------------	---	---	--	--

Average Flow	=	1.25	MLD
Peak Flow Factor	=	3.00	
Design Flow	=	Peak Flow	
Peak Flow	=	3.75	MLD
	=	3750	m ³ /day
	=	156	m ³ /hr
	=	0.043	m ³ /sec
Design Flow to each Grit Chamber	=	3750/1	
	=	3750	m ³ /day
	=	156	m ³ /hr
	=	0.043	m ³ /sec
According to CPHEEO Manual			
Particle Size	=	0.15	mm
Specific Gravity	=	2.65	
Surface Overflow Rate for 100% removal efficiency in an ideal Grit Chamber	=	Settling Velocity of the minimum size of Particles to be removed	
	=	1.5	m/s
	=	1296	m ³ /m ² /day
Considering Efficiency of removal of desired Particles, $\eta = 75\%$	=	75%	
and Measure of Settling Basin Performance, $n = 1/8$ for very good performance	=	0.125	
Design Overflow Rate	=	857	m ³ /m ² /day
Surface Overflow Rate for 0.15 mm dia. Particle Size with Specific Gravity $S_s > 2.65$ Table 5.6	=	1555	m ³ /m ² /day
Considering Design Overflow Rate	=	960	m ³ /m ² /day
Area of Grit Chamber required	=	3750	m ³ /day
	=	960	m ³ /m ² /day
	=	3.91	m ²
L:B ratio	=	3	
Length of Chamber provided	=	4.50	m
Width of Chamber provided	=	1.20	m
Hydraulic Retention Time (HRT) in Grit Chamber at Peak Flow	=	60	sec
Volume of Grit Chamber required	=	0.043x60	
	=	2.58	m ³
Depth required in Grit Chamber	=	2.58 / (4.5x1.2)	
	=	0.48	m
Say	=	0.50	m
Grit Storage Depth	=	0.30	m

Total Liquid Depth required	=	0.80	m
Length of Grit Pit	=	0.50	m
Width of Grit Pit	=	0.50	m
Depth of Grit Pit	=	0.30	m
Free Board	=	1.30	m

3 RAW SEWAGE SUMP (WET WELL)

No. of Units	=	1	No.
Average Flow	=	1.25	MLD
	=	52.083	m ³ /hr
	=	0.0145	m ³ /sec

Peak Flow Factor	=	3.00	
------------------	---	------	--

Design Flow	=	Peak Flow	
	=	3.75	MLD
	=	156	m ³ /hr
	=	0.043	m ³ /sec

Hydraulic Retention Time (HRT) at Average Flow	=	120	min
--	---	------------	-----

Volume required	=	0.0145 x 120 x 60	
	=	104	m ³

Hydraulic Retention Time (HRT) at Peak Flow	=	Volume / Average Flow	
	=	40	min
	<	30	min

Total Volume of Wet Well	=	104	m ³
--------------------------	---	-----	----------------

Side Water Depth (SWD) provided	=	2.50	m
Plan Area of Wet Well	=	41.76	m ²
Length/width of Sump required	=	6.46	m
Length/width of Sump provided	=	6.50	m
Volume of Sump provided	=	105.63	m ³
Length of Pump Pit	=	2.00	m
Width of Pump Pit	=	0.80	m
Depth of Pump Pit	=	0.30	m
Free Board	=	1.30	m

3.1 DESIGN STATEMENT-RSS E&M

Design Considerations

Design flow	=	1.25	MLD
	=	1250.00	Cum/Day
Peak flow factor	=	3.00	

Pumping machinery

Friction factor for Fittings in Pressure Mains

Elbow 90 degrees	=	30		
Friction Factor for each	=	1		
Friction factor for all	=	30		
Elbow 45 degrees	=	0		
Friction Factor for each	=	0.75		
Friction factor for all	=	0		
Elbow 22 degrees	=	0		
Friction Factor for each	=	0.5		
Friction factor for all	=	0		
Tee 90 degrees	=	0		
Friction Factor for each	=	1.5		
Friction factor for all	=	0		
Tee in straight pipe	=	18		
Friction Factor for each	=	0.3		
Friction factor for all	=	5.4		
Gate valve open	=	1		
Friction Factor for each	=	0.4		
Friction factor for all	=	0.4		
Swing check	=	1		
Friction Factor for each	=	2.5		
Friction factor for all	=	2.5		
Total friction factor	=	38.3		
Stage		low	ave	peak
Average flow, cum / day	=		1250.00	
Proportion	=	0.6	1	2
Design flow, cum / day	=	750	1250	2500
Hazen Williams C	=	140	140	140
Desired velocity, m/s	=	0.6	1.0	1.5
Number of Pumping hours	=	16.0	16.0	16.0
Area needed, sqm	=	0.0217	0.0217	0.0289
Dia needed, m	=	0.166	0.166	0.192
Dia needed, mm	=	166	166	192
Dia provided, mm (User)	=	180	180	180
Radius, m	=	0.090	0.090	0.090
Radius power 0.63	=	0.219	0.219	0.219
S power 0.54	=	0.023	0.038	0.058
S	=	0.001	0.002	0.005
Slope 1 in	=	1077.7	418.5	197.5
length, m	=	75	75	75
Friction in pipeline, m	=	0.1	0.2	0.4
Velocity head, m	=	0.018	0.051	0.115
Friction factor in fittings	=	38.3	38.3	38.3
Friction in fittings, m	=	0.7	2.0	4.4
Static lift, m	=	5.0	5.0	5.0
Total head, m	=	5.7	7.0	9.4
Efficiency of pumpset	=	0.8	0.8	0.8
Discharge, lps	=	13.0	21.7	43.4
Discharge, Cum/Hr	=	46.9	78.1	156.3
Kw required	=	2.017	3.359	6.722
HP required	=	3.0	5.0	9.5
Number of Pumps	=	2	2	2

**4 TIGER BIO FILTER
DESIGN STATEMENT-TBF1- 50 KLD**

Number of pumping hours	=	16	Hrs	
Number of BMF tanks provided	=	25	Nos	
Design flow to each tank	=	50.00	Cum/day	
	=	3.13	Cum/ Hr for 16 Hr	
	=	0.87	lps	
Inlet BOD	=	250.00	mg/l	
Inlet TSS	=	400.00	mg/l	
BOD load applied	=	12.5	kg/day	
BOD uptake rate	=	0.1	Kg of BOD / Kg of worms	(0.5 - 1.0)
Worms required	=	125	Kg worms	
Sewage application rate	=	1.85	Cum/Sqm/day	(1 - 2 Cum/Sqm/day)
Area required	=	27.03	Sqm	
Area Provided	=	28	Sqm	
Area of each crate	=	0.4	Sqm	
Number of crates	=	70	Nos	
say	=	72	Nos	
Crate in longitudinal direction	=	18	Nos	
Crate in travers direction	=	4	Nos	
crates provided	=	72	Nos	OK
Width provided	=	4.00	m	
Length required	=	11.00	m	
Depth provided	=	1.2	m	

5 TERTIARY TREATMENT UNIT

Design Considerations

Design flow	=	1.25	MLD	
	=	1250.00	Cum/Day	
Peak flow factor	=	3.00		

5.1 FILTER FEED TANK

Number of FFT provided	=	1	Nos	
Number of operating hours	=	16	Hrs	
Design flow	=	1250.00	Cum/Day	
	=	78.13	Cum/Hr	
	=	0.02170	Cum/Sec	
Hydraulic Retention time	=	60	min	
Volume required	=	78.13	Cum	
Depth	=	2.50	m	
Civil Tanks				
Area	=	31.25	Sqm	
Length/Width required	=	5.59	m	
Length/Width provided	=	6.00	m	
Freeboard provided	=	0.50	m	

Volume Provided	90.00	Cum
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DESIGN STATEMENT-TTU E&M

Design Considerations

Design flow	=	1.25	MLD
	=	1250.00	Cum/Day
Peak flow factor	=	3.00	

Pumping machinery

Friction factor for Fittings in Pressure Mains

Elbow 90 degrees	=	8
Friction Factor for each	=	1
Friction factor for all	=	8
Elbow 45 degrees	=	0
Friction Factor for each	=	0.75
Friction factor for all	=	0
Elbow 22 degrees	=	0
Friction Factor for each	=	0.5
Friction factor for all	=	0
Tee 90 degrees	=	0
Friction Factor for each	=	1.5
Friction factor for all	=	0
Tee in straight pipe	=	8
Friction Factor for each	=	0.3
Friction factor for all	=	2.4
Gate valve open	=	1
Friction Factor for each	=	0.4
Friction factor for all	=	0.4
Swing check	=	1
Friction Factor for each	=	2.5
Friction factor for all	=	2.5
Total friction factor	=	13.3

Stage	low	ave	peak	
Average flow, cum / day	=	1250.00		
Proportion	=	0.6	2	
Design flow, cum / day	=	750	2500	
Hazen Williams C	=	140	140	
Desired velocity, m/s	=	0.8	1.5	
Number of Pumping hours	=	16.0	16.0	
Area needed, sqm	=	0.0163	0.0217	0.0289
Dia needed, m	=	0.144	0.166	0.192
Dia needed, mm	=	144	166	192
Dia provided, mm (User)	=	160	160	160
Radius, m	=	0.080	0.080	0.080
Radius power 0.63	=	0.204	0.204	0.204
S power 0.54	=	0.033	0.041	0.062
S	=	0.002	0.003	0.006
Slope 1 in length, m	=	551.4	364.7	172.1
	=	35	35	35

Friction in pipeline, m	=	0.1	0.1	0.2
Velocity head, m	=	0.033	0.051	0.115
Friction factor in fittings	=	13.3	13.3	13.3
Friction in fittings, m	=	0.4	0.7	1.5
Static lift, m	=	10.0	10.0	10.0
Total head, m	=	10.4	10.7	11.5
Efficiency of pumpset	=	0.8	0.8	0.8
Discharge, lps	=	13.0	21.7	43.4
Discharge, Cum/Hr	=	46.9	78.1	156.3
Kw required	=	3.458	5.758	11.523
HP provided	=	5.0	8.0	15.5
Number of Pumps	=	2	2	2

5.2 PRESSURE SAND FILTER

Number of unit provided	=	3	Nos.
Designed @ 16 hrs working for flow of	=	26.04	m ³ /h
Loading rate	=	12.00	m ³ /m ² /h
Area of DMF	=	2.17	m ²
Dia of DMF	=	1.66	m
Provided	=	1.700	m
Backwash water			
Backwash velocity	=	15.00	m/hr
backwash flowrate	=	33.27	m ³ /h
Backwash volume for 20 mins	=	11.09	m ³

5.3 ACTIVATED CARBON FILTER

Number of unit provided	=	3	Nos.
Designed @ 16 hrs working for flow of	=	26.04	m ³ /h
Loading rate	=	12.00	m ³ /m ² /h
Area of ACF	=	2.17	m ²
Dia of ACF	=	1.66	m
Provided	=	1.700	m
Backwash water			
Backwash velocity	=	15.00	m/hr
backwash flowrate	=	33.27	m ³ /h
Backwash volume for 20 mins	=	11.09	m ³

5.4 CHLORINE DOSING SYSTEM NaOCl DOSING SYSTEM

Average Flow	=	78.13	m ³ /hr
Design Chlorine Dosage (Max)	=	3	mg/l
Concentration of Chlorine in commercially available NaOCl	=	10%	
Design NaOCl Dosage	=	30	mg/l
Operating hours	=	16.0	hr

$$\begin{aligned} \text{Quantity of NaOCl required} &= 78.125 \times 30 \times 16 / 1000 \\ &= 37.50 \quad \text{Kg/day} \end{aligned}$$

$$\begin{aligned} \text{Design Strength of NaOCl Solution} &= 100\% \\ \text{Volume of NaOCl Solution} &= 37.5 / (1 \times 1000) \\ &= 0.040 \quad \text{m}^3 \end{aligned}$$

$$\begin{aligned} \text{No. of Dosing Tanks provided} &= 1 \quad \text{Nos.} \end{aligned}$$

$$\begin{aligned} \text{Volume of each Dosing Tank} &= 0.04 / 1 \\ &= 0.04 \quad \text{m}^3 \\ &= 100 \quad \text{Litres} \end{aligned}$$

$$\begin{aligned} \text{No. of Working NaOCl Dosing Pump provided} &= 1 \quad \text{No.} \end{aligned}$$

$$\begin{aligned} \text{Capacity of each NaOCl Dosing Pump required} &= \frac{\text{Total Volume of NaOCl Solution}}{\text{(No. of Dosing pumps)}} \\ &= 0.04 / (1 \times 16) \end{aligned}$$

$$\begin{aligned} &= 0.003 \quad \text{m}^3/\text{hr} \end{aligned}$$

$$\begin{aligned} &= 3.00 \quad \text{LPH} \end{aligned}$$

$$\begin{aligned} \text{Capacity of each NaOCl Dosing Pump provided} &= 3.00 \quad \text{LPH} \end{aligned}$$

$$\begin{aligned} \text{No. of Standby NaOCl Dosing Pump provided} &= 1 \quad \text{No.} \end{aligned}$$

SIZING DETAILS (CIVIL)
TIGER BIO FILTER OF 1250 KLD CAPACITY

S I. N o	Unit name	N o s	Leng th	Widt h	Height			Soling		PCC		Raft		RCC Wall thk	Bric k Wall thk	Slab Thk	Steel - HCR M/ Kg/C
					SW	FB	Tota	offs	Thk	offs	Thk	offs	Thk				
		N	m	m	m	m	m	m	m	m	m	m	m	m	m	m	
1	Screen Chamber	1	4.0	0.5	0.3	1.0	1.3	0.2	0.3	0.1	0.1	0.2	0.1	0.1			80
2	Grit Chamber	1	4.5	1.2	0.8	1.3	2.1	0.2	0.3	0.1	0.1	0.2	0.2	0.1			80
3	Raw Sewage Sump	1	6.5	6.5	2.5	1.3	3.8	0.2	0.3	0.1	0.1	0.2	0.4	0.2		0.2	100
4	TBF Bed 50 KLD	2	11.0	4.0			1.2	0.2	0.3	0.1	0.1	0.2	0.1		0.2		60
5	Filter Feed tank	1	6.0	6.0	2.5	0.5	3.0	0.2	0.3	0.1	0.1	0.2	0.4	0.2		0.2	100
6	Filter Platform	1	6.7	4.6				0.2	0.3	0.1	0.1	0.2	0.1				80

Assumptions

Incoming Sewer Invert 1.0 m Below Ground level

Method of excavation Mechanical means

Underground strata		soil	Muru m	Soft roc	hard	Total
0.0 to 1.5 m	=	25	25	25	25	100
1.5 m to 3.0 m	=	25	25	25	25	100
3.0 to 4.5 m	=	25	25	25	25	100
4.5 to 6.0	=	25	25	25	25	100

**TIGER BIO FILTER OF 1250 KLD CAPACITY
BILL OF QUANTITIES**

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
1	Excavation for foundation / pipe trenches in earth, soils of all types, sand, gravel and soft murum, including removing the excavated material upto a distance of 50 metres and lifts as below, stacking and spreading as directed, normal dewatering, preparing the bed for foundation and excluding backfilling, etc. complete. (Bd-A-1/259)				
	0.0 to 1.5 m	313.75	Cum	150.00	47,062.50
	1.5 to 3.0 m	70.49	Cum	164.00	11,560.40
	3.0 to 4.5 m	47.69	Cum	178.00	8,488.90
	4.5 to 6.0 m	1.85	Cum	192.00	355.20
	MJP/ SSR/ 2021-22 / Section E / Excavation Item No.1/ Page no. 42				
2	Excavation for foundation / pipe trenches in hard murum and boulders, W.B.M. road including removing the excavated material upto a distance of 50 M beyond the area and lifts as below, stacking and spreading as directed by Engineer-in-charge, normal dewatering, preparing the bed for foundation and excluding backfilling, etc. complete. (Bd-A-3/259)				
	0.0 to 1.5 m	313.75	Cum	192.00	60,240.00
	1.5 to 3.0 m	70.49	Cum	206.00	14,521.00
	3.0 to 4.5 m	47.69	Cum	220.00	10,491.80
	4.5 to 6.0 m	1.85	Cum	234.00	432.90
	MJP/ SSR/ 2021-22/ Section E/ Excavation Item No.3, Page no. 42				
3	Excavation for foundation / pipe trenches in soft rock and old cement and lime masonry foundation asphalt road including removing the excavated material upto a distance of 50 M beyond the area and lifts as below, stacking as directed by Engineer-in-charge, normal dewatering, preparing the bed for foundation and excluding backfilling, etc. complete. (Bd-A- 4/259)				
	0.0 to 1.5 m	313.75	Cum	572.00	179,465.00
	1.5 to 3.0 m	70.49	Cum	597.00	42,082.60
	3.0 to 4.5 m	47.69	Cum	622.00	29,663.20
	4.5 to 6.0 m	1.85	Cum	647.00	1,197.00
	MJP/ SSR/ 2021-22 / Section E/ Excavation Item No.5, Page no. 42				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
4	Excavation for foundation / pipe trenches in hard rock and concrete road by chiselling, wedging, line drilling by mechanical means or by all means other than blasting including trimming and levelling the bed, removing the excavated material upto a distance of 50 metres beyond the area and lifts as below, stacking as directed by Engineer-in-charge, normal dewatering, excluding backfilling, etc. complete by all means. (Bd-A-6/259)				
	0.0 to 1.5 m	313.75	Cum	1,017.00	319,083.80
	1.5 to 3.0 m	70.49	Cum	1,042.00	73,450.60
	3.0 to 4.5 m	47.69	Cum	1,067.00	50,885.30
	4.5 to 6.0 m	1.85	Cum	1,092.00	2,020.20
	MJP/ SSR/ 2021-22 / Section E/ Excavation Item No.7, Page no. 43				
5	Providing dry trap/ granite/ quartzite/ gneiss, rubble stone soling in 15 cm to 20 cm thick layers including hand packing and compacting, etc. complete. (Bd-A-12/264)	563.53	Cum	1,175.00	662,147.80
	MJP/ SSR/ 2021-22 / Section E/ Excavat				
6	Providing and laying in situ Cement Concrete M- 15 of trap/ granite / quartzite / gneiss metal for foundation and bedding including bailing out water, form work, compaction, curing, etc. complete. (Cement 5.90 bags / cum) Spec. No. - Bd E /1 Page No. 287 and B- 7, Page No. 38	169.27	Cum	5,640.00	954,682.80
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.1, Page no.49				
7	Providing and laying in situ Cement Concrete of trap/ granite / quartzite / gneiss metal for RCC work in foundation like raft, grillage, strip foundation and footing of RCC columns and steel stanchions including normal dewatering, form work, compaction, finishing and curing, etc. complete. (By weigh batching and mix design for M250 and M-300 only. Use of L&T, A.C.C., Ambuja, Birla Gold, Manikgad, Rajashree, etc. cement is permitted.) (Excluding M.S. or Tor reinforcement)	192.54	Cum	7,448.00	1,434,038.00
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE/ Item No.2, Page no. 49				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
8	Providing and casting in situ C.C. of trap / granite/ quartzite / gneiss metal of approved quality for RCC works as per detailed drawings and designs or as directed by Engineer-in- charge including normal dewatering, centering, form work, compaction, finishing the formed surfaces with C.M. 1:3 of sufficient minimum thickness to give a smooth and even surface wherever necessary or roughening if special finish is to be provided and curing, etc. complete. (By weigh batching and mix design for M-250 and M-300 only. Use of L&T, A.C.C., Ambuja, Birla Gold, Manikgad, Rajashree, etc. cement is permitted.) (Excluding M.S. or Tor reinforcement)	3.00	Cum	8,624.00	25,872.00
	For Beams / Braces / Lintels In RCC M-300				
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.4, Page no. 50				
9	Providing and casting in situ C.C. of trap / granite/ quartzite / gneiss metal of approved quality for RCC works as per detailed drawings and designs or as directed by Engineer-in- charge including normal dewatering, centering, form work, compaction, finishing the formed surfaces with C.M. 1:3 of sufficient minimum thickness to give a smooth and even surface wherever necessary or roughening if special finish is to be provided and curing, etc. complete. (By weigh batching and mix design for M-250 and M-300 only. Use of L&T, A.C.C., Ambuja, Birla Gold, Manikgad, Rajashree, etc. cement is permitted.) (Excluding M.S. or Tor reinforcement)	17.03	Cum	9,247.00	157,476.50
	Slabs / Landings / Vertical Walls / Waist Slabs / Steps for Staircase In RCC M-300				
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.5, / Page no. 50				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
10	Providing and casting in situ C.C. of trap / granite/ quartzite / gneiss metal of approved quality for RCC works as per detailed drawings and designs or as directed by Engineer-in- charge including normal dewatering, centering, form work, compaction, finishing the formed surfaces with C.M. 1:3 of sufficient minimum thickness to give a smooth and even surface wherever necessary or roughening if special finish is to be provided and curing, etc. complete. (By weigh batching and mix design for M-250 and M-300 only. Use of L&T, A.C.C., Ambuja, Birla Gold, Manikgad, Rajashree, etc. cement is permitted.) (Excluding M.S. or Tor reinforcement)	50.31	Cum	9,218.00	463,757.60
	Chajjas / Parapets / Curtain Walls /Partition Walls / Pardies In RCC M-300				
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.6 / Page no. 51				
11	Providing and fixing in position steel bar reinforcement of various diameters for RCC piles, caps, footings, foundations, slabs, beams, columns, canopies, staircases, newels, chajjas, lintels, pardies, copings, fins, arches, etc. as per detailed designs, drawings and schedules; including cutting, bending, hooking the bars, binding with wires or tack welding and supporting as required, etc. complete (including cost of binding wire). (Bd-F-17/306)				
	c) Corrosion Resistant Steel (Fe 500)	20.41	MT	70,658.00	1,442,129.80
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.8 / Page no. 52				
12	Providing and fixing mild steel grill work for windows/ ventilators of 20 Kg/Sqm. As per drawings including necessary welding and painting with one coat of anticorrosive paint and two coats of oil painting, etc. complete. (Bd-U- 1/537)	16.00	Sqm	1,895.00	30,320.00
	MJP/ SSR/ 2021-22 / SECTION - F : IRON AND STRUCTURAL STEEL WORK Item No.1 / Page				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
13	Providing structural steel work in rolled stanchions fixed with connecting plates or angle cleats as in main and cross beams, hip and jack rafters, purlins connecting to truss members and like as per detailed designs and drawings or as directed by Engineer-in-charge including cutting, fabricating, hoisting, erecting, fixing in position, making riveted / bolted / welded connections and one coat of anticorrosive paint and over it two coats of oil painting, etc. complete. (Bd-C- 3/275)	18.68	MT	71,286.00	1,331,337.40
	MJP/ SSR/ 2021-22 / SECTION - F :: IRON AND STRUCTURAL STEEL WORK Item No.3,				
14	Providing and fixing corrugated galvanised iron sheets of 0.63 mm thick (24B .W .G.) for roofing without wind tiles including fastening with galvanised iron screws and bolts , lead and bitumen washers as per drawing etc. complete. (Weight of 5.5 kg/sq.m.).	1885.00	Sqm	777.00	1,464,645.00
	PWD / SSR 2020-21 / Roofing and Ceiling SSR Item No.38.04 Reference No. Bd.R.5, Page No. 453 Item No.1133, Page no. 224				
15	Providing fly ash brick masonry with conventional / I.S. type bricks in cement mortar 1:6 in superstructure including striking joints, raking out joints, watering and scaffolding etc. Complete	371.75	Cum	6,305.00	2,343,883.80
	PWD / SSR 2020-21 / Brick Masonry SSR Item No.27.13 Reference No. As director by engineer incharge and BDG- 2 and 5 Item No.893, Page no. 190				
16	Providing internal cement plaster 12 mm thick in single coat in cement mortar 1:5 without neeru finish to concrete or brick surfaces, in all positions including scaffolding and curing etc. complete.	2041.25	Sqm	257.00	524,601.30
	PWD / SSR 2020-21 / Plastering and Pointing SSR Item No. 32.03 Reference No. Bd. L.2 Page No. 368 Item No.950, Page no. 201				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
17	Providing rough cast cement plaster externally in two coats to concrete, brick or stone masonry surfaces in all positions with base coat of 12 to 15 mm thick in C.M. 1:4 and rough cast treatment 12 mm thick in proportion 1:11 / 2:3 including scaffolding and fourteen days curing complete.	1187.50	Sqm	529.00	628,187.50
	PWD / SSR 2020-21 / Plastering and Pointing SSR Item No. 32.12 Reference No. Bd.L.8 Page No. 370 Item No.957, Page no. 201				
18	Providing and applying white-wash in two coats on old / new plastered or masonry surfaces and asbestos cement sheets including scaffolding and preparing the surface by brushing and brooming down etc. complete.	1187.50	Sqm	10.00	11,875.00
	PWD / SSR 2020-21 / Colouring SSR Item No. 36.03 Reference No. Bd. P. I Page No. 411				
19	Providing and applying colour-wash of approved colour and shade in one coat to new surface including scaffolding, brushing and brooming down (excluding base coats of white wash) etc. complete.	1187.50	Sqm	8.00	9,500.00
	PWD / SSR 2020-21 / Colouring SSR Item No. 36.04 Reference No. Bd. P.2 Page No. 412				
20	Dewatering the excavated trenches and pools of water in the building trenches / pipeline trenches, well works by using pumps and other devices including disposing off water to safe distance as directed by Engineer-in-charge (including cost of machinery, labour, fuel), etc. complete. (Bd-A-9/261)	176.00	HP/ Hr.	77.00	13,552.00
	MJP/ SSR/ 2021-22 / Section E/ Excav				
21	Refilling the trenches with available excavated stuff with soft material first over pipeline and then hard material in 15 cm layers with all leads and lifts including consolidation, surcharging, etc. complete.	485.85	Cum	84.00	40,811.40
	MJP/ SSR/ 2021-22 / Section E/ Excav				
22	Transportation as per STATEMENT VI Including loading, unloading and stacking Earth (4.8 Cum) lead 15 Km	1748.57	Cum	604.45	1,056,923.20

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
	Electromechnical Items				
23	Screen (Manual) of size 1.8 m length x 0.5 m width of SS 304 MOC and Manual hand rake for cleaning screen of SS handle 1 m in length and cleaning area of 6 nos 5 mm SS rod of total length 200 mm straight and 50 mm of 90 degree bend.	0.90	Sqm	35,000.00	31,500.00
24	Grit pump				
	Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below				
	MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION - Pumps, Page no. 6, 7 of size 1.8 m length				
	1 HP (Up to 9000 LPH)	1.00	No	68,654.00	68,654.00
25	Raw Sewage Pumps				
	Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below				
	MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION -				
	10 HP (Up to 90000 LPH)	2.00	Nos	152,969.00	305,938.00
26	TTU Feed pumps				
	Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below				
	MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION -				
	10 HP (Up to 90000 LPH)	2.00	Nos	152,969.00	305,938.00
27	Pressure Sand Filter of FRP / MSEP vessel with suitable thickness to withstand a water pressure including MPV or 5 Valve system and PVC / UPVC / MSEP interconnecting and underdrain piping including fittings, with standard filter media layer with minimum depth of filter sand 1.0 m supported by gravels. The piping arrangement should provide sufficient pressure for backwash operations and avoid loss of sand during backwash operation. Suitable openings to be provided to ease addition and removal the media.				
	Dia 1.7 m x 2 m minimum height	3.00	Nos	454,000.00	1,362,000.00

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
28	Activated Carbon Filter of FRP / MSEP vessel with suitable thickness to withstand a water pressure including MPV or 5 Valve system and PVC / UPVC / MSEP interconnecting and underdrain piping including fittings, with standard filter media layer with minimum depth of Activated Carbon 1.0 m supported by gravels. The piping arrangement should provide sufficient pressure for backwash operations and avoid loss of Activated carbon during backwash operation. Suitable openings to be provided to ease addition and				
	Dia 1.7 m x 2 m minimum height	3.00	Nos	454,000.00	1,362,000.00
29	NaOCl Chlorinator Pump Diaphragm Type / peristaltic type / Solenoid Max Flow Rate Upto 10LPH Power Source Electric Phase Single Material PP / PTFE(Teflon) Voltage 230 Volt Frequency				
	Mixing Tank of 100 Ltrs capacity	100.00	Ltrs	8.00	800.00
	Dosing Pump	2.00	Nos	15,000.00	30,000.00
30	Control Panel				
	Design, Supply, Installing, Commissioning & Testing of Master PLC control monitoring and communication panel as per IEC 61131 at Pure Water Sump suitable for monitoring and control of pure water Pumps. Pressure Transmitters, Level Transmitter, PH Transmitter, Turbidity Transmitter ,for all pumps installed.	1.00	No	50,041.00	50,041.00
	MJP/ MECH/ ELECT / SSR/ 2021-22/ SECTION 19 - SA [SCADA & AUTOMATION]				
31	Supplying and erecting Fully Automatic Star Delta starter to operate squirrel cage induction motor working on 380- 440 Volt, 3 phase, 50 Hz with no volt coil, over load element, and ON - OFF push buttons, with necessary material and connected to supply, etc complete. Starter with original sheet steel encloser.				
	> 7.5 HP & Up to 12.5 HP	6.00	nos	7,150.00	42,900.00

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
	MJP /MECH/ ELECT/ SSR/ 2021-22 SECTION 10 - LG [L.T. SWITCHGEAR AND PROTECTION] Item no. LG 3 Page no. 27				
32	Main power supply cable				
	3 core PVC insulated, PVC sheathed copper conductor flat submersible cable				
	Supplying and erecting, Flat flexible submersible cable with, Copper Conductor, PVC insulated, and PVC sheathed.				
	3 core 16 sq mm	35.00	m	549.00	19,215.00
33	Power cables				
	Aluminium conductor 4 Core, XLPE / PVC insulated & armoured cable				
	Supplying and erecting, XLPE / PVC insulated, armoured cable 1100 V grade with ISI mark Four core, solid / stranded aluminium conductor with 6 mm thick 25 mm width M.S. spacer with G.I. Earth wire 6 sq mm, complete erected on wall / on pole with 25 X 3 mm M.S. clamps or in provided trench in an approved				
	4 Core 6 sq mm	180.00	m	137.00	24,660.00
	MJP MECH/ ELECT/ SSR/ 2021-22 SECTION 12 - CB [L.T. CABLE] Item no. CB 6 Page				
34	Control Cables				
	Copper conductor PVC insulated, Unarmoured control cable				
	Supplying and erecting Un-armoured control cable with ISI mark stranded / solid copper conductor 1.1 kV grade complete erected on wall / panel or in provided trench in an approved manner.				
	4 core 2.5 sq mm	180.00	m	137.00	24,660.00
	MJP MECH/ ELECT/ SSR/ 2021-22/ SECTION 12 - CB [L.T. CABLE] Item no. CB 8-				
	Plumbing Items				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
35	Providing and supplying in standard lengths ISI mark rigid unplasticised PVC pipes suitable for potable water with solvent cement joints including cost of couplers, as per IS specification no. 4985 / 1988 excluding GST levied by GOI and GOM in all respect, including transportation, freight charges, inspection charges, loading, unloading, conveyance to the departmental stores and stacking the same in closed shed duly protected from sun rays and rains including cost of jointing material i.e. solvent cement, etc. complete (selffit type to be jointed with cement solvent).				
	1) 10% of cost of pipes shall be considered for cost of PVC specials for estimate purpose only. 2) One coupler and required cement solvent shall be provided with each full length pipe				
	MJP/ SSR/ 2021-22 / SECTION – I(II) P.V.C. PIPES, Page no.77				
1	Raw Sewage pump to TBF Distribution				
a	Main header				
	180 mm.	75.00	m	1,249.00	93,675.00
	PVC Specials- 10%				9,367.50
b	Distribution				
	140 mm.	100.00	m	693.00	69,300.00
	PVC Specials- 10%				6,930.00
2	TBF collection to FFT (gravity)				
a	Main header				
	140 mm.	200.00	m	693.00	138,600.00
	PVC Specials- 10%				13,860.00
b	collection tributary				
	75 mm.	45.00	m	211.00	9,495.00
	PVC Specials- 10%				949.50
3	TTU Plumbing				
	160 mm.	35.00	m	906.00	31,710.00
	PVC Specials- 10%				3,171.00
4	TBF distribution				
	75 mm.	125.00	m	211.00	26,375.00
	PVC Specials- 10%				2,637.50
36	Labour				
	Plumber	40.00	days	641.00	25,640.00
	Helper	80.00	days	579.00	46,320.00

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
	MJP/ SSR/ 2021-22 / SECTION - B LABOUR & MACHINERY , Page no. 14				
37	Providing double flange sluice valve confirming for IS- 14846 including worn gear arrangements as per test pressure, stainless steel spindle, caps, including inspection charges, transportation upto departmental store, unloading, stacking excluding GST levied by GOI & GOM in all respect etc. complete.				
	Sluice valves - PN -1 (Without by pass)				
	Raw Sewage pump				
	200 mm.	2.00	Nos	18,581.00	37,162.00
	Filter Feed Pump				
	200 mm.	2.00	Nos	18,581.00	37,162.00
	MJP/ SSR/ 2021-22 / SECTION - I(XII) : PIPES APPURTENANCES , Page no. 132				
38	Providing and supplying ISI mark CI D/F reflux valves (non-return valves) of following dia including railway freight, inspection charges, unloading from railway wagon, loading into truck, transportation upto departmental stores, unloading, stacking excluding GST levied by GOI & GOM in all respect etc. complete. Reflux valves as per I.S.5312 Part I (1984)				
	Without by pass arrangement -PN -1				
	Raw Sewage pump				
	200 mm.	2.00	Nos	17,751.00	35,502.00
	Filter Feed Pump				
	200 mm.	2.00	Nos	17,751.00	35,502.00
	MJP/ SSR/ 2021-22 / SECTION - I(XII) : PIPES APPURTENANCES , Page no. 131				
	Bio media Items				
39	Supplying of Specially designed container for holding Filter media including Lightweight Expanded Clay Aggregates size (8-30 mm) and Bio media including mixture of woodchips Vermicompost, cocopeat and bacterial culture with special worms per designed quantity including transportation & fixing in position as directed etc. complete.	1800.00	Nos	4,750.00	8,550,000.00
	Market rate				
40	Rapid sand Gravity filter sand At Source (Godhara, Gokak, Kanhan,	171.22	Cum	1,730.00	296,210.60
	MJP/ SSR/ 2021-22 / SECTION- A MATERIALS				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
41	Trasnsportation Godhara to Pune distance by Road 660 Km.	171.22	Cum	11,031.37	1,888,791.20
	MJP/ SSR/ 2021-22 / SECTION - C : TRANSPORTATION Page no.				
42	Stone Aggregate 20 mm	171.22	Cum	900.00	154,098.00
	MJP/ SSR/ 2021-22 / SECTION- A MATERIALS				
43	Transportation as per STATEMENT VI Including loading, unloading and stacking				
	Manure or sludge (5.52 Cum) lead 25 Km	661.25	Cum	747.48	494,271.20
	MJP/ SSR/ 2021-22 / SECTION - C : TRANSPORTATION Page no.				
NET TOTAL Rs.					29,081,777.00

MEASUREMENT SHEET - SCREEN CHAMBER, GRIT CHAMBER AND RAW SEWAGE SUMP

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	Short Wall	2	0.80	0.15	1.50	0.36	Cum
				Total for screen		2.3	Cum
	Grit						
	Long Wall (extra than screen chamber)	1	0.50	0.15	2.30	0.18	Cum
	Short Wall	2	1.20	0.15	2.30	0.83	Cum
				Total for grit		1.01	Cum
6	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	80	Cum	5.31	0.43	MT
7	Fabrication work in Frame and Grating for Access						
	Screen	1	4.30	0.80		3.44	Sqm
	Grit	1	4.80	1.35		6.48	Sqm
					Total	9.92	Sqm
8	Removing excess excavated material out of site						
	Screen chamber	1	4.30	0.80	1.30	4.48	Cum
	Grit Chamber	1	4.80	1.20	2.10	12.1	Cum
	soling, PCC, Raft volume					7.5	Cum
	Total Volume					24.08	Cum
	bulkage @ 40%					33.72	Cum
9	Refilling and compaction						
	Total Excavation					73.71	Cum
	Deduction for tank volume, soling, PCC, Raft					24.08	Cum
	Refilling and compaction volume					49.63	Cum

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	Raw Sewage Sump						
1	Excavation				4.60		
A	0.0 to 1.5 m	1	10.6	10.60	1.5	168.54	Cum
	soil					42.14	Cum
	Murum					42.14	Cum
	Soft rock					42.14	Cum
	hard rock					42.14	Cum
B	1.5 to 3.0 m	1	9.60	9.60	1.5	138.24	Cum
	soil					34.56	Cum
	Murum					34.56	Cum
	Soft rock					34.56	Cum
	hard rock					34.56	Cum
C	3.0 to 4.5 m	1	9.60	9.60	1.5	138.24	Cum

MEASUREMENT SHEET - SCREEN CHAMBER, GRIT CHAMBER AND RAW SEWAGE SUMP

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	soil					34.56	Cum
	Murum					34.56	Cum
	Soft rock					34.56	Cum
	hard rock					34.56	Cum
D	4.5 to 6.0 m	1	8.60	8.60	0.1	7.4	Cum
	soil					1.85	Cum
	Murum					1.85	Cum
	Soft rock					1.85	Cum
	hard rock					1.85	Cum
2	Soling						
	RSS	1	8.00	8.00	0.30	19.2	Cum
3	PCC M20						
	RSS	1	7.60	7.60	0.10	5.78	Cum
4	Raft M30						
	RSS	1	7.40	7.40	0.40	21.91	Cum
5	RCC Wall						
	Long Wall	2	7.00	0.25	4.00	14	Cum
	Short Wall	2	6.50	0.25	4.00	13	Cum
					Total	27	Cum
6	Beams						
	Beam 1	2	6.50	0.2	0.3	0.78	Cum
	Beam 2	2	6.50	0.2	0.3	0.78	Cum
					Total	1.56	Cum
7	Slab	1	7.00	7.00	0.2	9.8	Cum
	Deduction for manhole	-2	2.20	1.00	0.2	-0.88	Cum
					Total	8.92	Cum
8	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	100	Cum	59.39	5.94	MT
9	Fabrication work in Frame and Grating for Access						
	RSS	2	2.20	1.00		4.4	Sqm
10	Removing excess excavated material out of site						
	RSS	1	7.00	7.00	3.80	186.2	Cum
	soling, PCC, Raft volume					46.89	Cum
	Total Volume					233.09	Cum
	bulkage @ 40%					326.33	Cum
11	Refilling and compaction						

MEASUREMENT SHEET - SCREEN CHAMBER, GRIT CHAMBER AND RAW SEWAGE SUMP

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	Total Excavation					452.42	Cum
	Deduction for tank volume, soling, PCC, Raft					233.09	Cum
	Refilling and compaction volume					219.33	Cum
12	Dewatering						
	22 Days x 4 hours/day	days	22	hours / day	4	88	Hrs

MEASUREMENT SHEET - TIGER BIO FILTER

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	TIGER BIO FILTER						
1	Excavation				0.50		
A	0.0 to 1.5 m	1	12.66	5.66	0.5	35.83	Cum
	soil					8.96	Cum
	Murum					8.96	Cum
	Soft rock					8.96	Cum
	hard rock					8.96	Cum
2	Soling						
	TBF	1	12.46	5.46	0.30	20.41	Cum
3	PCC M20						
	TBF	1	12.06	5.06	0.10	6.11	Cum
4	Raft M30						
	TBF	1	11.86	4.86	0.10	5.77	Cum
5	Brick Wall						
	TBF						
	Long Wall	2	11.46	0.23	1.20	6.33	Cum
	Short Wall	2	4.00	0.23	1.20	2.21	Cum
	Crate Support Wall	5	11.00	0.23	0.50	6.33	Cum
						Total for T	14.87
							Cum
6	Plaster						
	Internal						
	Crate Support Wall						
	Long Wall	6	11.00		0.50	33	Sqm
	Wall top	5	11.00		0.23	12.65	Sqm
	Long Wall	2	11.00		1.20	26.4	Sqm
	Short Wall	2	4.00		1.20	9.6	Sqm
						Total	81.65
							Sqm
	External						
	Long Wall	2	11.46		1.20	27.51	Sqm
	Short Wall	2	4.46		1.20	10.71	Sqm
	Wall Top	1	30.92	0.3		9.28	Sqm
						Total	47.50
							Sqm
7	External-white-wash	1				47.50	Sqm
8	External-colour-wash	1				47.50	Sqm
9	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	60	Cum	5.77	0.35	MT
10	Removing excess excavated material out of site						
	soling, PCC, Raft volume					32.29	Cum
	Total Volume					32.29	Cum
	bulkage @ 40%					45.21	Cum

MEASUREMENT SHEET - TIGER BIO FILTER

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
11	Refilling and compaction						
	Total Excavation					35.83	Cum
	Deduction for tank volume, soling, PCC, Raft					32.29	Cum
	Refilling and compaction volume					3.54	Cum
12	MS Fabricated Shed						
	TBF-II Shed in Fabrication work Shed Size-12 m X 5 m x		12.00	5.00	3.00		
	for column 50*50*5 Unit Weight 6.97 kg/m	10	3.00	6.97	kg/m	209.10	KG
	for truss 50*50*3 Unit Weight 3.71 kg/m	5	5.00	3.71	kg/m	92.75	KG
	for principle rafter 50*50*3 Unit Weight	10	2.90	3.71	kg/m	107.59	KG
	for strut rafter 50*50*3 Unit Weight 3.71 kg/m	10	0.20	3.71	kg/m	7.42	KG
	for central strut rafter 50*50*3 Unit Weight	5	0.30	3.71	kg/m	5.57	KG
	for bottom frame below truss 50*50*3 Unit Weight 3.71 kg/m	1	34.00	3.71	kg/m	126.14	KG
	for perlin 30*30*3 Unit Weight 2.51 kg/m	5	13.00	2.51	kg/m	163.15	KG
	for Base Plate 150*150*10 mm	20	0.15	0.15	0.010	35.33	KG
					Total Wei	747.04	Kg
						0.75	MT
13	corrugated galvanised iron sheets	2	13.00	2.90		75.4	Sqm

MEASUREMENT SHEET - FILTER FEED TANK

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
8	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	100	Cum	48.6	4.86	MT
9	Fabrication work in Frame and Grating for Access						
	FFT	2	1.20	0.70		1.68	Sqm
10	Removing excess excavated material out of site						
	FFT	1	6.50	6.50	3.00	126.75	Cum
	soling, PCC, Raft volume					40.98	Cum
	Total Volume					167.73	Cum
	bulkage @ 40%					234.83	Cum
11	Refilling and compaction						
	Total Excavation					287.65	Cum
	Deduction for tank volume, soling, PCC, Raft					167.73	Cum
	Refilling and compaction volume					119.92	Cum
12	Dewatering						
	22 Days x 4 hours/day	days	22	hours/day	4	88	Hrs

MEASUREMENT SHEET - FILTER PLATFORM

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	FILTER PLATFORM						
1	Excavation				0.55		
A	0.0 to 1.5 m	1	7.9	5.80	0.55	25.21	Cum
	soil					6.31	Cum
	Murum					6.31	Cum
	Soft rock					6.31	Cum
	hard rock					6.31	Cum
2	Soling						
	Filter Platform	1	7.70	5.60	0.30	12.94	Cum
3	PCC M20						
	Filter Platform	1	7.30	5.20	0.10	3.8	Cum
4	Raft M30						
	Filter Platform	1	7.10	5.00	0.15	5.33	Cum
5	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	80	Cum	5.33	0.43	MT
6	Removing excess excavated material out of site						
	soling and PCC volume					16.74	Cum
	Total Volume					16.74	Cum
	bulkage @ 40%					23.44	Cum
7	Refilling and compaction						
	Total Excavation					25.21	Cum
	Deduction for tank volume, soling, PCC, Raft					16.74	Cum
	Refilling and compaction volume					8.47	Cum

MEASUREMENT SHEET - ELECTROMECHANICAL WORKS

Sr. No.	Item Description	Nos.	Unit
1	Screen (Manual) of size 1.8 m length x 0.5 m width of SS 304 MOC and Manual hand rake for cleaning screen of SS handle 1 m in length and cleaning area of 6 nos 5 mm SS rod of total length 200 mm straight and 50 mm of 90 degree bend.	1	No
2	Grit pump Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION - Pumps, Page no. 6, 7 of size 1.8 m length x 0.5 m width of SS304 MOC 1 HP (Up to 9000 LPH)	1	No
3	Raw Sewage Pumps Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION - Pumps, Page no. 6, 7 10 HP (Up to 90000 LPH)	2	Nos
4	TTU Feed pumps Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION - Pumps, Page no. 6, 7 10 HP (Up to 90000 LPH)	2	Nos
5	Pressure Sand Filter of FRP / MSEP vessel with suitable thickness to withstand a water pressure including MPV or 5 Valve system and PVC / UPVC / MSEP interconnecting and underdrain piping including fittings, with standard filter media layer with minimum depth of filter sand 1.0 m supported by gravels. The piping arrangement should provide sufficient pressure for backwash operations and avoid loss of sand during backwash operation. Suitable openings to be provided to ease addition and removal the media. Dia 1.7 m x 2 m minimum height	3	Nos
6	Activated Carbon Filter of FRP / MSEP vessel with suitable thickness to withstand a water pressure including MPV or 5 Valve system and PVC / UPVC / MSEP interconnecting and underdrain piping including fittings, with standard filter media layer with minimum depth of Activated Carbon 1.0 m supported by gravels. The piping arrangement should provide sufficient pressure for backwash operations and avoid loss of Activated carbon during backwash operation. Suitable openings to be provided to ease addition and removal the media. Dia 1.7 m x 2 m minimum height	3	Nos
7	PurAll Tablet Chlorinator + cartridge	0	nos

MEASUREMENT SHEET - ELECTROMECHANICAL WORKS

Sr. No.	Item Description	Nos.	Unit
7	NaOCl Chlorinator Pump Diaphragm Type / peristaltic type / Solenoid Max Flow Rate Upto 10LPH Power Source Electric Phase Single Material PP / PTFE(Teflon) Voltage 230 Volt Frequency 50Hz		
a	Mixing Tank of 100 Ltrs capacity	1	Nos
b	Dosing Pump	2	Nos
8	Control Panel		
	Design, Supply, Installing, Commissioning & Testing of Master PLC control monitoring and communication panel as per IEC 61131 at Pure Water Sump suitable for monitoring and control of pure water Pumps. Pressure Transmitters, Level Transmitter, PH Transmitter, Turbidity Transmitter ,for all pumps installed.		
	Master PLC Panel	1	No
	MJP/ MECH/ ELECT / SSR/ 2021-22/ SECTION 19 - SA [SCADA & AUTOMATION] Item no. 2.7 Page no. 72		
9	Supplying and erecting Fully Automatic Star Delta starter to operate squirrel cage induction motor working on 380- 440 Volt, 3 phase, 50 Hz with no volt coil, over load element, and ON - OFF push buttons, with necessary material and connected to supply, etc complete. Starter with original sheet steel encloser.		
	> 7.5 HP & Up to 12.5 HP	6	nos
	1 nos extra starter considered as spare.		
	MJP /MECH/ ELECT/ SSR/ 2021-22 SECTION 10 - LG [L.T. SWITCHGEAR AND PROTECTION] Item no. LG 3 Page no. 27		
10	Main power supply cable		
	3 core PVC insulated, PVC sheathed copper conductor flat submersible cable		
	Supplying and erecting, Flat flexible submersible cable with, Copper Conductor, PVC insulated, and PVC sheathed.		
	3 core 16 sq mm	35	m
11	Power cables		
	Aluminium conductor 4 Core, XLPE / PVC insulated & armoured cable		
	Supplying and erecting, XLPE / PVC insulated, armoured cable 1100 V grade with ISI mark Four core, solid / stranded aluminium conductor with 6 mm thick 25 mm width M.S. spacer with G.I. Earth wire 6 sq mm, complete erected on wall / on pole with 25 X 3 mm M.S. clamps or in provided trench in an approved manner.		
	4 Core 6 sq mm	180	m
	MJP MECH/ ELECT/ SSR/ 2021-22 SECTION 12 - CB [L.T. CABLE] Item no. CB 6 Page no. 35		
12	Control Cables		
	Copper conductor PVC insulated, Unarmoured control cable		

MEASUREMENT SHEET - ELECTROMECHANICAL WORKS

Sr. No.	Item Description	Nos.	Unit
	Supplying and erecting Un-armoured control cable with ISI mark stranded / solid copper conductor 1.1 kV grade complete erected on wall / panel or in provided trench in an approved manner.		
	4 core 2.5 sq mm	180	m
	MJP MECH/ ELECT/ SSR/ 2021-22/ SECTION 12 - CB [L.T. CABLE] Item no. CB 8-2 Page no. 36		

MEASUREMENT SHEET - PLUMBING

Sr. No.	Item Description	Nos.	L (m)	B (m)	Quantity	Unit
	Providing and supplying in standard lengths ISI mark rigid unplasticised PVC pipes suitable for potable water with solvent cement joints including cost of couplers, as per IS specification no. 4985 / 1988 excluding GST levied by GOI and GOM in all respect, including transportation, freight charges, inspection charges, loading, unloading, conveyance to the departmental stores and stacking the same in closed shed duly protected from sun rays and rains including cost of jointing material i.e. solvent cement, etc. complete (selffit type to be jointed with cement solvent).					
	1) 10% of cost of pipes shall be considered for cost of PVC specials for estimate purpose only. 2) One coupler and required cement solvent shall be provided with each full length pipe cost of which is included in rates below.					
	MJP/ SSR/ 2021-22 / SECTION – I(II) P.V.C. PIPES,					
1	Raw Sewage pump to TBF Distribution					
a	Main header	Dia	180			
	180 mm.	1	75		75	m
	PVC Specials- 10%					
b	Distribution					
	140 mm.	1	100		100	m
	PVC Specials- 10%					
2	TBF collection to FFT (gravity)					
a	Main header					
	140 mm.	1	200		200	m
	PVC Specials- 10%					
b	collection tributary					
	75 mm.	1	45		45	m
	PVC Specials- 10%					
3	TTU Plumbing	Dia	160			
	160 mm.	1	35		35	m
	PVC Specials- 10%					
4	TBF distribution			No. of beds		
	75 mm.	1	5	25	125	m
	PVC Specials- 10%					
5	Labour	Nos	Days			
	Plumber	4	10		40	days
	Helper	8	10		80	days
6	Sluice valves					

MEASUREMENT SHEET - PLUMBING

Sr. No.	Item Description	Nos.	L (m)	B (m)	Quantity	Unit
	Providing double flange sluice valve confirming for IS- 14846 including worn gear arrangements as per test pressure, stainless steel spindle, caps, including inspection charges, transportation upto departmental store, unloading, stacking excluding GST levied by GOI & GOM in all respect etc. complete.					
	MJP/ SSR/ 2021-22 / SECTION - I(XII) : PIPES APPURTENANCES , Page no. 132					
	Raw Sewage pump					
	200 mm.	2			2	Nos
	Filter Feed Pump					
	200 mm.	2			2	Nos
7	Reflux valves (non-return valves)					
	Providing and supplying ISI mark CI D/F reflux valves (non-return valves) of following dia including railway freight, inspection charges, unloading from railway wagon, loading into truck, transportation upto departmental stores, unloading, stacking excluding GST levied by GOI & GOM in all respect etc. complete. Reflux valves as per I.S.5312 Part I (1984)					
	MJP/ SSR/ 2021-22 / SECTION - I(XII) : PIPES APPURTENANCES , Page no. 131					
	Raw Sewage pump					
	200 mm.	2			2	Nos
	Filter Feed Pump					
	200 mm.	2			2	Nos

PROJECT NAME :
1250 KLD SEWAGE TREATMENT PLANT
BASED ON TIGER BIO FILTER
TECHNOLOGY.

NOTES

- All dimensions are in 'mm' unless mentioned otherwise.
- All dimensions are checked and co-related with the design and structural drawings and any discrepancy or omission shall be brought to the notice.
- All linear dimensions are including plastering in structural drawings unless otherwise mentioned.
- The structural component and BOQ prepared considering Finished Ground Level (+00.000) and Existing Ground Level (+00.00). Temporary Bench Mark 1 (xxx.000) Kept on the Top level of Road on North East side of the site.
- BIS Grade Cement to be used for all concrete and plastering applications.
- All water treatment structure to be checked for water leakages.
- This drawing should be read in conjunction with relevant detailed Design and Structural drawings. All dimensions shall be verified on site prior to commencement of work.
- This Drawing is the property of TBF Environmental Solutions Pvt. Ltd. It is not to be copied or produced or handed over to third party or used for any other purpose other than which it is intended. This drawing together with any copies made by the recipient shall be returned on demand to us.

REVISION		
DATE	REMARKS	SIGNATURE

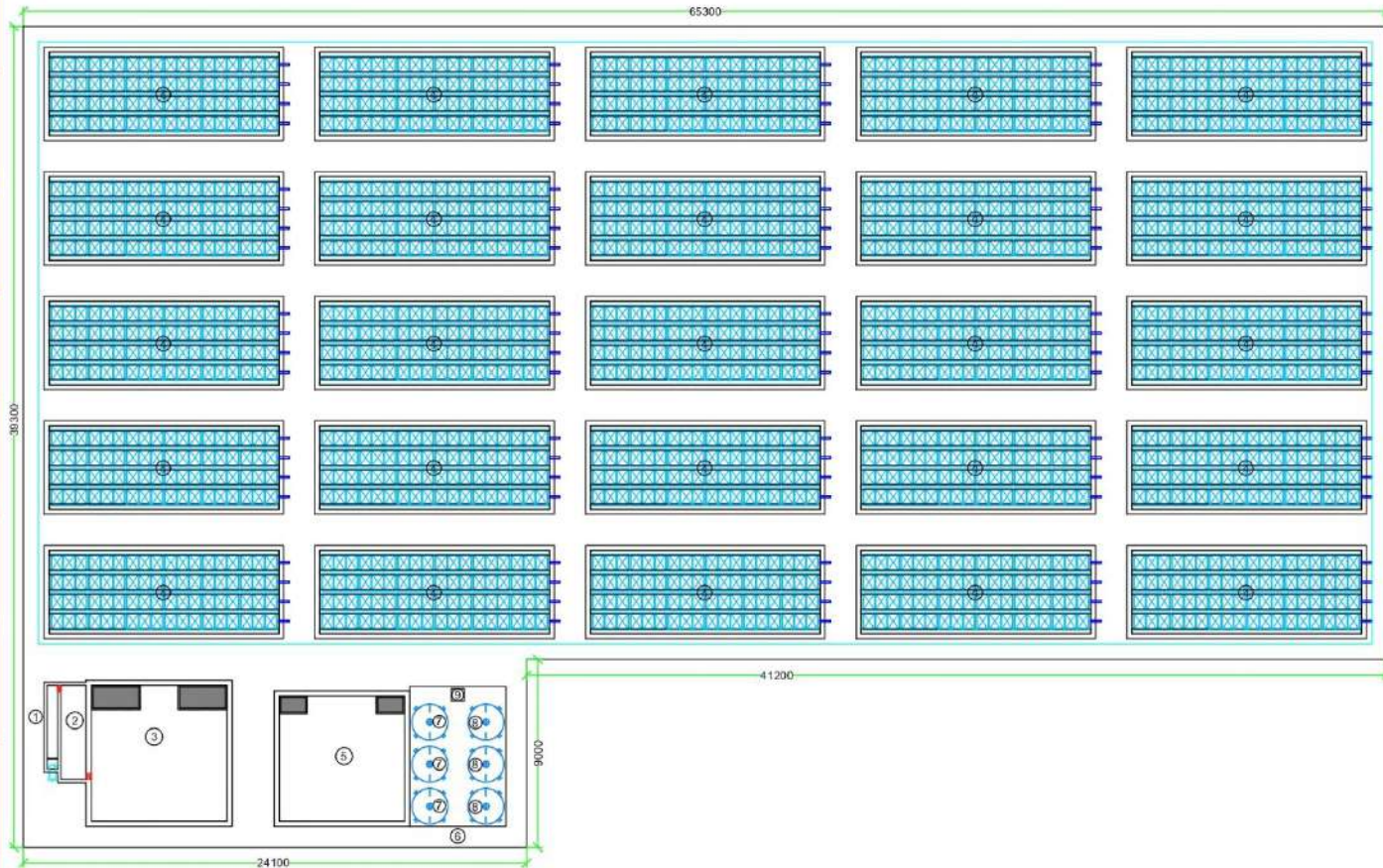
CLIENT : SWSM, MAHARASHTRA

DRAWING NAME:

PLANT LAYOUT

PROJECT CODE : TBF-	DRAWING NO : D-01/PL/01	DATE : JUNE-2021
DRAWN BY : L.D.B.	CHECKED BY : S.B.	SCALE : NTS.

TBF ENVIRONMENTAL SOLUTIONS PVT. LTD.
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Web : www.tbfenvironmental.in



PLANT LAYOUT
AREA = 2195 SQM.

Process Unit Details								
Sr No	Description	No	L/D	B	H	FB	Total H	MOC
			m	m	m	m	m	
1	Screen Chamber	1	4.00	0.50	0.30	1.00	1.30	RCC
2	Gril Chamber	1	4.50	1.20	0.80	1.30	2.10	RCC
3	Raw Sewage Sump	1	6.50	6.50	2.50	1.30	3.80	RCC
4	Tiger Bio Filter	25	11.00	4.00	-	-	1.20	BRICK
5	Filter Feed Tank	1	6.00	6.00	2.50	0.50	3.00	RCC
6	Filter Platform	1	6.70	4.80	-	-	-	RCC
7	Pressure Sand Filter	3	DIA	1.70	-	-	2.00	MSEP
8	Activated Carbon Filter	3	DIA	1.70	-	-	2.00	MSEP
9	Chlorination Unit	1	-	-	-	-	-	-

PROJECT NAME :
1250 KLD SEWAGE TREATMENT PLANT
BASED ON TIGER BIO FILTER
TECHNOLOGY.

NOTES

1. All dimensions are in 'mm' unless mentioned otherwise.
2. All dimensions are checked and co-related with the design and structural drawings and any discrepancy or omission shall be brought to the notice.
3. All linear dimensions are including plastering in structural drawings unless otherwise mentioned.
4. The structural component and BOQ prepared considering Finished Ground Level (+100.00) and Existing Ground Level (+00.00). Temporary Bench Mark 1 (xxx.000) Kept on the Top level of Road on North East side of the site.
5. BIS Grade Cement to be used for all concrete and plastering applications.
6. All water treatment structure to be checked for water leakages.
7. This drawing should be read in conjunction with relevant detailed Design and Structural drawings. All dimensions shall be verified on site prior to commencement of work.
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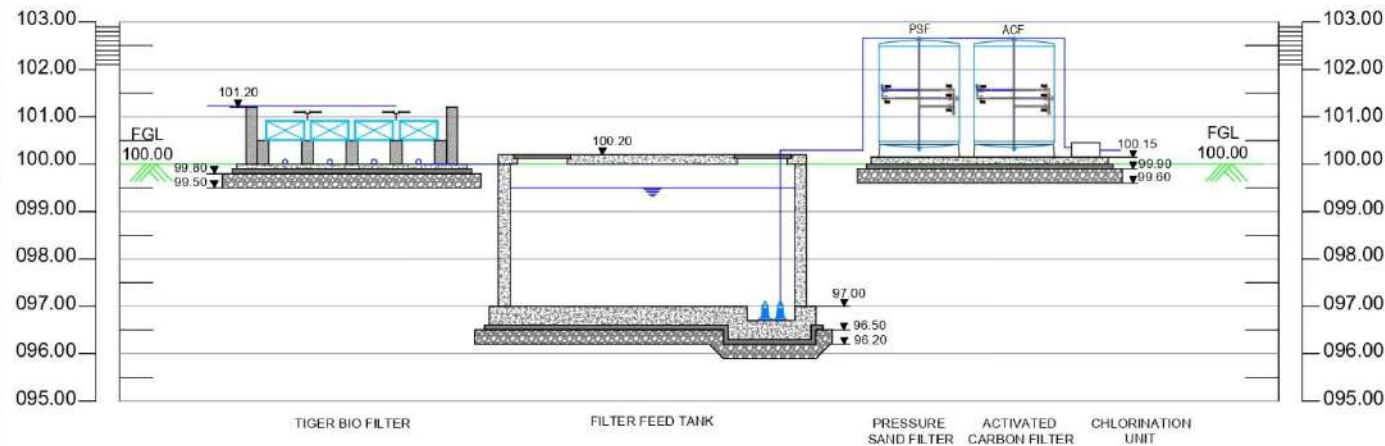
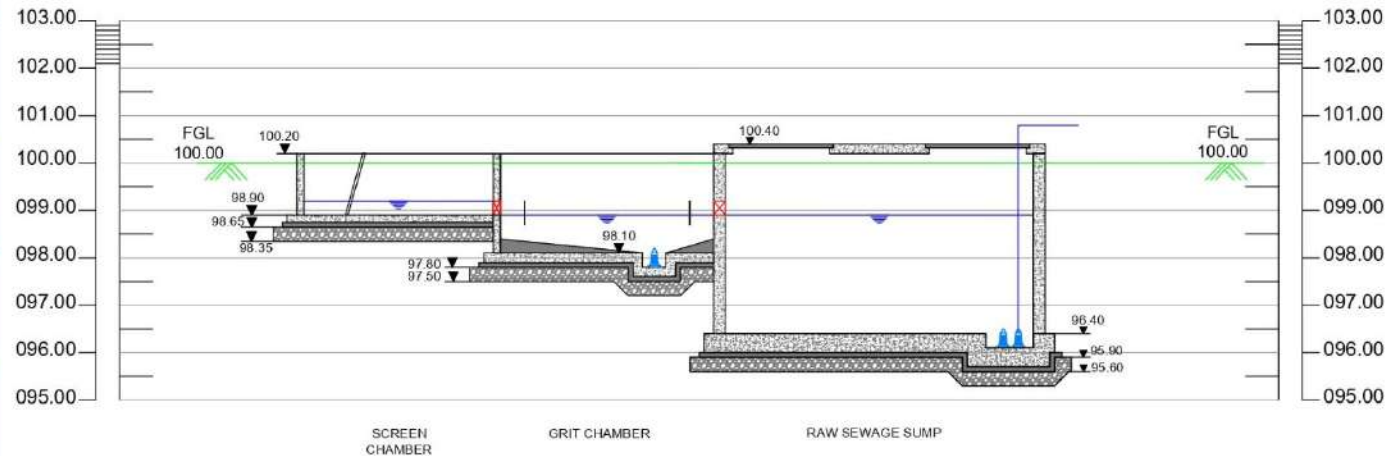
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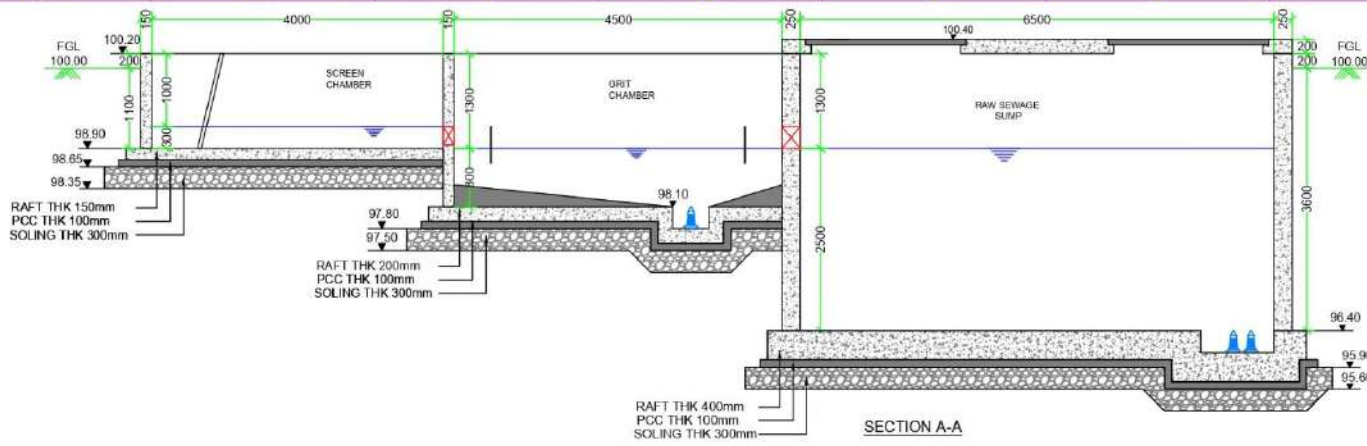
DRAWING NAME :
HYDRAULIC FLOW DIAGRAM

PROJECT CODE : TBF-	DRAWING NO : D-02/HFD/01	DATE : JUNE-2021
DRAWN BY : L.D.B.	CHECKED BY : S.B.	SCALE : NTS.

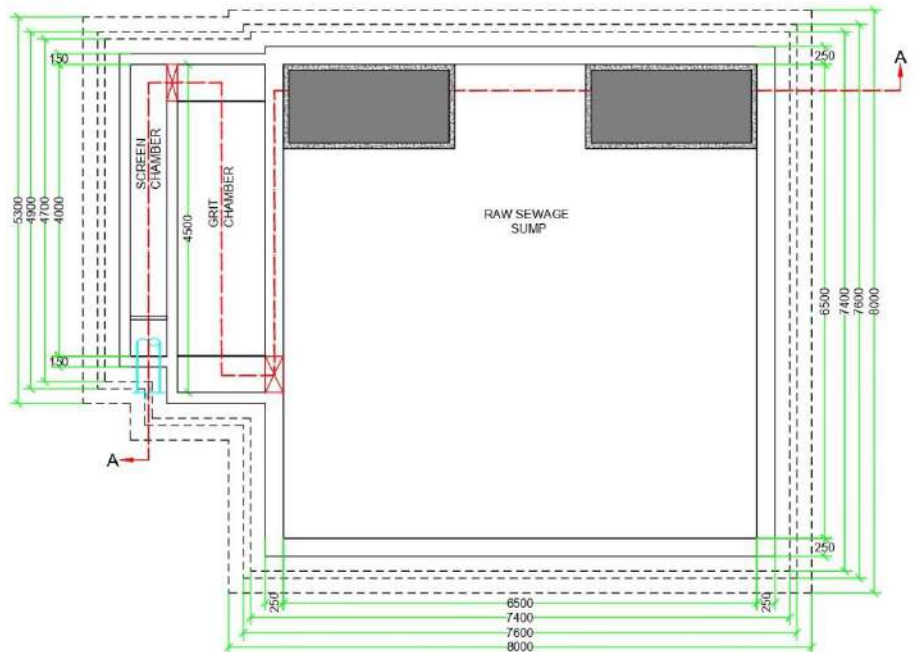
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HYDRAULIC FLOW DIAGRAM



SECTION A-A



PLAN

SCREEN CHAMBER, GRIT CHAMBER & RAW SEWAGE SUMP

PROJECT NAME :
1250 KLD SEWAGE TREATMENT PLANT
BASED ON TIGER BIO FILTER
TECHNOLOGY.

- NOTES**
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DATE	REMARKS	SIGNATURE

CLIENT : SWSM, MAHARASHTRA
DRAWING NAME :
SCREEN CHAMBER, GRIT CHAMBER
& RAW SEWAGE SUMP

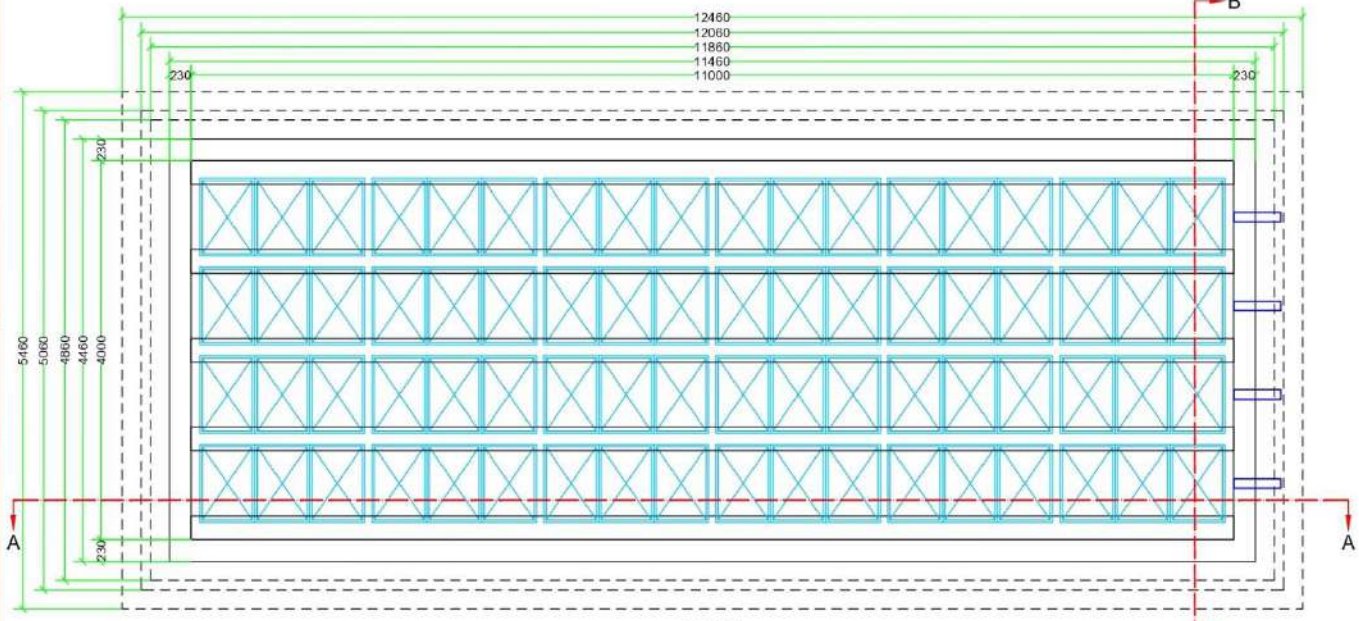
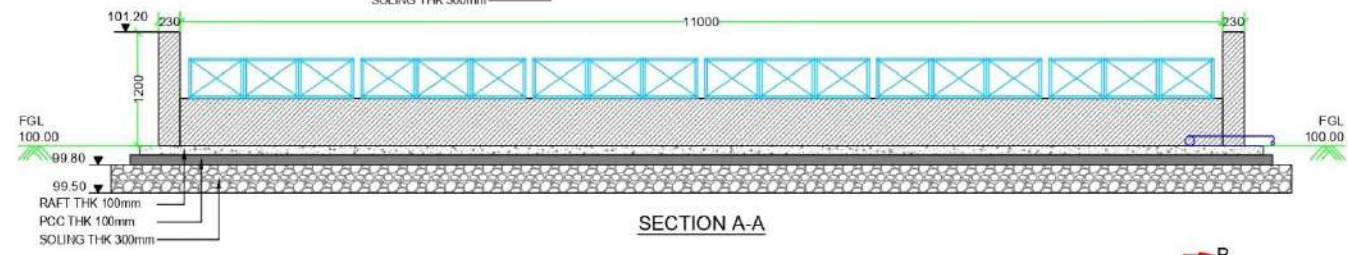
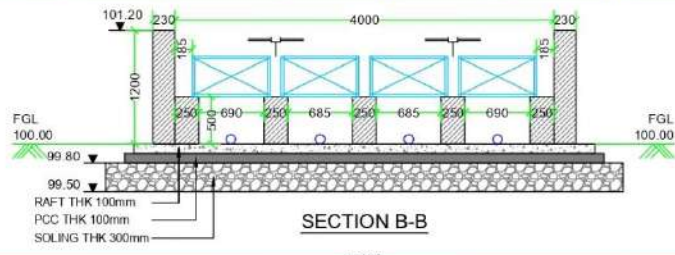
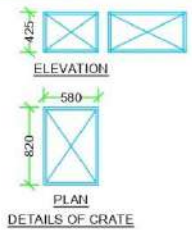
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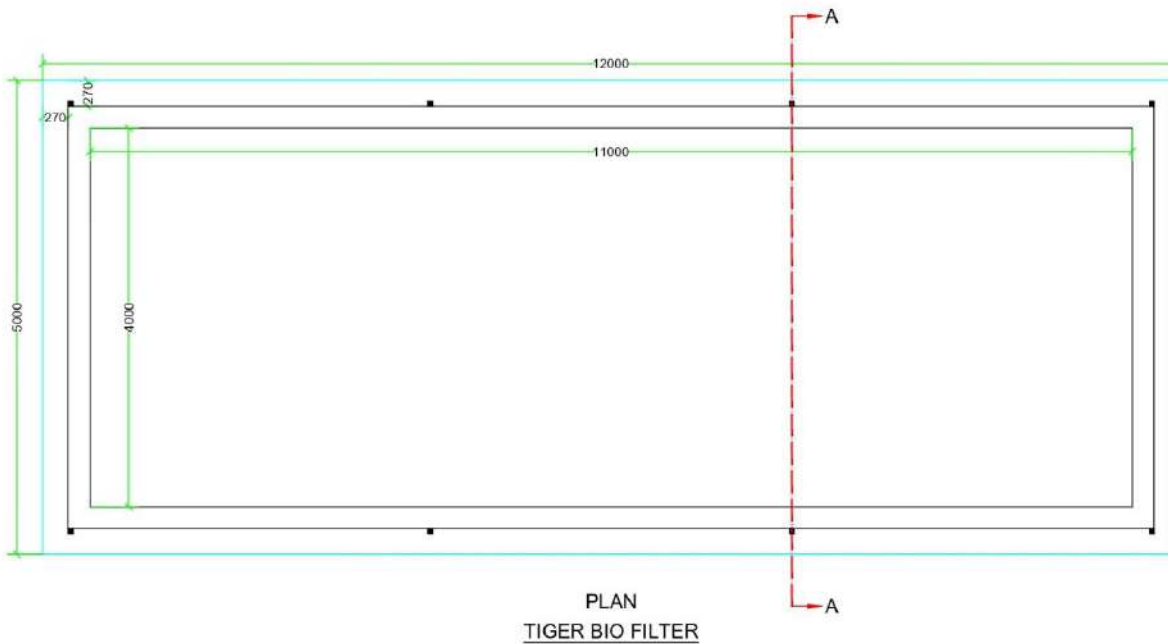
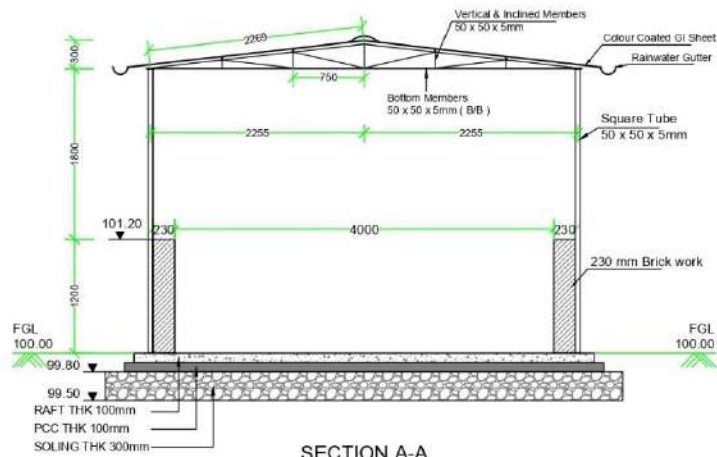


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DATE	REMARKS	SIGNATURE

CLIENT : SWSM, MAHARASHTRA
DRAWING NAME :
TIGER BIO FILTER

PROJECT CODE : TBF-	DRAWING NO : D-04/TBF/01	DATE : JUNE-2021
DRAWN BY : L.D.B.	CHECKED BY : S.B.	SCALE : NTS.

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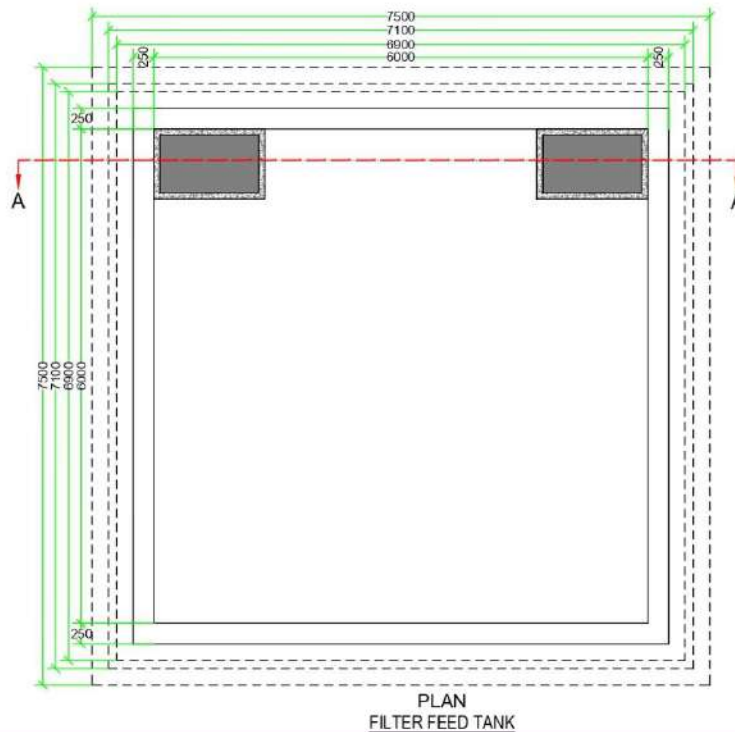
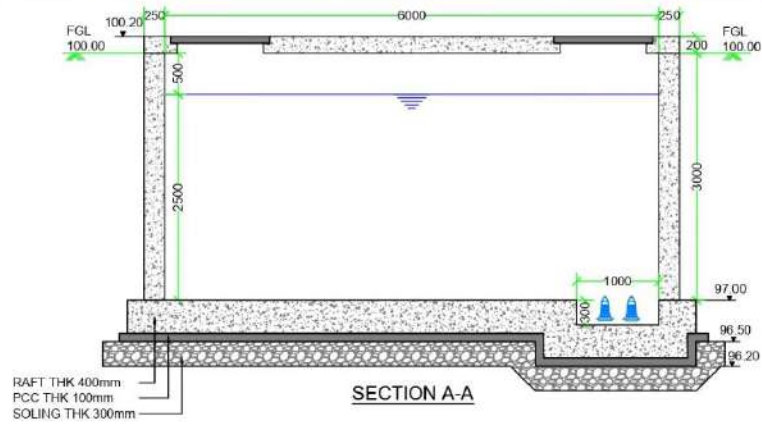
CLIENT : SWSM, MAHARASHTRA

DRAWING NAME:

TIGER BIO FILTER

PROJECT CODE : TBF-	DRAWING NO : D-04/TBF/02	DATE : JUNE-2021
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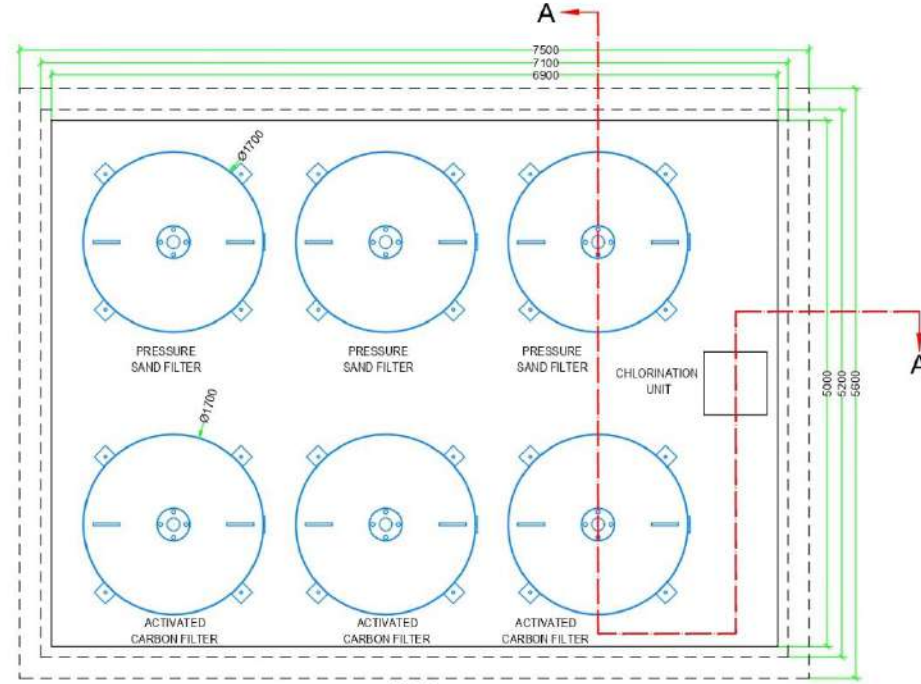
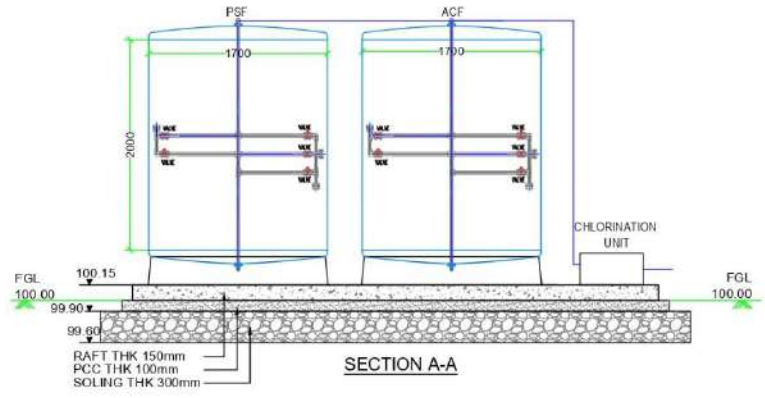
CLIENT : SWSM, MAHARASHTRA

DRAWING NAME:

FILTER FEED TANK

PROJECT CODE : TBF-	DRAWING NO : D-05/FF TAD1	DATE : JUNE-2021
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PLAN
PRESSURE SAND FILTER,
ACTIVATED CARBON FILTER & CHLORINATION UNIT

PROJECT NAME :
1250 KLD SEWAGE TREATMENT PLANT
BASED ON TIGER BIO FILTER
TECHNOLOGY.

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REVISION		
DATE	REMARKS	SIGNATURE

CLIENT : SWSM, MAHARASHTRA

DRAWING NAME:
PRESSURE SAND FILTER,
ACTIVATED CARBON FILTER
& CHLORINATION UNIT

PROJECT CODE : TBF-	DRAWING NO : D-06PSF,ACF&CU01	DATE : JUNE-2021
DRAWN BY : L.D.B.	CHECKED BY : S.B.	SCALE : NTS.


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**1500 KLD STP
BASED ON TBF TECHNOLOGY**

PROCESS CALCULATIONS
TIGER BIO FILTER OF 1500 KLD CAPACITY

Design flow	=	1500.00	KLD
	=	1.500	MLD
Peak flow factor	=	3.00	
1 SCREEN CHANNELS: MANUAL			
No. of Manual Screen	=	1	No.
Average Flow	=	1.50	MLD
Peak Flow Factor	=	3.00	
Design Flow	=	Peak Flow	
	=	4.50	MLD
	=	187.50	m ³ /hr
	=	0.052	m ³ /sec
Average Flow	=	1.50	MLD
	=	62.500	m ³ /hr
	=	0.017	m ³ /sec
Design Flow in each Screen	=	0.052	m ³ /sec
		1	No.
	=	0.052	m ³ /sec
Average Flow in each Screen	=	0.017	m ³ /sec
		1	No.
	=	0.017	m ³ /sec
Maximum Velocity through Screen at Peak Flow	=	1.2	m/sec
Minimum Velocity through Screen at Average Flow	=	0.6	m/sec
Clear Area of Opening through Screen for Peak Flow	=	0.052	m ³ /sec
		1.2	m/sec
	=	0.043	m ²
Clear Area of Opening through Screen for Average Flow	=	0.017	m ³ /sec
		0.6	m/sec
	=	0.028	m ²
Considering maximum Area of Opening through Screen	=	0.043	m ²
Clear Spacing of Bars	=	10	mm

Thickness of Bars	=	5	mm	
Gross Area of Screen	=	$0.043 \times (10+5) / 10$		
	=	0.065	m ²	
Assuming Depth of Screen Channel	=	300.00	mm	
Gross Width of Screen	=	$0.065 / 0.3$		
	=	0.217	m	
No. of Bars	=	$(\text{Gross Width of Screen} / \text{Center to Center Spacing of Bars}) - 1$		
	=	$0.2166666666666667 / ((10+5) / 1000) - 1$		
	=	13.4	Nos.	
Say	=	14	Nos.	
Width of Screen provided	=	$(\text{Number of Bars} + 1) \times \text{Clear Spacing} + (\text{Number of Bars} \times \text{Bar Thickness})$		
	=	$(14+1) \times 10 + (14 \times 5)$		
	=	220	mm	
Width Say	=	0.50	m	
Liquid Depth of Screen Channel provided	=	0.30	m	
L:B	=	8.00		
Length of Screen Channel provided	=	4.00	m	
Freeboard provided	=	1.00	m	Invert Dep of incomin sewer
Total Depth of Screen Chamber	=	1.30	m	
Velocity in Channel at Average Flow	=	$\text{Average Flow} / \text{Cross Sectional Area of Screen Channel}$		
	=	$0.017 / ((0.5 \times 0.3) / 1000 \times 1000)$		
	=	0.113	m/sec	
	>	0.300	m/sec	
Head Loss across Screen				
Head Loss across Screen	=	$0.0728 (V^2 - v^2)$		
V = Velocity through Screen at Peak Flow	=	$\text{Peak Flow through Screen Channel} / \text{Clear Area of Opening through Screen}$		
	=	1.156	m/sec	
v = Velocity in approach Channel at Peak Flow	=	$\text{Peak Flow through Screen Channel} / \text{Cross Sectional Area of Screen Channel}$		
	=	0.8	m/sec	
Head Loss across Screen at Peak Flow	=	0.051	m	
Head Loss across Screen at 50% Clogged Condition				
Velocity through Screen at 50% Clogged Condition at Peak Flow	=	2.311	m/sec	
Head Loss across screen at 50% Clogged Condition at Peak Flow	=	0.342	m	
	>	0.300	m/sec	OK

2 CONVENTIONAL GRIT CHAMBER: MANUAL

No. of Grit Chamber	=	1	
Average Flow	=	1.50	MLD

Peak Flow Factor	=	3.00	
Design Flow	=	Peak Flow	
Peak Flow	=	4.50	MLD
	=	4500	m ³ /day
	=	188	m ³ /hr
	=	0.052	m ³ /sec
Design Flow to each Grit Chamber	=	4500/1	
	=	4500	m ³ /day
	=	188	m ³ /hr
	=	0.052	m ³ /sec
According to CPHEEO Manual			
Particle Size	=	0.15	mm
Specific Gravity	=	2.65	
Surface Overflow Rate for 100% removal efficiency in an ideal Grit Chamber	=	Settling Velocity of the minimum size of Particles to be removed	
	=	1.5	m/s
	=	1296	m ³ /m ² /day
Considering Efficiency of removal of desired Particles, $\eta = 75\%$	=	75%	
and Measure of Settling Basin Performance, $n = 1/8$ for very good performance	=	0.125	
Design Overflow Rate	=	857	m ³ /m ² /day
Surface Overflow Rate for 0.15 mm dia. Particle Size with Specific Gravity $S_s > 2.65$ Table 5.6	=	1555	m ³ /m ² /day
Considering Design Overflow Rate	=	960	m ³ /m ² /day
Area of Grit Chamber required	=	4500	m ³ /day
		960	m ³ /m ² /day
	=	4.69	m ²
L:B ratio	=	3	
Length of Chamber provided	=	5.00	m
Width of Chamber provided	=	1.30	m
Hydraulic Retention Time (HRT) in Grit Chamber at Peak Flow	=	60	sec
Volume of Grit Chamber required	=	0.052x60	
	=	3.12	m ³
Depth required in Grit Chamber	=	3.12 / (5x1.3)	
	=	0.48	m
Say	=	0.50	m
Grit Storage Depth	=	0.30	m
Total Liquid Depth required	=	0.80	m

Length of Grit Pit	=	0.50	m
Width of Grit Pit	=	0.50	m
Depth of Grit Pit	=	0.30	m
Free Board	=	1.30	m

3 RAW SEWAGE SUMP (WET WELL)

No. of Units	=	1	No.
Average Flow	=	1.50	MLD
	=	62.500	m ³ /hr
	=	0.0174	m ³ /sec

Peak Flow Factor	=	3.00	
------------------	---	------	--

Design Flow	=	Peak Flow	
	=	4.50	MLD
	=	188	m ³ /hr
	=	0.052	m ³ /sec

Hydraulic Retention Time (HRT) at Average Flow	=	120	min
--	---	------------	-----

Volume required	=	0.0174 x 120 x 60	
	=	125	m ³

Hydraulic Retention Time (HRT) at Peak Flow	=	Volume / Average Flow	
	=	40	min
	<	30	min

Total Volume of Wet Well	=	125	m ³
--------------------------	---	-----	----------------

Side Water Depth (SWD) provided	=	2.50	m
Plan Area of Wet Well	=	50.11	m ²
Length/width of Sump required	=	7.08	m
Length/width of Sump provided	=	7.10	m
Volume of Sump provided	=	126.03	m ³
Length of Pump Pit	=	2.00	m
Width of Pump Pit	=	0.80	m
Depth of Pump Pit	=	0.30	m
Free Board	=	1.30	m

3.1 DESIGN STATEMENT-RSS E&M

Design Considerations

Design flow	=	1.50	MLD
	=	1500.00	Cum/Day
Peak flow factor	=	3.00	

Pumping machinery

Friction factor for Fittings in Pressure Mains			
Elbow 90 degrees	=	35	

Friction Factor for each	=	1		
Friction factor for all	=	35		
Elbow 45 degrees	=	0		
Friction Factor for each	=	0.75		
Friction factor for all	=	0		
Elbow 22 degrees	=	0		
Friction Factor for each	=	0.5		
Friction factor for all	=	0		
Tee 90 degrees	=	0		
Friction Factor for each	=	1.5		
Friction factor for all	=	0		
Tee in straight pipe	=	20		
Friction Factor for each	=	0.3		
Friction factor for all	=	6		
Gate valve open	=	1		
Friction Factor for each	=	0.4		
Friction factor for all	=	0.4		
Swing check	=	1		
Friction Factor for each	=	2.5		
Friction factor for all	=	2.5		
Total friction factor	=	43.9		
Stage		low	ave	peak
Average flow, cum / day	=		1500.00	
Proportion	=	0.6	1	2
Design flow, cum / day	=	900	1500	3000
Hazen Williams C	=	140	140	140
Desired velocity, m/s	=	0.6	1.0	1.5
Number of Pumping hours	=	16.0	16.0	16.0
Area needed, sqm	=	0.0260	0.0260	0.0347
Dia needed, m	=	0.182	0.182	0.210
Dia needed, mm	=	182	182	210
Dia provided, mm (User)	=	200	200	200
Radius, m	=	0.100	0.100	0.100
Radius power 0.63	=	0.234	0.234	0.234
S power 0.54	=	0.022	0.036	0.054
S	=	0.001	0.002	0.004
Slope 1 in	=	1218.6	473.2	223.3
length, m	=	85	85	85
Friction in pipeline, m	=	0.1	0.2	0.4
Velocity head, m	=	0.018	0.051	0.115
Friction factor in fittings	=	43.9	43.9	43.9
Friction in fittings, m	=	0.8	2.2	5.0
Static lift, m	=	5.0	5.0	5.0
Total head, m	=	5.8	7.2	10.0
Efficiency of pumpset	=	0.8	0.8	0.8
Discharge, lps	=	15.6	26.0	52.1
Discharge, Cum/Hr	=	56.3	93.8	187.5
Kw required	=	2.421	4.034	8.063
HP required	=	3.5	5.5	11.0
Number of Pumps	=	2	2	2

4 TIGER BIO FILTER

DESIGN STATEMENT-TBF1- 50 KLD

Number of pumping hours	=	16	Hrs	
Number of BMF tanks provided	=	30	Nos	
Design flow to each tank	=	50.00	Cum/day	
	=	3.13	Cum/ Hr for 16 Hr	
	=	0.87	lps	
Inlet BOD	=	250.00	mg/l	
Inlet TSS	=	400.00	mg/l	
BOD load applied	=	12.5	kg/day	
BOD uptake rate	=	0.1	Kg of BOD / Kg of worms	(0.5 - 1.0)
Worms required	=	125	Kg worms	
Sewage application rate	=	1.85	Cum/Sqm/day	(1 - 2 Cum/Sqm/d
Area required	=	27.03	Sqm	
Area Provided	=	28	Sqm	
Area of each crate	=	0.4	Sqm	
Number of crates	=	70	Nos	
say	=	72	Nos	
Crate in longitudinal direction	=	18	Nos	
Crate in travers direction	=	4	Nos	
crates provided	=	72	Nos	OK
Width provided	=	4.00	m	
Length required	=	11.00	m	
Depth provided	=	1.2	m	

5 TERTIARY TREATMENT UNIT

Design Considerations

Design flow	=	1.50	MLD	
	=	1500.00	Cum/Day	
Peak flow factor	=	3.00		

5.1 FILTER FEED TANK

Number of FFT provided	=	1	Nos	
Number of operating hours	=	16	Hrs	
Design flow	=	1500.00	Cum/Day	
	=	93.75	Cum/Hr	
	=	0.02604	Cum/Sec	
Hydraulic Retention time	=	60	min	
Volume required	=	93.75	Cum	
Depth	=	2.50	m	
Civil Tanks				
Area	=	37.50	Sqm	
Length/Width required	=	6.12	m	
Length/Width provided	=	6.50	m	
Freeboard provided	=	0.50	m	
Volume Provided		105.63	Cum	

DESIGN STATEMENT-TTU E&M

Design Considerations

Design flow	=	1.50	MLD
	=	1500.00	Cum/Day
Peak flow factor	=	3.00	

Pumping machinery

Friction factor for Fittings in Pressure Mains

Elbow 90 degrees	=	8
Friction Factor for each	=	1
Friction factor for all	=	8
Elbow 45 degrees	=	0
Friction Factor for each	=	0.75
Friction factor for all	=	0
Elbow 22 degrees	=	0
Friction Factor for each	=	0.5
Friction factor for all	=	0
Tee 90 degrees	=	0
Friction Factor for each	=	1.5
Friction factor for all	=	0
Tee in straight pipe	=	8
Friction Factor for each	=	0.3
Friction factor for all	=	2.4
Gate valve open	=	1
Friction Factor for each	=	0.4
Friction factor for all	=	0.4
Swing check	=	1
Friction Factor for each	=	2.5
Friction factor for all	=	2.5
Total friction factor	=	13.3

Stage

		low	ave	peak
Average flow, cum / day	=		1500.00	
Proportion	=	0.6	1	2
Design flow, cum / day	=	900	1500	3000
Hazen Williams C	=	140	140	140
Desired velocity, m/s	=	0.8	1.0	1.5
Number of Pumping hours	=	16.0	16.0	16.0
Area needed, sqm	=	0.0195	0.0260	0.0347
Dia needed, m	=	0.158	0.182	0.210
Dia needed, mm	=	158	182	210
Dia provided, mm (User)	=	180	180	180
Radius, m	=	0.090	0.090	0.090
Radius power 0.63	=	0.219	0.219	0.219
S power 0.54	=	0.031	0.038	0.058
S	=	0.002	0.002	0.005
Slope 1 in	=	632.6	418.5	197.5
length, m	=	35	35	35
Friction in pipeline, m	=	0.1	0.1	0.2

Velocity head, m	=	0.033	0.051	0.115
Friction factor in fittings	=	13.3	13.3	13.3
Friction in fittings, m	=	0.4	0.7	1.5
Static lift, m	=	10.0	10.0	10.0
Total head, m	=	10.4	10.7	11.5
Efficiency of pumpset	=	0.8	0.8	0.8
Discharge, lps	=	15.6	26.0	52.1
Discharge, Cum/Hr	=	56.3	93.8	187.5
Kw required	=	4.150	6.915	13.823
HP provided	=	6.0	9.5	19.0
Number of Pumps	=	2	2	2

5.2 PRESSURE SAND FILTER

Number of unit provided	=	4	Nos.
Designed @ 16 hrs working for flow of	=	23.44	m ³ /h
Loading rate	=	12.00	m ³ /m ² /h
Area of DMF	=	1.95	m ²
Dia of DMF	=	1.58	m
Provided	=	1.600	m
Backwash water			
Backwash velocity	=	15.00	m/hr
backwash flowrate	=	29.71	m ³ /h
Backwash volume for 20 mins	=	9.90	m ³

5.3 ACTIVATED CARBON FILTER

Number of unit provided	=	4	Nos.
Designed @ 16 hrs working for flow of	=	23.44	m ³ /h
Loading rate	=	12.00	m ³ /m ² /h
Area of ACF	=	1.95	m ²
Dia of ACF	=	1.58	m
Provided	=	1.600	m
Backwash water			
Backwash velocity	=	15.00	m/hr
backwash flowrate	=	29.71	m ³ /h
Backwash volume for 20 mins	=	9.90	m ³

5.4 CHLORINE DOSING SYSTEM NaOCl DOSING SYSTEM

Average Flow	=	93.75	m ³ /hr
Design Chlorine Dosage (Max)	=	3	mg/l
Concentration of Chlorine in commercially available NaOCl	=	10%	
Design NaOCl Dosage	=	30	mg/l
Operating hours	=	16.0	hr

Quantity of NaOCl required 93.75 X 30 X 16 / 1000

	=	45.00	Kg/day
	=		
Design Strength of NaOCl Solution	=	100%	
Volume of NaOCl Solution	=	$45 / (1 \times 1000)$	
	=	0.050	m3
No. of Dosing Tanks provided	=	1	Nos.
Volume of each Dosing Tank	=	$0.05 / 1$	
	=	0.05	m3
	=	100	Litres
	=		
No. of Working NaOCl Dosing Pump provided	=	1	No.
Capacity of each NaOCl Dosing Pump required	=	$\frac{\text{Total Volume of NaOCl Solution}}{\text{(No. of Dosing pumps)}}$	
	=	$0.05 / (1 \times 16)$	
	=	0.003	m3/hr
	=	3.00	LPH
	=		
Capacity of each NaOCl Dosing Pump provided	=	3.00	LPH
No. of Standby NaOCl Dosing Pump provided	=	1	No.

SIZING DETAILS (CIVIL)
TIGER BIO FILTER OF 1500 KLD CAPACITY

S I. N o	Unit name	N o s	Leng th	Widt h	Height			Soling		PCC		Raft		RCC Wall thk	Bric k Wall thk	Slab Thk	Steel - HCR M/ Kg/C
					SW	FB	Tota	offs	Thk	offs	Thk	offs	Thk				
		N	m	m	m	m	m	m	m	m	m	m	m	m	m	m	
1	Screen Chamber	1	4.0	0.5	0.3	1.0	1.3	0.2	0.3	0.1	0.1	0.2	0.1	0.1			80
2	Grit Chamber	1	5.0	1.3	0.8	1.3	2.1	0.2	0.3	0.1	0.1	0.2	0.2	0.1			80
3	Raw Sewage Sump	1	7.1	7.1	2.5	1.3	3.8	0.2	0.3	0.1	0.1	0.2	0.4	0.3		0.2	100
4	TBF Bed 50 KLD	3	11.0	4.0			1.2	0.2	0.3	0.1	0.1	0.2	0.1		0.2		60
5	Filter Feed tank	1	6.5	6.5	2.5	0.5	3.0	0.2	0.3	0.1	0.1	0.2	0.4	0.3		0.2	100
6	Filter Platform	1	8.0	4.4				0.2	0.3	0.1	0.1	0.2	0.1				80

Assumptions

Incoming Sewer Invert 1.0 m Below Ground level

Method of excavation Mechanical means

Underground strata		soil	Muru m	Soft roc	hard	Total
0.0 to 1.5 m	=	25	25	25	25	100
1.5 m to 3.0 m	=	25	25	25	25	100
3.0 to 4.5 m	=	25	25	25	25	100
4.5 to 6.0	=	25	25	25	25	100

**TIGER BIO FILTER OF 1500 KLD CAPACITY
BILL OF QUANTITIES**

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
1	Excavation for foundation / pipe trenches in earth, soils of all types, sand, gravel and soft murum, including removing the excavated material upto a distance of 50 metres and lifts as below, stacking and spreading as directed, normal dewatering, preparing the bed for foundation and excluding backfilling, etc. complete. (Bd-A-1/259)				
	0.0 to 1.5 m	370.28	Cum	150.00	55,542.00
	1.5 to 3.0 m	80.50	Cum	164.00	13,202.00
	3.0 to 4.5 m	54.93	Cum	178.00	9,777.60
	4.5 to 6.0 m	2.17	Cum	192.00	416.70
	MJP/ SSR/ 2021-22 / Section E / Excavation Item No.1/ Page no. 42				
2	Excavation for foundation / pipe trenches in hard murum and boulders, W.B.M. road including removing the excavated material upto a distance of 50 M beyond the area and lifts as below, stacking and spreading as directed by Engineer-in-charge, normal dewatering, preparing the bed for foundation and excluding backfilling, etc. complete. (Bd-A-3/259)			8.00	
	0.0 to 1.5 m	370.28	Cum	192.00	71,093.80
	1.5 to 3.0 m	80.50	Cum	206.00	16,583.00
	3.0 to 4.5 m	54.93	Cum	220.00	12,084.60
	4.5 to 6.0 m	2.17	Cum	234.00	507.80
	MJP/ SSR/ 2021-22/ Section E/ Excavation Item No.3, Page no. 42				
3	Excavation for foundation / pipe trenches in soft rock and old cement and lime masonry foundation asphalt road including removing the excavated material upto a distance of 50 M beyond the area and lifts as below, stacking as directed by Engineer-in-charge, normal dewatering, preparing the bed for foundation and excluding backfilling, etc. complete. (Bd-A- 4/259)				
	0.0 to 1.5 m	370.28	Cum	572.00	211,800.20
	1.5 to 3.0 m	80.50	Cum	597.00	48,058.50
	3.0 to 4.5 m	54.93	Cum	622.00	34,166.50
	4.5 to 6.0 m	2.17	Cum	647.00	1,404.00
	MJP/ SSR/ 2021-22 / Section E/ Excavation Item No.5, Page no. 42				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
4	Excavation for foundation / pipe trenches in hard rock and concrete road by chiselling, wedging, line drilling by mechanical means or by all means other than blasting including trimming and levelling the bed, removing the excavated material upto a distance of 50 metres beyond the area and lifts as below, stacking as directed by Engineer-in-charge, normal dewatering, excluding backfilling, etc. complete by all means. (Bd-A-6/259)				
	0.0 to 1.5 m	370.28	Cum	1,017.00	376,574.80
	1.5 to 3.0 m	80.50	Cum	1,042.00	83,881.00
	3.0 to 4.5 m	54.93	Cum	1,067.00	58,610.40
	4.5 to 6.0 m	2.17	Cum	1,092.00	2,369.70
	MJP/ SSR/ 2021-22 / Section E/ Excavation Item No.7, Page no. 43				
5	Providing dry trap/ granite/ quartzite/ gneiss, rubble stone soling in 15 cm to 20 cm thick layers including hand packing and compacting, etc. complete. (Bd-A-12/264)	674.01	Cum	1,175.00	791,961.80
	MJP/ SSR/ 2021-22 / Section E/ Excavat				
6	Providing and laying in situ Cement Concrete M- 15 of trap/ granite / quartzite / gneiss metal for foundation and bedding including bailing out water, form work, compaction, curing, etc. complete. (Cement 5.90 bags / cum) Spec. No. - Bd E /1 Page No. 287 and B- 7, Page No. 38	202.60	Cum	5,640.00	1,142,664.00
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.1, Page no.49				
7	Providing and laying in situ Cement Concrete of trap/ granite / quartzite / gneiss metal for RCC work in foundation like raft, grillage, strip foundation and footing of RCC columns and steel stanchions including normal dewatering, form work, compaction, finishing and curing, etc. complete. (By weigh batching and mix design for M250 and M-300 only. Use of L&T, A.C.C., Ambuja, Birla Gold, Manikgad, Rajashree, etc. cement is permitted.) (Excluding M.S. or Tor reinforcement)	230.17	Cum	7,448.00	1,714,306.20
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE/ Item No.2, Page no. 49				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
8	Providing and casting in situ C.C. of trap / granite/ quartzite / gneiss metal of approved quality for RCC works as per detailed drawings and designs or as directed by Engineer-in- charge including normal dewatering, centering, form work, compaction, finishing the formed surfaces with C.M. 1:3 of sufficient minimum thickness to give a smooth and even surface wherever necessary or roughening if special finish is to be provided and curing, etc. complete. (By weigh batching and mix design for M-250 and M-300 only. Use of L&T, A.C.C., Ambuja, Birla Gold, Manikgad, Rajashree, etc. cement is permitted.) (Excluding M.S. or Tor reinforcement)	4.90	Cum	8,624.00	42,257.60
	For Beams / Braces / Lintels In RCC M-300				
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.4, Page no. 50				
9	Providing and casting in situ C.C. of trap / granite/ quartzite / gneiss metal of approved quality for RCC works as per detailed drawings and designs or as directed by Engineer-in- charge including normal dewatering, centering, form work, compaction, finishing the formed surfaces with C.M. 1:3 of sufficient minimum thickness to give a smooth and even surface wherever necessary or roughening if special finish is to be provided and curing, etc. complete. (By weigh batching and mix design for M-250 and M-300 only. Use of L&T, A.C.C., Ambuja, Birla Gold, Manikgad, Rajashree, etc. cement is permitted.) (Excluding M.S. or Tor reinforcement)	20.73	Cum	9,247.00	191,690.40
	Slabs / Landings / Vertical Walls / Waist Slabs / Steps for Staircase In RCC M-300				
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.5, / Page no. 50				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
10	Providing and casting in situ C.C. of trap / granite/ quartzite / gneiss metal of approved quality for RCC works as per detailed drawings and designs or as directed by Engineer-in- charge including normal dewatering, centering, form work, compaction, finishing the formed surfaces with C.M. 1:3 of sufficient minimum thickness to give a smooth and even surface wherever necessary or roughening if special finish is to be provided and curing, etc. complete. (By weigh batching and mix design for M-250 and M-300 only. Use of L&T, A.C.C., Ambuja, Birla Gold, Manikgad, Rajashree, etc. cement is permitted.) (Excluding M.S. or Tor reinforcement)	65.19	Cum	9,218.00	600,921.50
	Chajjas / Parapets / Curtain Walls /Partition Walls / Pardies In RCC M-300				
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.6 / Page no. 51				
11	Providing and fixing in position steel bar reinforcement of various diameters for RCC piles, caps, footings, foundations, slabs, beams, columns, canopies, staircases, newels, chajjas, lintels, pardies, copings, fins, arches, etc. as per detailed designs, drawings and schedules; including cutting, bending, hooking the bars, binding with wires or tack welding and supporting as required, etc. complete (including cost of binding wire). (Bd-F-17/306)				
	c) Corrosion Resistant Steel (Fe 500)	25.08	MT	70,658.00	1,772,102.70
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.8 / Page no. 52				
12	Providing and fixing mild steel grill work for windows/ ventilators of 20 Kg/Sqm. As per drawings including necessary welding and painting with one coat of anticorrosive paint and two coats of oil painting, etc. complete. (Bd-U- 1/537)	17.21	Sqm	1,895.00	32,613.00
	MJP/ SSR/ 2021-22 / SECTION - F : IRON AND STRUCTURAL STEEL WORK Item No.1 / Page				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
13	Providing structural steel work in rolled stanchions fixed with connecting plates or angle cleats as in main and cross beams, hip and jack rafters, purlins connecting to truss members and like as per detailed designs and drawings or as directed by Engineer-in-charge including cutting, fabricating, hoisting, erecting, fixing in position, making riveted / bolted / welded connections and one coat of anticorrosive paint and over it two coats of oil painting, etc. complete. (Bd-C- 3/275)	22.41	MT	71,286.00	1,597,604.90
	MJP/ SSR/ 2021-22 / SECTION - F :: IRON AND STRUCTURAL STEEL WORK Item No.3,				
14	Providing and fixing corrugated galvanised iron sheets of 0.63 mm thick (24B .W .G.) for roofing without wind tiles including fastening with galvanised iron screws and bolts , lead and bitumen washers as per drawing etc. complete. (Weight of 5.5 kg/sq.m.).	2262.00	Sqm	777.00	1,757,574.00
	PWD / SSR 2020-21 / Roofing and Ceiling SSR Item No.38.04 Reference No. Bd.R.5, Page No. 453 Item No.1133, Page no. 224				
15	Providing fly ash brick masonry with conventional / I.S. type bricks in cement mortar 1:6 in superstructure including striking joints, raking out joints, watering and scaffolding etc. Complete	446.10	Cum	6,305.00	2,812,660.50
	PWD / SSR 2020-21 / Brick Masonry SSR Item No.27.13 Reference No. As director by engineer incharge and BDG- 2 and 5 Item No.893, Page no. 190				
16	Providing internal cement plaster 12 mm thick in single coat in cement mortar 1:5 without neeru finish to concrete or brick surfaces, in all positions including scaffolding and curing etc. complete.	2449.50	Sqm	257.00	629,521.50
	PWD / SSR 2020-21 / Plastering and Pointing SSR Item No. 32.03 Reference No. Bd. L.2 Page No. 368 Item No.950, Page no. 201				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
17	Providing rough cast cement plaster externally in two coats to concrete, brick or stone masonry surfaces in all positions with base coat of 12 to 15 mm thick in C.M. 1:4 and rough cast treatment 12 mm thick in proportion 1:11 / 2:3 including scaffolding and fourteen days curing complete.	1425.00	Sqm	529.00	753,825.00
	PWD / SSR 2020-21 / Plastering and Pointing SSR Item No. 32.12 Reference No. Bd.L.8 Page No. 370 Item No.957, Page no. 201				
18	Providing and applying white-wash in two coats on old / new plastered or masonry surfaces and asbestos cement sheets including scaffolding and preparing the surface by brushing and brooming down etc. complete.	1425.00	Sqm	10.00	14,250.00
	PWD / SSR 2020-21 / Colouring SSR Item No. 36.03 Reference No. Bd. P. I Page No. 411				
19	Providing and applying colour-wash of approved colour and shade in one coat to new surface including scaffolding, brushing and brooming down (excluding base coats of white wash) etc. complete.	1425.00	Sqm	8.00	11,400.00
	PWD / SSR 2020-21 / Colouring SSR Item No. 36.04 Reference No. Bd. P.2 Page No. 412				
20	Dewatering the excavated trenches and pools of water in the building trenches / pipeline trenches, well works by using pumps and other devices including disposing off water to safe distance as directed by Engineer-in-charge (including cost of machinery, labour, fuel), etc. complete. (Bd-A-9/261)	200.00	HP/ Hr.	77.00	15,400.00
	MJP/ SSR/ 2021-22 / Section E/ Excava				
21	Refilling the trenches with available excavated stuff with soft material first over pipeline and then hard material in 15 cm layers with all leads and lifts including consolidation, surcharging, etc. complete.	535.61	Cum	84.00	44,991.30
	MJP/ SSR/ 2021-22 / Section E/ Excava				
22	Transportation as per STATEMENT VI Including loading, unloading and stacking Earth (4.8 Cum) lead 15 Km	2093.75	Cum	604.45	1,265,567.20

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
	Electromechanical Items				
23	Screen (Manual) of size 1.8 m length x 0.5 m width of SS 304 MOC and Manual hand rake for cleaning screen of SS handle 1 m in length and cleaning area of 6 nos 5 mm SS rod of total length 200 mm straight and 50 mm of 90 degree bend.	0.90	Sqm	35,000.00	31,500.00
24	Grit pump				
	Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below				
	MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION - Pumps, Page no. 6, 7of size 1.8 m length				
	1 HP (Up to 9000 LPH)	1.00	No	68,654.00	68,654.00
25	Raw Sewage Pumps				
	Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below				
	MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION -				
	15 HP (Up to 132000 LPH)	2.00	Nos	184,154.00	368,308.00
26	TTU Feed pumps				
	Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below				
	MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION -				
	15 HP (Up to 132000 LPH)	2.00	Nos	184,154.00	368,308.00
27	Pressure Sand Filter of FRP / MSEP vessel with suitable thickness to withstand a water pressure including MPV or 5 Valve system and PVC / UPVC / MSEP interconnecting and underdrain piping including fittings, with standard filter media layer with minimum depth of filter sand 1.0 m supported by gravels. The piping arrangement should provide sufficient pressure for backwash operations and avoid loss of sand during backwash operation. Suitable openings to be provided to ease addition and removal the media.				
	Dia 1.6 m x 2 m minimum height	4.00	Nos	454,000.00	1,816,000.00

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
28	Activated Carbon Filter of FRP / MSEP vessel with suitable thickness to withstand a water pressure including MPV or 5 Valve system and PVC / UPVC / MSEP interconnecting and underdrain piping including fittings, with standard filter media layer with minimum depth of Activated Carbon 1.0 m supported by gravels. The piping arrangement should provide sufficient pressure for backwash operations and avoid loss of Activated carbon during backwash operation. Suitable openings to be provided to ease addition and				
	Dia 1.6 m x 2 m minimum height	4.00	Nos	454,000.00	1,816,000.00
29	NaOCl Chlorinator Pump Diaphragm Type / peristaltic type / Solenoid Max Flow Rate Upto 10LPH Power Source Electric Phase Single Material PP / PTFE(Teflon) Voltage 230 Volt Frequency				
	Mixing Tank of 100 Ltrs capacity	100.00	Ltrs	8.00	800.00
	Dosing Pump	2.00	Nos	15,000.00	30,000.00
30	Control Panel				
	Design, Supply, Installing, Commissioning & Testing of Master PLC control monitoring and communication panel as per IEC 61131 at Pure Water Sump suitable for monitoring and control of pure water Pumps. Pressure Transmitters, Level Transmitter, PH Transmitter, Turbidity Transmitter ,for all pumps installed.	1.00	No	50,041.00	50,041.00
	MJP/ MECH/ ELECT / SSR/ 2021-22/ SECTION 19 - SA [SCADA & AUTOMATION]				
31	Supplying and erecting Fully Automatic Star Delta starter to operate squirrel cage induction motor working on 380- 440 Volt, 3 phase, 50 Hz with no volt coil, over load element, and ON - OFF push buttons, with necessary material and connected to supply, etc complete. Starter with original sheet steel encloser.				
	> 12.5 HP & Up to 20 HP	6.00	nos	8,696.00	52,176.00

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
	MJP /MECH/ ELECT/ SSR/ 2021-22 SECTION 10 - LG [L.T. SWITCHGEAR AND PROTECTION] Item no. LG 3 Page no. 27				
32	Main power supply cable 3 core PVC insulated, PVC sheathed copper conductor flat submersible cable Supplying and erecting, Flat flexible submersible cable with, Copper Conductor, PVC insulated, and PVC sheathed.				
	3 core 16 sq mm	40.00	m	549.00	21,960.00
33	Power cables Aluminium conductor 4 Core, XLPE / PVC insulated & armoured cable Supplying and erecting, XLPE / PVC insulated, armoured cable 1100 V grade with ISI mark Four core, solid / stranded aluminium conductor with 6 mm thick 25 mm width M.S. spacer with G.I. Earth wire 6 sq mm, complete erected on wall / on pole with 25 X 3 mm M.S. clamps or in provided trench in an approved				
	4 Core 6 sq mm	200.00	m	137.00	27,400.00
	MJP MECH/ ELECT/ SSR/ 2021-22 SECTION 12 - CB [L.T. CABLE] Item no. CB 6 Page				
34	Control Cables Copper conductor PVC insulated, Unarmoured control cable Supplying and erecting Un-armoured control cable with ISI mark stranded / solid copper conductor 1.1 kV grade complete erected on wall / panel or in provided trench in an approved manner.				
	4 core 2.5 sq mm	200.00	m	137.00	27,400.00
	MJP MECH/ ELECT/ SSR/ 2021-22/ SECTION 12 - CB [L.T. CABLE] Item no. CB 8-				

Plumbing Items					
Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
35	Providing and supplying in standard lengths ISI mark rigid unplasticised PVC pipes suitable for potable water with solvent cement joints including cost of couplers, as per IS specification no. 4985 / 1988 excluding GST levied by GOI and GOM in all respect, including transportation, freight charges, inspection charges, loading, unloading, conveyance to the departmental stores and stacking the same in closed shed duly protected from sun rays and rains including cost of jointing material i.e. solvent cement, etc. complete (selffit type to be jointed with cement solvent).				
	1) 10% of cost of pipes shall be considered for cost of PVC specials for estimate purpose only. 2) One coupler and required cement solvent shall be provided with each full length pipe cost of which is included in rates below.				
	MJP/ SSR/ 2021-22 / SECTION – I(II) P.V.C. PIPES, Page no.77				
1	Raw Sewage pump to TBF Distribution				
a	Main header				
	200 mm.	85.00	m	1,544.00	131,240.00
	PVC Specials- 10%				13,124.00
b	Distribution				
	140 mm.	120.00	m	693.00	83,160.00
	PVC Specials- 10%				8,316.00
2	TBF collection to FFT (gravity)				
a	Main header				
	140 mm.	230.00	m	693.00	159,390.00
	PVC Specials- 10%				15,939.00
b	collection tributary				
	75 mm.	55.00	m	211.00	11,605.00
	PVC Specials- 10%				1,160.50
3	TTU Plumbing				
	180 mm.	35.00	m	1,249.00	43,715.00
	PVC Specials- 10%				4,371.50
4	TBF distribution				
	75 mm.	150.00	m	211.00	31,650.00
	PVC Specials- 10%				3,165.00
36	Labour				
	Plumber	40.00	days	641.00	25,640.00
	Helper	100.00	days	579.00	57,900.00

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
	MJP/ SSR/ 2021-22 / SECTION - B LABOUR & MACHINERY , Page no. 14				
37	Providing double flange sluice valve confirming for IS- 14846 including worn gear arrangements as per test pressure, stainless steel spindle, caps, including inspection charges, transportation upto departmental store, unloading, stacking excluding GST levied by GOI & GOM in all respect etc. complete.				
	Sluice valves - PN -1 (Without by pass)				
	Raw Sewage pump				
	200 mm.	2.00	Nos	18,581.00	37,162.00
	Filter Feed Pump				
	200 mm.	2.00	Nos	18,581.00	37,162.00
	MJP/ SSR/ 2021-22 / SECTION - I(XII) : PIPES APPURTENANCES , Page no. 132				
38	Providing and supplying ISI mark CI D/F reflux valves (non-return valves) of following dia including railway freight, inspection charges, unloading from railway wagon, loading into truck, transportation upto departmental stores, unloading, stacking excluding GST levied by GOI & GOM in all respect etc. complete. Reflux valves as per I.S.5312 Part I (1984)				
	Without by pass arrangement -PN -1				
	Raw Sewage pump				
	200 mm.	2.00	Nos	17,751.00	35,502.00
	Filter Feed Pump				
	200 mm.	2.00	Nos	17,751.00	35,502.00
	MJP/ SSR/ 2021-22 / SECTION - I(XII) : PIPES APPURTENANCES , Page no. 131				
	Bio media Items				
39	Supplying of Specially designed container for holding Filter media including Lightweight Expanded Clay Aggregates size (8-30 mm) and Bio media including mixture of woodchips Vermicompost, cocopeat and bacterial culture with special worms per designed quantity including transportation & fixing in position as directed etc. complete.	2160.00	Nos	4,750.00	10,260,000.00
	Market rate				
40	Rapid sand Gravity filter sand At Source (Godhara, Gokak, Kanhan,	205.46	Cum	1,730.00	355,445.80
	MJP/ SSR/ 2021-22 / SECTION- A MATERIALS				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
41	Trasnsportation Godhara to Pune distance by Road 660 Km.	205.46	Cum	11,031.37	2,266,505.30
	MJP/ SSR/ 2021-22 / SECTION - C : TRANSPORTATION Page no.				
42	Stone Aggregate 20 mm	205.46	Cum	900.00	184,914.00
	MJP/ SSR/ 2021-22 / SECTION- A MATERIALS				
43	Transportation as per STATEMENT VI Including loading, unloading and stacking				
	Manure or sludge (5.52 Cum) lead 25 Km	793.50	Cum	747.48	593,125.40
	MJP/ SSR/ 2021-22 / SECTION - C : TRANSPORTATION Page no.				
NET TOTAL Rs.					35,261,625.70

MEASUREMENT SHEET - SCREEN CHAMBER, GRIT CHAMBER AND RAW SEWAGE SUMP

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	Short Wall	2	0.80	0.15	1.50	0.36	Cum
				Total for screen		2.3	Cum
	Grit						
	Long Wall (extra than screen chamber)	1	1.00	0.15	2.30	0.35	Cum
	Short Wall	2	1.30	0.15	2.30	0.9	Cum
				Total for grit		1.25	Cum
6	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	80	Cum	5.82	0.47	MT
7	Fabrication work in Frame and Grating for Access						
	Screen	1	4.30	0.80		3.44	Sqm
	Grit	1	5.30	1.45		7.69	Sqm
					Total	11.13	Sqm
8	Removing excess excavated material out of site						
	Screen chamber	1	4.30	0.80	1.30	4.48	Cum
	Grit Chamber	1	5.30	1.30	2.10	14.47	Cum
	soling, PCC, Raft volume					8.4	Cum
	Total Volume					27.35	Cum
	bulkage @ 40%					38.29	Cum
9	Refilling and compaction						
	Total Excavation					80.68	Cum
	Deduction for tank volume, soling, PCC, Raft					27.35	Cum
	Refilling and compaction volume					53.33	Cum

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	Raw Sewage Sump						
1	Excavation				4.60		
A	0.0 to 1.5 m	1	11.3	11.30	1.5	191.54	Cum
	soil					47.89	Cum
	Murum					47.89	Cum
	Soft rock					47.89	Cum
	hard rock					47.89	Cum
B	1.5 to 3.0 m	1	10.30	10.30	1.5	159.14	Cum
	soil					39.79	Cum
	Murum					39.79	Cum
	Soft rock					39.79	Cum
	hard rock					39.79	Cum
C	3.0 to 4.5 m	1	10.30	10.30	1.5	159.14	Cum

MEASUREMENT SHEET - SCREEN CHAMBER, GRIT CHAMBER AND RAW SEWAGE SUMP

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	soil					39.79	Cum
	Murum					39.79	Cum
	Soft rock					39.79	Cum
	hard rock					39.79	Cum
D	4.5 to 6.0 m	1	9.30	9.30	0.1	8.65	Cum
	soil					2.17	Cum
	Murum					2.17	Cum
	Soft rock					2.17	Cum
	hard rock					2.17	Cum
2	Soling						
	RSS	1	8.70	8.70	0.30	22.71	Cum
3	PCC M20						
	RSS	1	8.30	8.30	0.10	6.89	Cum
4	Raft M30						
	RSS	1	8.10	8.10	0.40	26.25	Cum
5	RCC Wall						
	Long Wall	2	7.70	0.30	4.00	18.48	Cum
	Short Wall	2	7.10	0.30	4.00	17.04	Cum
					Total	35.52	Cum
6	Beams						
	Beam 1	3	7.10	0.2	0.3	1.28	Cum
	Beam 2	3	7.10	0.2	0.3	1.28	Cum
					Total	2.56	Cum
7	Slab	1	7.70	7.70	0.2	11.86	Cum
	Deduction for manhole	-2	2.20	1.00	0.2	-0.88	Cum
					Total	10.98	Cum
8	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	100	Cum	75.31	7.54	MT
9	Fabrication work in Frame and Grating for Access						
	RSS	2	2.20	1.00		4.4	Sqm
10	Removing excess excavated material out of site						
	RSS	1	7.70	7.70	3.80	225.31	Cum
	soling, PCC, Raft volume					55.85	Cum
	Total Volume					281.16	Cum
	bulkage @ 40%					393.63	Cum
11	Refilling and compaction						

MEASUREMENT SHEET - SCREEN CHAMBER, GRIT CHAMBER AND RAW SEWAGE SUMP

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	Total Excavation					518.47	Cum
	Deduction for tank volume, soling, PCC, Raft					281.16	Cum
	Refilling and compaction volume					237.31	Cum
12	Dewatering						
	25 Days x 4 hours/day	days	25	hours / day	4	100	Hrs

MEASUREMENT SHEET - TIGER BIO FILTER

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	TIGER BIO FILTER						
1	Excavation				0.50		
A	0.0 to 1.5 m	1	12.66	5.66	0.5	35.83	Cum
	soil					8.96	Cum
	Murum					8.96	Cum
	Soft rock					8.96	Cum
	hard rock					8.96	Cum
2	Soling						
	TBF	1	12.46	5.46	0.30	20.41	Cum
3	PCC M20						
	TBF	1	12.06	5.06	0.10	6.11	Cum
4	Raft M30						
	TBF	1	11.86	4.86	0.10	5.77	Cum
5	Brick Wall						
	TBF						
	Long Wall	2	11.46	0.23	1.20	6.33	Cum
	Short Wall	2	4.00	0.23	1.20	2.21	Cum
	Crate Support Wall	5	11.00	0.23	0.50	6.33	Cum
					Total for T	14.87	Cum
6	Plaster						
	Internal						
	Crate Support Wall						
	Long Wall	6	11.00		0.50	33	Sqm
	Wall top	5	11.00		0.23	12.65	Sqm
	Long Wall	2	11.00		1.20	26.4	Sqm
	Short Wall	2	4.00		1.20	9.6	Sqm
					Total	81.65	Sqm
	External						
	Long Wall	2	11.46		1.20	27.51	Sqm
	Short Wall	2	4.46		1.20	10.71	Sqm
	Wall Top	1	30.92	0.3		9.28	Sqm
					Total	47.50	Sqm
7	External-white-wash	1				47.50	Sqm
8	External-colour-wash	1				47.50	Sqm
9	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	60	Cum	5.77	0.35	MT
10	Removing excess excavated material out of site						
	soling, PCC, Raft volume					32.29	Cum
	Total Volume					32.29	Cum
	bulkage @ 40%					45.21	Cum

MEASUREMENT SHEET - TIGER BIO FILTER

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
11	Refilling and compaction						
	Total Excavation					35.83	Cum
	Deduction for tank volume, soling, PCC, Raft					32.29	Cum
	Refilling and compaction volume					3.54	Cum
12	MS Fabricated Shed						
	TBF-II Shed in Fabrication work Shed Size-12 m X 5 m x		12.00	5.00	3.00		
	for column 50*50*5 Unit Weight 6.97 kg/m	10	3.00	6.97	kg/m	209.10	KG
	for truss 50*50*3 Unit Weight 3.71 kg/m	5	5.00	3.71	kg/m	92.75	KG
	for principle rafter 50*50*3 Unit Weight	10	2.90	3.71	kg/m	107.59	KG
	for strut rafter 50*50*3 Unit Weight 3.71 kg/m	10	0.20	3.71	kg/m	7.42	KG
	for central strut rafter 50*50*3 Unit Weight	5	0.30	3.71	kg/m	5.57	KG
	for bottom frame below truss 50*50*3 Unit Weight 3.71 kg/m	1	34.00	3.71	kg/m	126.14	KG
	for perlin 30*30*3 Unit Weight 2.51 kg/m	5	13.00	2.51	kg/m	163.15	KG
	for Base Plate 150*150*10 mm	20	0.15	0.15	0.010	35.33	KG
					Total Wei	747.04	Kg
						0.75	MT
13	corrugated galvanised iron sheets	2	13.00	2.90		75.4	Sqm

MEASUREMENT SHEET - FILTER FEED TANK

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
8	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	100	Cum	60.71	6.08	MT
9	Fabrication work in Frame and Grating for Access						
	FFT	2	1.20	0.70		1.68	Sqm
10	Removing excess excavated material out of site						
	FFT	1	7.10	7.10	3.00	151.23	Cum
	soling, PCC, Raft volume					48.12	Cum
	Total Volume					199.35	Cum
	bulkage @ 40%					279.09	Cum
11	Refilling and compaction						
	Total Excavation					328.66	Cum
	Deduction for tank volume, soling, PCC, Raft					199.35	Cum
	Refilling and compaction volume					129.31	Cum
12	Dewatering						
	25 Days x 4 hours/day	days	25	hours/day	4	100	Hrs

MEASUREMENT SHEET - FILTER PLATFORM

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	FILTER PLATFORM						
1	Excavation				0.55		
A	0.0 to 1.5 m	1	9.2	5.60	0.55	28.34	Cum
	soil					7.09	Cum
	Murum					7.09	Cum
	Soft rock					7.09	Cum
	hard rock					7.09	Cum
2	Soling						
	Filter Platform	1	9.00	5.40	0.30	14.58	Cum
3	PCC M20						
	Filter Platform	1	8.60	5.00	0.10	4.3	Cum
4	Raft M30						
	Filter Platform	1	8.40	4.80	0.15	6.05	Cum
5	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	80	Cum	6.05	0.49	MT
6	Removing excess excavated material out of site						
	soling and PCC volume					18.88	Cum
	Total Volume					18.88	Cum
	bulkage @ 40%					26.44	Cum
7	Refilling and compaction						
	Total Excavation					28.34	Cum
	Deduction for tank volume, soling, PCC, Raft					18.88	Cum
	Refilling and compaction volume					9.46	Cum

MEASUREMENT SHEET - ELECTROMECHANICAL WORKS

Sr. No.	Item Description	Nos.	Unit
1	Screen (Manual) of size 1.8 m length x 0.5 m width of SS 304 MOC and Manual hand rake for cleaning screen of SS handle 1 m in length and cleaning area of 6 nos 5 mm SS rod of total length 200 mm straight and 50 mm of 90 degree bend.	1	No
2	Grit pump Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION - Pumps, Page no. 6, 7 of size 1.8 m length x 0.5 m width of SS304 MOC 1 HP (Up to 9000 LPH)	1	No
3	Raw Sewage Pumps Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION - Pumps, Page no. 6, 7 15 HP (Up to 132000 LPH)	2	Nos
4	TTU Feed pumps Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION - Pumps, Page no. 6, 7 15 HP (Up to 132000 LPH)	2	Nos
5	Pressure Sand Filter of FRP / MSEP vessel with suitable thickness to withstand a water pressure including MPV or 5 Valve system and PVC / UPVC / MSEP interconnecting and underdrain piping including fittings, with standard filter media layer with minimum depth of filter sand 1.0 m supported by gravels. The piping arrangement should provide sufficient pressure for backwash operations and avoid loss of sand during backwash operation. Suitable openings to be provided to ease addition and removal the media. Dia 1.6 m x 2 m minimum height	4	Nos
6	Activated Carbon Filter of FRP / MSEP vessel with suitable thickness to withstand a water pressure including MPV or 5 Valve system and PVC / UPVC / MSEP interconnecting and underdrain piping including fittings, with standard filter media layer with minimum depth of Activated Carbon 1.0 m supported by gravels. The piping arrangement should provide sufficient pressure for backwash operations and avoid loss of Activated carbon during backwash operation. Suitable openings to be provided to ease addition and removal the media. Dia 1.6 m x 2 m minimum height	4	Nos
7	PurAll Tablet Chlorinator + cartridge	0	nos

MEASUREMENT SHEET - ELECTROMECHANICAL WORKS

Sr. No.	Item Description	Nos.	Unit
7	NaOCl Chlorinator Pump Diaphragm Type / peristaltic type / Solenoid Max Flow Rate Upto 10LPH Power Source Electric Phase Single Material PP / PTFE(Teflon) Voltage 230 Volt Frequency 50Hz		
a	Mixing Tank of 100 Ltrs capacity	1	Nos
b	Dosing Pump	2	Nos
8	Control Panel		
	Design, Supply, Installing, Commissioning & Testing of Master PLC control monitoring and communication panel as per IEC 61131 at Pure Water Sump suitable for monitoring and control of pure water Pumps. Pressure Transmitters, Level Transmitter, PH Transmitter, Turbidity Transmitter ,for all pumps installed.		
	Master PLC Panel	1	No
	MJP/ MECH/ ELECT / SSR/ 2021-22/ SECTION 19 - SA [SCADA & AUTOMATION] Item no. 2.7 Page no. 72		
9	Supplying and erecting Fully Automatic Star Delta starter to operate squirrel cage induction motor working on 380- 440 Volt, 3 phase, 50 Hz with no volt coil, over load element, and ON - OFF push buttons, with necessary material and connected to supply, etc complete. Starter with original sheet steel encloser.		
	> 12.5 HP & Up to 20 HP	6	nos
	1 nos extra starter considered as spare.		
	MJP /MECH/ ELECT/ SSR/ 2021-22 SECTION 10 - LG [L.T. SWITCHGEAR AND PROTECTION] Item no. LG 3 Page no. 27		
10	Main power supply cable		
	3 core PVC insulated, PVC sheathed copper conductor flat submersible cable		
	Supplying and erecting, Flat flexible submersible cable with, Copper Conductor, PVC insulated, and PVC sheathed.		
	3 core 16 sq mm	40	m
11	Power cables		
	Aluminium conductor 4 Core, XLPE / PVC insulated & armoured cable		
	Supplying and erecting, XLPE / PVC insulated, armoured cable 1100 V grade with ISI mark Four core, solid / stranded aluminium conductor with 6 mm thick 25 mm width M.S. spacer with G.I. Earth wire 6 sq mm, complete erected on wall / on pole with 25 X 3 mm M.S. clamps or in provided trench in an approved manner.		
	4 Core 6 sq mm	200	m
	MJP MECH/ ELECT/ SSR/ 2021-22 SECTION 12 - CB [L.T. CABLE] Item no. CB 6 Page no. 35		
12	Control Cables		
	Copper conductor PVC insulated, Unarmoured control cable		

MEASUREMENT SHEET - ELECTROMECHANICAL WORKS

Sr. No.	Item Description	Nos.	Unit
	Supplying and erecting Un-armoured control cable with ISI mark stranded / solid copper conductor 1.1 kV grade complete erected on wall / panel or in provided trench in an approved manner.		
	4 core 2.5 sq mm	200	m
	MJP MECH/ ELECT/ SSR/ 2021-22/ SECTION 12 - CB [L.T. CABLE] Item no. CB 8-2 Page no. 36		

MEASUREMENT SHEET - PLUMBING

Sr. No.	Item Description	Nos.	L (m)	B (m)	Quantity	Unit
	Providing and supplying in standard lengths ISI mark rigid unplasticised PVC pipes suitable for potable water with solvent cement joints including cost of couplers, as per IS specification no. 4985 / 1988 excluding GST levied by GOI and GOM in all respect, including transportation, freight charges, inspection charges, loading, unloading, conveyance to the departmental stores and stacking the same in closed shed duly protected from sun rays and rains including cost of jointing material i.e. solvent cement, etc. complete (selffit type to be jointed with cement solvent).					
	1) 10% of cost of pipes shall be considered for cost of PVC specials for estimate purpose only. 2) One coupler and required cement solvent shall be provided with each full length pipe cost of which is included in rates below.					
	MJP/ SSR/ 2021-22 / SECTION – I(II) P.V.C. PIPES,					
1	Raw Sewage pump to TBF Distribution					
a	Main header	Dia	200			
	200 mm.	1	85		85	m
	PVC Specials- 10%					
b	Distribution					
	140 mm.	1	120		120	m
	PVC Specials- 10%					
2	TBF collection to FFT (gravity)					
a	Main header					
	140 mm.	1	230		230	m
	PVC Specials- 10%					
b	collection tributary					
	75 mm.	1	55		55	m
	PVC Specials- 10%					
3	TTU Plumbing	Dia	180			
	180 mm.	1	35		35	m
	PVC Specials- 10%					
4	TBF distribution			No. of beds		
	75 mm.	1	5	30	150	m
	PVC Specials- 10%					
5	Labour	Nos	Days			
	Plumber	4	10		40	days
	Helper	10	10		100	days
6	Sluice valves					

MEASUREMENT SHEET - PLUMBING

Sr. No.	Item Description	Nos.	L (m)	B (m)	Quantity	Unit
	Providing double flange sluice valve confirming for IS- 14846 including worn gear arrangements as per test pressure, stainless steel spindle, caps, including inspection charges, transportation upto departmental store, unloading, stacking excluding GST levied by GOI & GOM in all respect etc. complete.					
	MJP/ SSR/ 2021-22 / SECTION - I(XII) : PIPES APPURTENANCES , Page no. 132					
	Raw Sewage pump					
	200 mm.	2			2	Nos
	Filter Feed Pump					
	200 mm.	2			2	Nos
7	Reflux valves (non-return valves)					
	Providing and supplying ISI mark CI D/F reflux valves (non-return valves) of following dia including railway freight, inspection charges, unloading from railway wagon, loading into truck, transportation upto departmental stores, unloading, stacking excluding GST levied by GOI & GOM in all respect etc. complete. Reflux valves as per I.S.5312 Part I (1984)					
	MJP/ SSR/ 2021-22 / SECTION - I(XII) : PIPES APPURTENANCES , Page no. 131					
	Raw Sewage pump					
	200 mm.	2			2	Nos
	Filter Feed Pump					
	200 mm.	2			2	Nos

PROJECT NAME :
 1500 KLD SEWAGE TREATMENT PLANT
 BASED ON TIGER BIO FILTER
 TECHNOLOGY.

NOTES

- All dimensions are in 'mm' unless mentioned otherwise.
- All dimensions are checked and co-related with the design and structural drawings and any discrepancy or omission shall be brought to the notice.
- All inner dimensions are including plastering in structural drawings unless otherwise mentioned.
- The structural component and BOQ prepared considering Finished Ground Level (+ve 000) and Existing Ground Level (+00.00). Temporary Bench Mark 1 (pax 000) kept on the Top level of Road on North East side of the site.
- BIS Grade Cement to be used for all concrete and plastering applications.
- All water treatment structure to be checked for water leakages.
- This drawing should be read in conjunction with relevant detailed Design and Structural drawings. All dimensions shall be verified on site prior to commencement of work.
- This Drawing is the property of TBE Environmental Solutions Pvt. Ltd. It is not to be copied or produced or handed over to third party or used for any other purpose other than which it is intended. This drawing together with any copies made by the recipient shall be returned on demand to us.

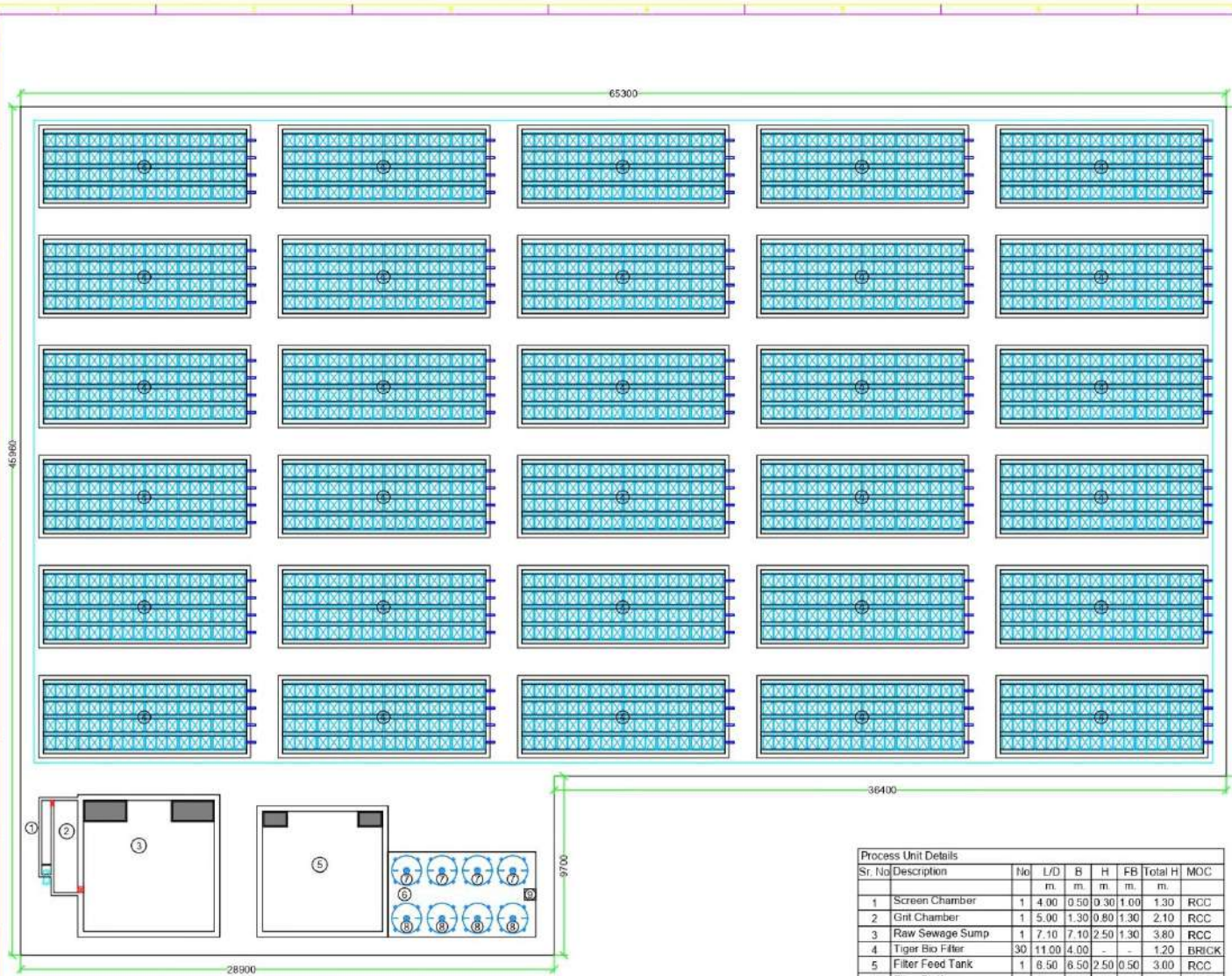
REVISION		
DATE	REMARKS	SIGNATURE

CLIENT : SWSM, MAHARASHTRA

DRAWING NAME :
 PLANT LAYOUT

PROJECT CODE : TBF-	DRAWING NO : D-01/PLD/1	DATE : JUNE-2021
DRAWN BY : L.D.B.	CHECKED BY : S.B.	SCALE : NTS.

TBE
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PLANT LAYOUT
 AREA = 2648 SQM.

Process Unit Details								
Sr. No	Description	No	L/D	B	H	FB	Total H	MOC
			m.	m.	m.	m.	m.	
1	Screen Chamber	1	4.00	0.50	0.30	1.00	1.30	RCC
2	Grit Chamber	1	5.00	1.30	0.80	1.30	2.10	RCC
3	Raw Sewage Sump	1	7.10	7.10	2.50	1.30	3.80	RCC
4	Tiger Bio Filter	30	11.00	4.00	-	-	1.20	BRICK
5	Filter Feed Tank	1	6.50	6.50	2.50	0.50	3.00	RCC
6	Filter Platform	1	8.00	4.40	-	-	-	RCC
7	Pressure Sand Filter	4	DIA	1.60	-	-	2.00	MSEF
8	Activated Carbon Filter	4	DIA	1.60	-	-	2.00	MSEF
9	Chlorination Unit	1	-	-	-	-	-	-

PROJECT NAME :
1500 KLD SEWAGE TREATMENT PLANT
BASED ON TIGER BIO FILTER
TECHNOLOGY.

NOTES

1. All dimensions are in 'mm' unless mentioned otherwise.
2. All dimensions are checked and co-related with the design and structural drawings and any discrepancy or omission shall be brought to the notice.
3. All linear dimensions are including plastering in structural drawings unless otherwise mentioned.
4. The structural component and BOQ prepared considering Finished Ground Level (+100.00) and Existing Ground Level (+00.00). Temporary Bench Mark 1 (xxx.000) Kept on the Top level of Road on North East side of the site.
5. BIS Grade Cement to be used for all concrete and plastering applications.
6. All water treatment structure to be checked for water leakages.
7. This drawing should be read in conjunction with relevant detailed Design and Structural drawings. All dimensions shall be verified on site prior to commencement of work.
8. This Drawing is the property of TBF Environmental Solutions Pvt. Ltd. It is not to be copied or produced or handed over to third party or used for any other purpose other than which it is intended. This drawing together with any copies made by the recipient shall be returned on demand to us.

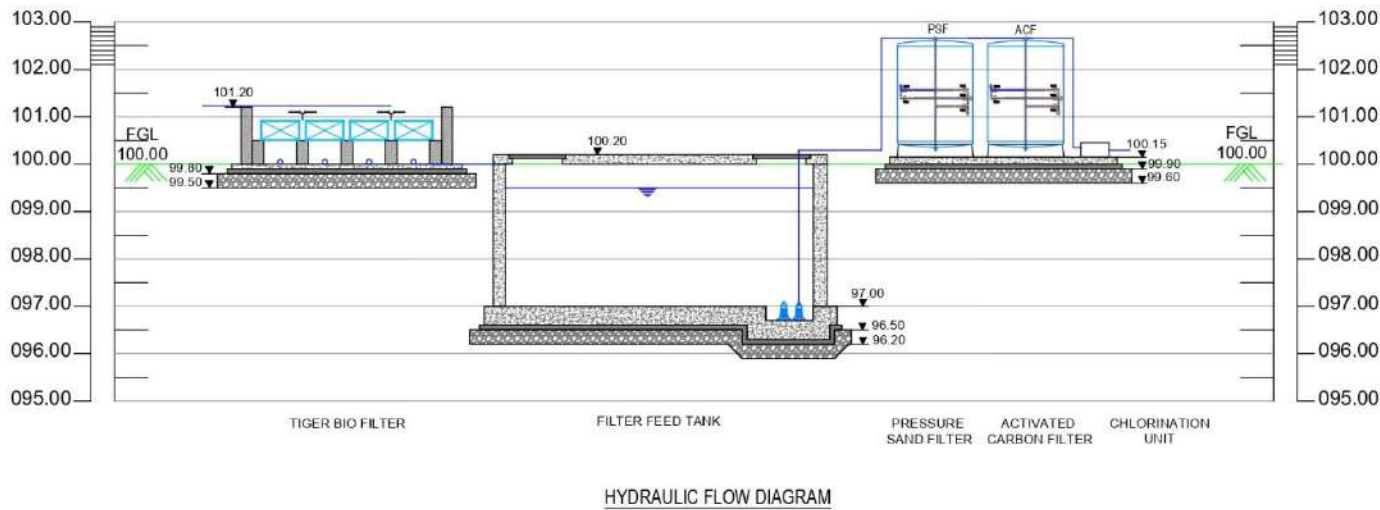
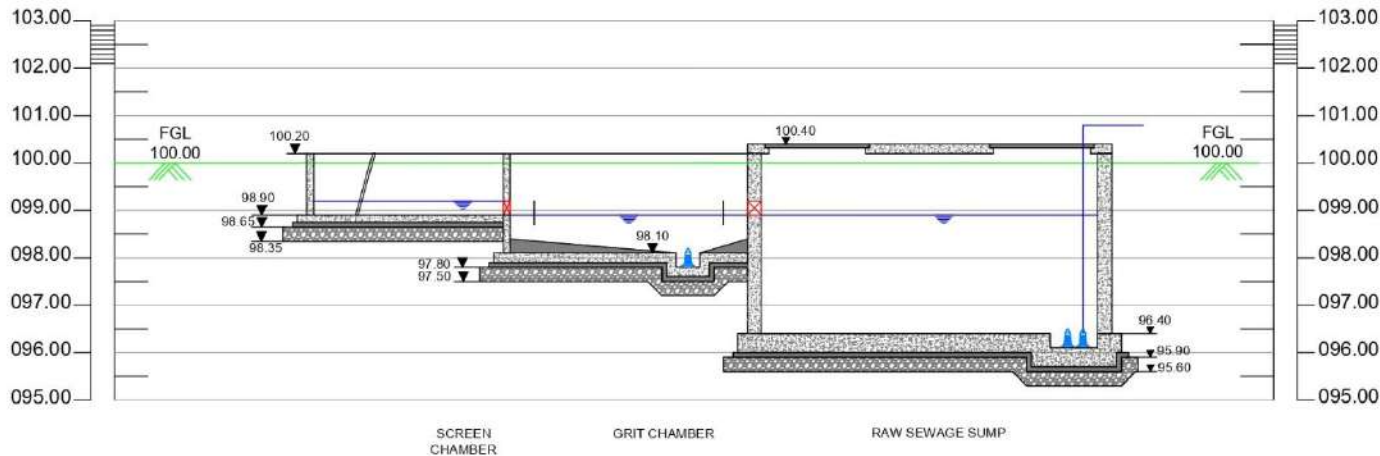
REVISION		
DATE	REMARKS	SIGNATURE

CLIENT : SWSM, MAHARASHTRA

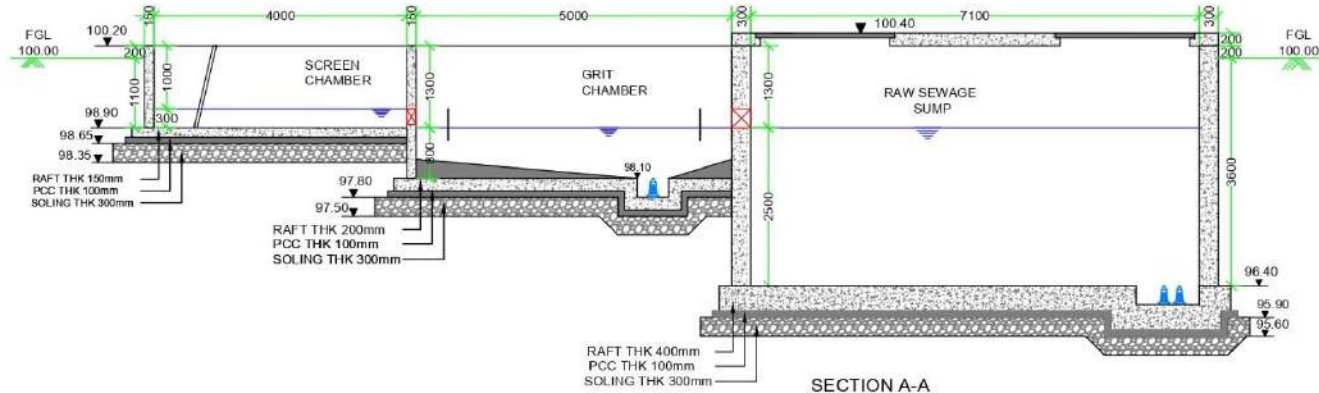
DRAWING NAME :
HYDRAULIC FLOW DIAGRAM

PROJECT CODE : TBF-	DRAWING NO : D-02/HFD/01	DATE : JUNE-2021
DRAWN BY : L.D.B.	CHECKED BY : S.B.	SCALE : NTS.

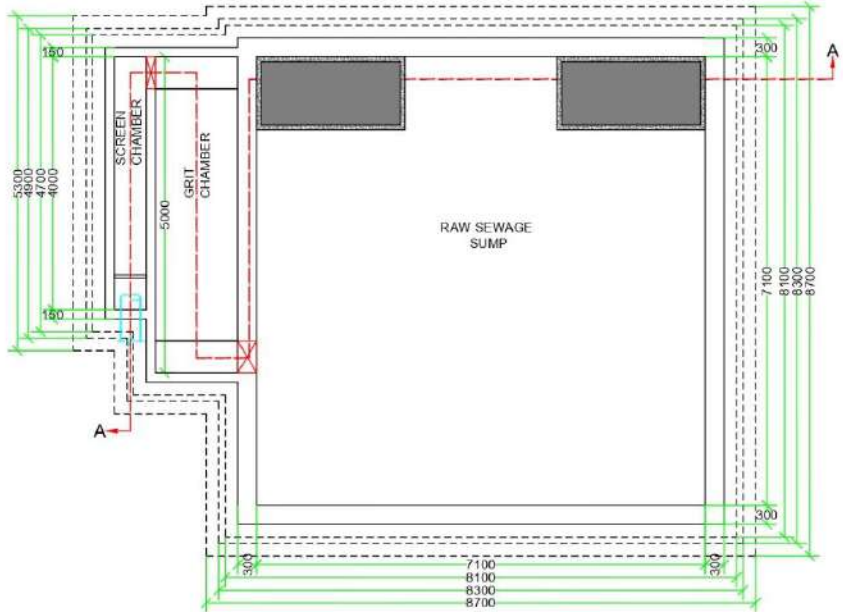
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Web : www.tbfenvironmental.in



HYDRAULIC FLOW DIAGRAM



SECTION A-A



PLAN

SCREEN CHAMBER, GRIT CHAMBER & RAW SEWAGE SUMP

PROJECT NAME :
1500 KLD SEWAGE TREATMENT PLANT
BASED ON TIGER BIO FILTER
TECHNOLOGY.

- NOTES**
1. All dimensions are in 'mm' unless mentioned otherwise.
 2. All dimensions are checked and co-related with the design and structural drawings and any discrepancy or omission shall be brought to the notice.
 3. All layer dimensions are including plastering in structural drawings unless otherwise mentioned.
 4. The structural component and BOQ prepared considering Finished Ground Level (+00.00) and Existing Ground Level (+00.00). Temporary Bench Mark 1 (xxx.000) Kept on the Top level of Road on North East side of the site.
 5. BIS Grade Cement to be used for all concrete and plastering applications.
 6. All water treatment structure to be checked for water leakages.
 7. This drawing should be read in conjunction with relevant detailed Design and Structural drawings. All dimensions shall be verified on site prior to commencement of work.
 8. This Drawing is the property of TBF Environmental Solutions Pvt. Ltd. It is not to be copied or produced or handed over to third party or used for any other purpose other than which it is intended. This drawing together with any copies made by the recipient shall be returned on demand to us.

REVISION		
DATE	REMARKS	SIGNATURE

CLIENT : SWSM, MAHARASHTRA

DRAWING NAME :
SCREEN CHAMBER, GRIT CHAMBER
& RAW SEWAGE SUMP

PROJECT CODE : TBF-	DRAWING NO : D.03/SC,GC&RS/S4	DATE : JUNE-2021
DRAWN BY : L.D.B.	CHECKED BY : S.B.	SCALE : NTS.



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 Email : info@tbfenvironmental.in
 Web : www.tbfenvironmental.in

PROJECT NAME :
 1500 KLD SEWAGE TREATMENT PLANT
 BASED ON TIGER BIO FILTER
 TECHNOLOGY.

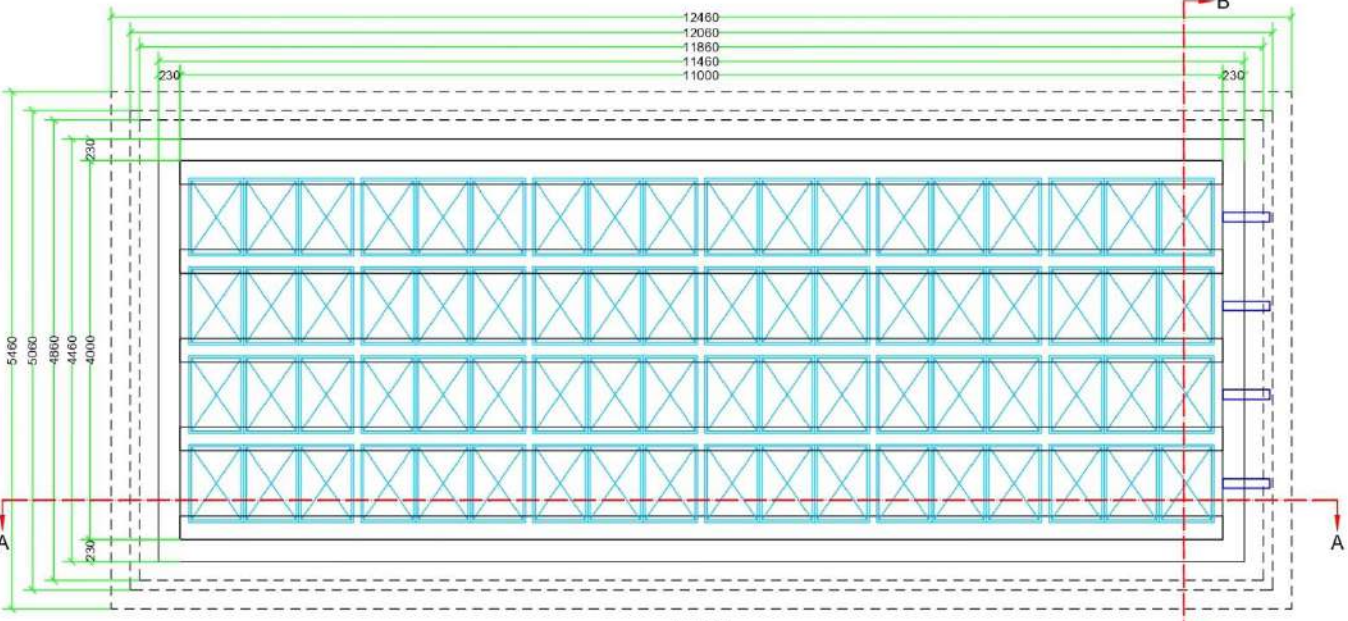
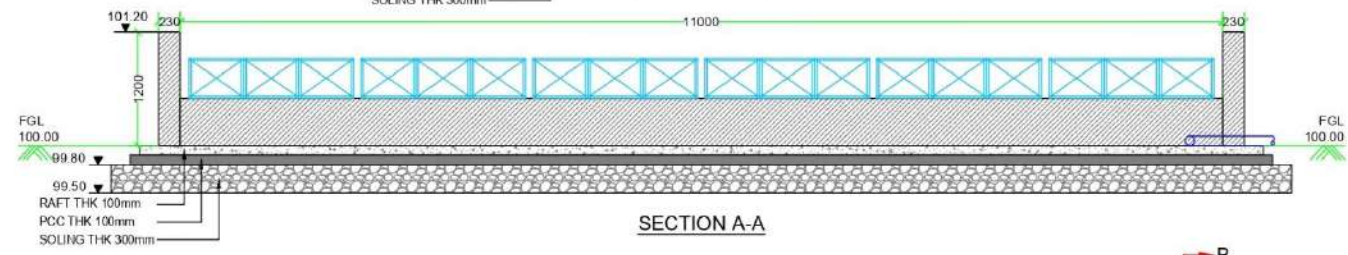
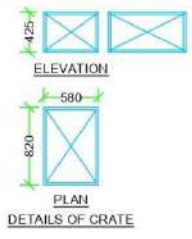
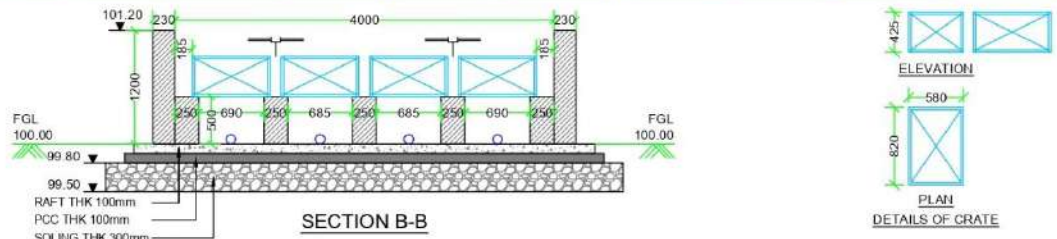
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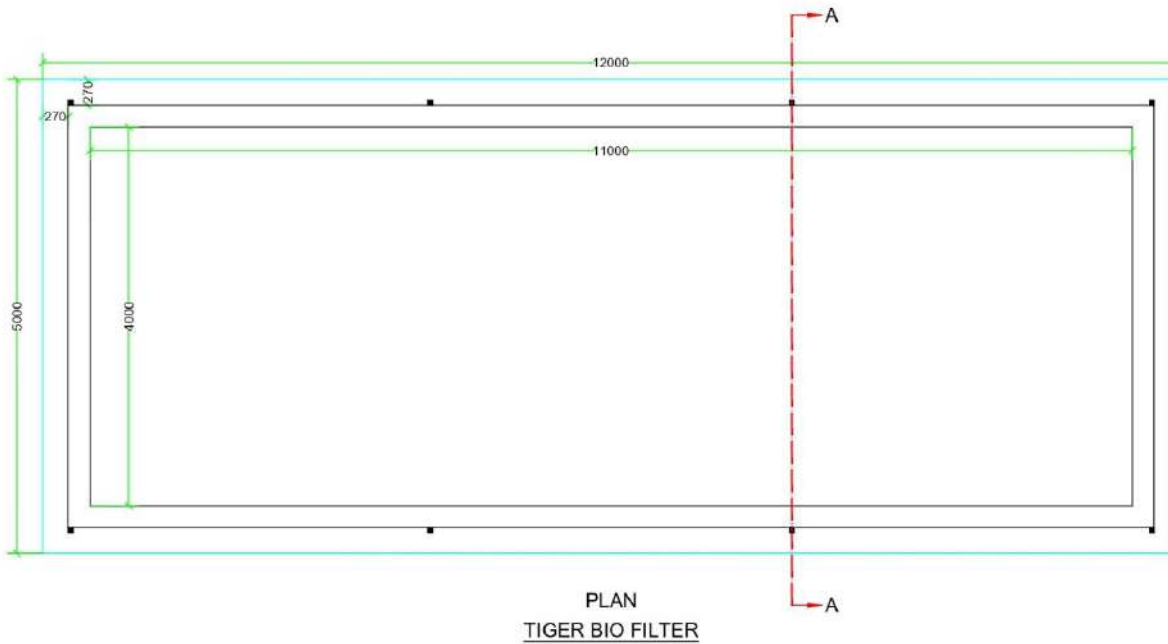
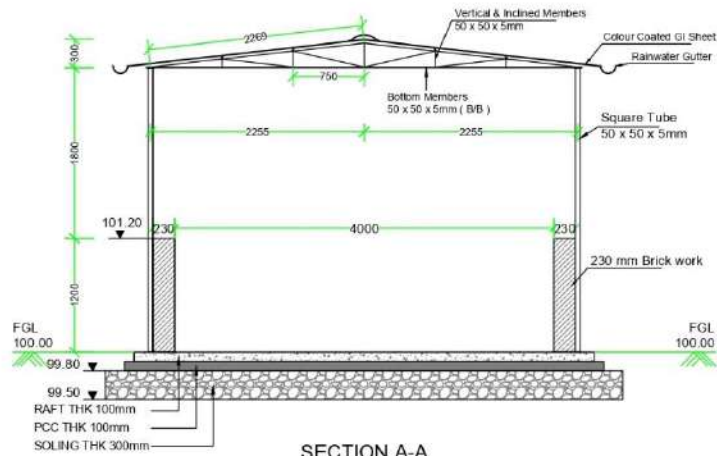
CLIENT : SWSM, MAHARASHTRA
 DRAWING NAME :
 TIGER BIO FILTER

PROJECT CODE : TBF-	DRAWING NO : D-04/TBF/01	DATE : JUNE 2021
DRAWN BY : L.D.B.	CHECKED BY : S.B.	SCALE : NTS.

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 Maharashtra, India. Web. www.tbfenvironmental.in



PLAN
 TIGER BIO FILTER



PROJECT NAME :
1500 KLD SEWAGE TREATMENT PLANT
BASED ON TIGER BIO FILTER
TECHNOLOGY.

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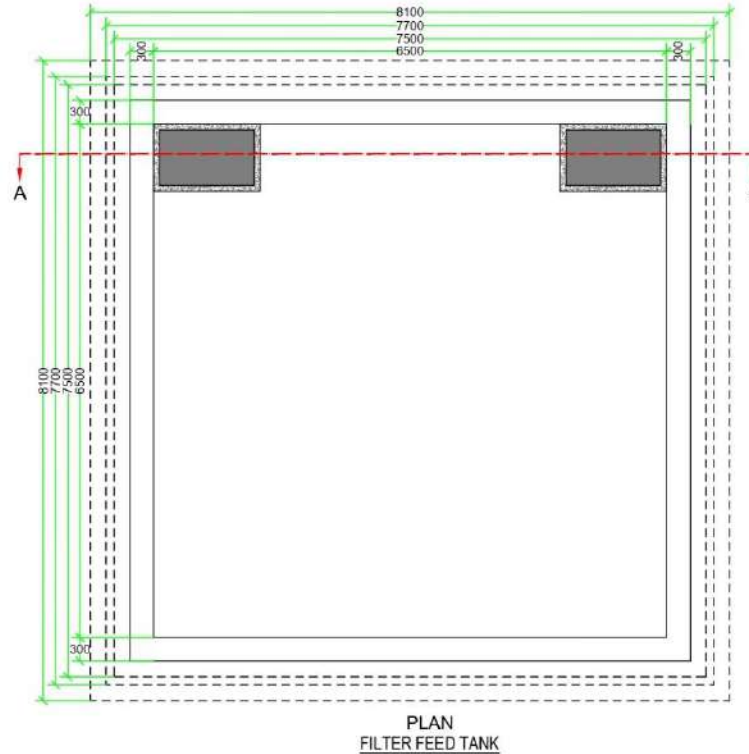
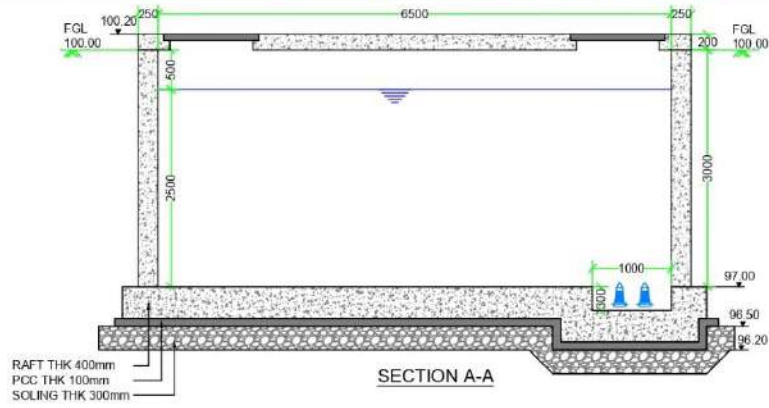
CLIENT : SWSM, MAHARASHTRA

DRAWING NAME:

TIGER BIO FILTER

PROJECT CODE : TBF-	DRAWING NO : D-04/TBF/02	DATE : JUNE-2021
DRAWN BY : L.D.B.	CHECKED BY : S.B.	SCALE : NTS.

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PROJECT NAME :

1500 KLD SEWAGE TREATMENT PLANT
BASED ON TIGER BIO FILTER
TECHNOLOGY.

NOTES

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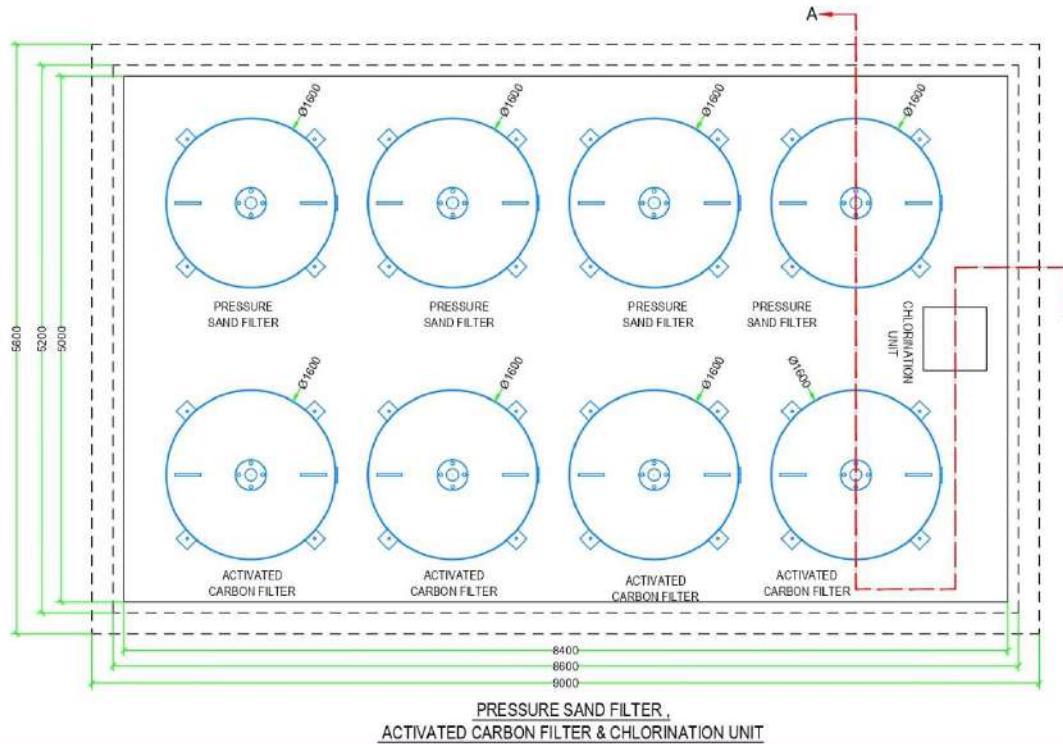
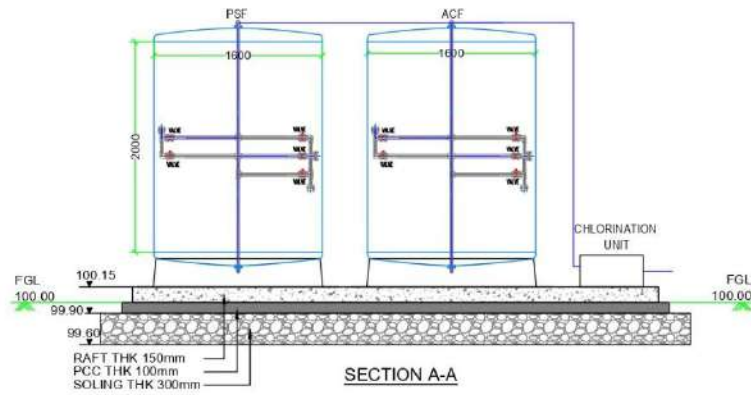
CLIENT : SWSM, MAHARASHTRA

DRAWING NAME:

FILTER FEED TANK

PROJECT CODE : TBF-	DRAWING NO : D-05/FF TAD1	DATE : JUNE-2021
DRAWN BY : L.D.B.	CHECKED BY : S.B.	SCALE : NTS.


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PROJECT NAME :
1500 KLD SEWAGE TREATMENT PLANT
BASED ON TIGER BIO FILTER
TECHNOLOGY.

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 - The structural component and BOQ prepared considering Finished Ground Level (+100.00) and Existing Ground Level (+99.90). Temporary Bench Mark 1 (xxx.000) Kept on the Top level of Road on North East side of the site.
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REVISION		
DATE	REMARKS	SIGNATURE

CLIENT : SWSM, MAHARASHTRA		
DRAWING NAME : PRESSURE SAND FILTER, ACTIVATED CARBON FILTER & CHLORINATION UNIT		
PROJECT CODE : TBF-	DRAWING NO : D-06PSF,ACF&CU01	DATE : JUNE-2021
DRAWN BY : L.D.B.	CHECKED BY : S.B.	SCALE : NTS.
TBF ENVIRONMENTAL SOLUTIONS PVT. LTD. C-3, 304 B, Saudamini Complex Shrushti Colony, Paud Road, Kothrud, Pune - 411038 Maharashtra, India.		
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**1750 KLD STP
BASED ON TBF TECHNOLOGY**

PROCESS CALCULATIONS
TIGER BIO FILTER OF 1750 KLD CAPACITY

Design flow	=	1750.00	KLD
	=	1.750	MLD
Peak flow factor	=	3.00	
1 SCREEN CHANNELS: MANUAL			
No. of Manual Screen	=	1	No.
Average Flow	=	1.75	MLD
Peak Flow Factor	=	3.00	
Design Flow	=	Peak Flow	
	=	5.25	MLD
	=	218.75	m ³ /hr
	=	0.061	m ³ /sec
Average Flow	=	1.75	MLD
	=	72.917	m ³ /hr
	=	0.020	m ³ /sec
Design Flow in each Screen	=	0.061	m ³ /sec
		1	No.
	=	0.061	m ³ /sec
Average Flow in each Screen	=	0.020	m ³ /sec
		1	No.
	=	0.020	m ³ /sec
Maximum Velocity through Screen at Peak Flow	=	1.2	m/sec
Minimum Velocity through Screen at Average Flow	=	0.6	m/sec
Clear Area of Opening through Screen for Peak Flow	=	0.061	m ³ /sec
		1.2	m/sec
	=	0.051	m ²
Clear Area of Opening through Screen for Average Flow	=	0.020	m ³ /sec
		0.6	m/sec
	=	0.033	m ²
Considering maximum Area of Opening through Screen	=	0.051	m ²
Clear Spacing of Bars	=	10	mm

Thickness of Bars	=	5	mm	
Gross Area of Screen	=	$0.051 \times (10+5) / 10$		
	=	0.077	m ²	
Assuming Depth of Screen Channel	=	300.00	mm	
Gross Width of Screen	=	$0.077 / 0.3$		
	=	0.257	m	
No. of Bars	=	$(\text{Gross Width of Screen} / \text{Center to Center Spacing of Bars}) - 1$		
	=	$0.2566666666666667 / ((10+5) / 1000) - 1$		
	=	16.1	Nos.	
Say	=	17	Nos.	
Width of Screen provided	=	$(\text{Number of Bars} + 1) \times \text{Clear Spacing} + (\text{Number of Bars} \times \text{Bar Thickness})$		
	=	$(17+1) \times 10 + (17 \times 5)$		
	=	265	mm	
Width Say	=	0.50	m	
Liquid Depth of Screen Channel provided	=	0.30	m	
L:B	=	10.00		
Length of Screen Channel provided	=	5.00	m	
Freeboard provided	=	1.00	m	Invert Dep of incomin sewer
Total Depth of Screen Chamber	=	1.30	m	
Velocity in Channel at Average Flow	=	$\text{Average Flow} / \text{Cross Sectional Area of Screen Channel}$		
	=	$0.02 / ((0.5 \times 0.3) / 1000 \times 1000)$		
	=	0.133	m/sec	
	>	0.300	m/sec	
Head Loss across Screen				
Head Loss across Screen	=	$0.0728 (V^2 - v^2)$		
V = Velocity through Screen at Peak Flow	=	$\text{Peak Flow through Screen Channel} / \text{Clear Area of Opening through Screen}$		
	=	1.130	m/sec	
v = Velocity in approach Channel at Peak Flow	=	$\text{Peak Flow through Screen Channel} / \text{Cross Sectional Area of Screen Channel}$		
	=	0.8	m/sec	
Head Loss across Screen at Peak Flow	=	0.047	m	
Head Loss across Screen at 50% Clogged Condition				
Velocity through Screen at 50% Clogged Condition at Peak Flow	=	2.259	m/sec	
Head Loss across screen at 50% Clogged Condition at Peak Flow	=	0.326	m	
	>	0.300	m/sec	OK

2 CONVENTIONAL GRIT CHAMBER: MANUAL

No. of Grit Chamber	=	1	
Average Flow	=	1.75	MLD

Peak Flow Factor	=	3.00	
Design Flow	=	Peak Flow	
Peak Flow	=	5.25	MLD
	=	5250	m ³ /day
	=	219	m ³ /hr
	=	0.061	m ³ /sec
Design Flow to each Grit Chamber	=	5250/1	
	=	5250	m ³ /day
	=	219	m ³ /hr
	=	0.061	m ³ /sec
According to CPHEEO Manual			
Particle Size	=	0.15	mm
Specific Gravity	=	2.65	
Surface Overflow Rate for 100% removal efficiency in an ideal Grit Chamber	=	Settling Velocity of the minimum size of Particles to be removed	
	=	1.5	m/s
	=	1296	m ³ /m ² /day
Considering Efficiency of removal of desired Particles, $\eta = 75\%$	=	75%	
and Measure of Settling Basin Performance, $n = 1/8$ for very good performance	=	0.125	
Design Overflow Rate	=	857	m ³ /m ² /day
Surface Overflow Rate for 0.15 mm dia. Particle Size with Specific Gravity $S_s > 2.65$ Table 5.6	=	1555	m ³ /m ² /day
Considering Design Overflow Rate	=	960	m ³ /m ² /day
Area of Grit Chamber required	=	5250	m ³ /day
		960	m ³ /m ² /day
	=	5.47	m ²
L:B ratio	=	4	
Length of Chamber provided	=	6.00	m
Width of Chamber provided	=	1.20	m
Hydraulic Retention Time (HRT) in Grit Chamber at Peak Flow	=	60	sec
Volume of Grit Chamber required	=	0.061x60	
	=	3.66	m ³
Depth required in Grit Chamber	=	3.66 / (6x1.2)	
	=	0.51	m
Say	=	0.60	m
Grit Storage Depth	=	0.30	m
Total Liquid Depth required	=	0.90	m

Length of Grit Pit	=	0.50	m
Width of Grit Pit	=	0.50	m
Depth of Grit Pit	=	0.30	m
Free Board	=	1.30	m

3 RAW SEWAGE SUMP (WET WELL)

No. of Units	=	1	No.
Average Flow	=	1.75	MLD
	=	72.917	m ³ /hr
	=	0.0203	m ³ /sec

Peak Flow Factor	=	3.00	
------------------	---	------	--

Design Flow	=	Peak Flow	
	=	5.25	MLD
	=	219	m ³ /hr
	=	0.061	m ³ /sec

Hydraulic Retention Time (HRT) at Average Flow	=	120	min
--	---	------------	-----

Volume required	=	0.0203 x 120 x 60	
	=	146	m ³

Hydraulic Retention Time (HRT) at Peak Flow	=	Volume / Average Flow	
	=	40	min
	<	30	min

Total Volume of Wet Well	=	146	m ³
--------------------------	---	-----	----------------

Side Water Depth (SWD) provided	=	3.00	m
Plan Area of Wet Well	=	48.72	m ²
Length/width of Sump required	=	6.98	m
Length/width of Sump provided	=	7.00	m
Volume of Sump provided	=	147.00	m ³
Length of Pump Pit	=	2.00	m
Width of Pump Pit	=	0.80	m
Depth of Pump Pit	=	0.30	m
Free Board	=	1.30	m

3.1 DESIGN STATEMENT-RSS E&M

Design Considerations

Design flow	=	1.75	MLD
	=	1750.00	Cum/Day
Peak flow factor	=	3.00	

Pumping machinery

Friction factor for Fittings in Pressure Mains			
Elbow 90 degrees	=	35	

Friction Factor for each	=	1		
Friction factor for all	=	35		
Elbow 45 degrees	=	0		
Friction Factor for each	=	0.75		
Friction factor for all	=	0		
Elbow 22 degrees	=	0		
Friction Factor for each	=	0.5		
Friction factor for all	=	0		
Tee 90 degrees	=	0		
Friction Factor for each	=	1.5		
Friction factor for all	=	0		
Tee in straight pipe	=	20		
Friction Factor for each	=	0.3		
Friction factor for all	=	6		
Gate valve open	=	1		
Friction Factor for each	=	0.4		
Friction factor for all	=	0.4		
Swing check	=	1		
Friction Factor for each	=	2.5		
Friction factor for all	=	2.5		
Total friction factor	=	43.9		
Stage		low	ave	peak
Average flow, cum / day	=		1750.00	
Proportion	=	0.6	1	2
Design flow, cum / day	=	1050	1750	3500
Hazen Williams C	=	140	140	140
Desired velocity, m/s	=	0.6	1.0	1.5
Number of Pumping hours	=	16.0	16.0	16.0
Area needed, sqm	=	0.0304	0.0304	0.0405
Dia needed, m	=	0.197	0.197	0.227
Dia needed, mm	=	197	197	227
Dia provided, mm (User)	=	225	225	225
Radius, m	=	0.113	0.113	0.113
Radius power 0.63	=	0.252	0.252	0.252
S power 0.54	=	0.020	0.033	0.050
S	=	0.001	0.002	0.004
Slope 1 in	=	1398.1	542.9	256.2
length, m	=	95	95	95
Friction in pipeline, m	=	0.1	0.2	0.4
Velocity head, m	=	0.018	0.051	0.115
Friction factor in fittings	=	43.9	43.9	43.9
Friction in fittings, m	=	0.8	2.2	5.0
Static lift, m	=	5.0	5.0	5.0
Total head, m	=	5.8	7.2	10.0
Efficiency of pumpset	=	0.8	0.8	0.8
Discharge, lps	=	18.2	30.4	60.8
Discharge, Cum/Hr	=	65.6	109.4	218.8
Kw required	=	2.821	4.705	9.409
HP required	=	4.0	6.5	13.0
Number of Pumps	=	2	2	2

4 TIGER BIO FILTER

DESIGN STATEMENT-TBF1- 50 KLD

Number of pumping hours	=	16	Hrs	
Number of BMF tanks provided	=	35	Nos	
Design flow to each tank	=	50.00	Cum/day	
	=	3.13	Cum/ Hr for 16 Hr	
	=	0.87	lps	
Inlet BOD	=	250.00	mg/l	
Inlet TSS	=	400.00	mg/l	
BOD load applied	=	12.5	kg/day	
BOD uptake rate	=	0.1	Kg of BOD / Kg of worms	(0.5 - 1.0)
Worms required	=	125	Kg worms	
Sewage application rate	=	1.85	Cum/Sqm/day	(1 - 2 Cum/Sqm/d
Area required	=	27.03	Sqm	
Area Provided	=	28	Sqm	
Area of each crate	=	0.4	Sqm	
Number of crates	=	70	Nos	
say	=	72	Nos	
Crate in longitudinal direction	=	18	Nos	
Crate in travers direction	=	4	Nos	
crates provided	=	72	Nos	OK
Width provided	=	4.00	m	
Length required	=	11.00	m	
Depth provided	=	1.2	m	

5 TERTIARY TREATMENT UNIT

Design Considerations

Design flow	=	1.75	MLD	
	=	1750.00	Cum/Day	
Peak flow factor	=	3.00		

5.1 FILTER FEED TANK

Number of FFT provided	=	1	Nos	
Number of operating hours	=	16	Hrs	
Design flow	=	1750.00	Cum/Day	
	=	109.38	Cum/Hr	
	=	0.03038	Cum/Sec	
Hydraulic Retention time	=	60	min	
Volume required	=	109.38	Cum	
Depth	=	3.00	m	
Civil Tanks				
Area	=	36.46	Sqm	
Length/Width required	=	6.04	m	
Length/Width provided	=	6.50	m	
Freeboard provided	=	0.50	m	
Volume Provided		126.75	Cum	

DESIGN STATEMENT-TTU E&M

Design Considerations

Design flow	=	1.75	MLD
	=	1750.00	Cum/Day
Peak flow factor	=	3.00	

Pumping machinery

Friction factor for Fittings in Pressure Mains

Elbow 90 degrees	=	10
Friction Factor for each	=	1
Friction factor for all	=	10
Elbow 45 degrees	=	0
Friction Factor for each	=	0.75
Friction factor for all	=	0
Elbow 22 degrees	=	0
Friction Factor for each	=	0.5
Friction factor for all	=	0
Tee 90 degrees	=	0
Friction Factor for each	=	1.5
Friction factor for all	=	0
Tee in straight pipe	=	10
Friction Factor for each	=	0.3
Friction factor for all	=	3
Gate valve open	=	1
Friction Factor for each	=	0.4
Friction factor for all	=	0.4
Swing check	=	1
Friction Factor for each	=	2.5
Friction factor for all	=	2.5
Total friction factor	=	15.9

Stage		low	ave	peak
Average flow, cum / day	=		1750.00	
Proportion	=	0.6	1	2
Design flow, cum / day	=	1050	1750	3500
Hazen Williams C	=	140	140	140
Desired velocity, m/s	=	0.8	1.0	1.5
Number of Pumping hours	=	16.0	16.0	16.0
Area needed, sqm	=	0.0228	0.0304	0.0405
Dia needed, m	=	0.170	0.197	0.227
Dia needed, mm	=	170	197	227
Dia provided, mm (User)	=	200	200	200
Radius, m	=	0.100	0.100	0.100
Radius power 0.63	=	0.234	0.234	0.234
S power 0.54	=	0.029	0.036	0.054
S	=	0.001	0.002	0.004
Slope 1 in	=	715.3	473.2	223.3
length, m	=	40	40	40
Friction in pipeline, m	=	0.1	0.1	0.2

Velocity head, m	=	0.033	0.051	0.115
Friction factor in fittings	=	15.9	15.9	15.9
Friction in fittings, m	=	0.5	0.8	1.8
Static lift, m	=	12.0	12.0	12.0
Total head, m	=	12.5	12.8	13.8
Efficiency of pumpset	=	0.8	0.8	0.8
Discharge, lps	=	18.2	30.4	60.8
Discharge, Cum/Hr	=	65.6	109.4	218.8
Kw required	=	4.836	8.065	16.130
HP provided	=	6.5	11.0	22.0
Number of Pumps	=	2	2	2

5.2 PRESSURE SAND FILTER

Number of unit provided	=	4	Nos.
Designed @ 16 hrs working for flow of	=	27.34	m ³ /h
Loading rate	=	12.00	m ³ /m ² /h
Area of DMF	=	2.28	m ²
Dia of DMF	=	1.70	m
Provided	=	1.800	m
Backwash water			
Backwash velocity	=	15.00	m/hr
backwash flowrate	=	36.10	m ³ /h
Backwash volume for 20 mins	=	12.03	m ³

5.3 ACTIVATED CARBON FILTER

Number of unit provided	=	4	Nos.
Designed @ 16 hrs working for flow of	=	27.34	m ³ /h
Loading rate	=	12.00	m ³ /m ² /h
Area of ACF	=	2.28	m ²
Dia of ACF	=	1.70	m
Provided	=	1.800	m
Backwash water			
Backwash velocity	=	15.00	m/hr
backwash flowrate	=	36.10	m ³ /h
Backwash volume for 20 mins	=	12.03	m ³

5.4 CHLORINE DOSING SYSTEM NaOCl DOSING SYSTEM

Average Flow	=	109.38	m ³ /hr
Design Chlorine Dosage (Max)	=	3	mg/l
Concentration of Chlorine in commercially available NaOCl	=	10%	
Design NaOCl Dosage	=	30	mg/l
Operating hours	=	16.0	hr

Quantity of NaOCl required 109.375 X 30 X 16 / 1000

	=		
	=	52.50	Kg/day
	=		
Design Strength of NaOCl Solution	=	100%	
Volume of NaOCl Solution	=	$52.5 / (1 \times 1000)$	
	=	0.060	m3
No. of Dosing Tanks provided	=	1	Nos.
Volume of each Dosing Tank	=	$0.06 / 1$	
	=	0.06	m3
	=	100	Litres
	=		
No. of Working NaOCl Dosing Pump provided	=	1	No.
Capacity of each NaOCl Dosing Pump required	=	$\frac{\text{Total Volume of NaOCl Solution}}{\text{(No. of Dosing pumps)}}$	
	=	$0.06 / (1 \times 16)$	
	=	0.004	m3/hr
	=	4.00	LPH
	=		
Capacity of each NaOCl Dosing Pump provided	=	4.00	LPH
No. of Standby NaOCl Dosing Pump provided	=	1	No.

SIZING DETAILS (CIVIL)
TIGER BIO FILTER OF 1750 KLD CAPACITY

S I. N o	Unit name	N o s	Leng th	Widt h	Height			Soling		PCC		Raft		RCC Wall thk	Bric k Wall thk	Slab Thk	Steel - HCR M/ Kg/C
					SW	FB	Tota	offs	Thk	offs	Thk	offs	Thk				
		N	m	m	m	m	m	m	m	m	m	m	m	m	m	m	
1	Screen Chamber	1	5.0	0.5	0.3	1.0	1.3	0.2	0.3	0.1	0.1	0.2	0.1	0.1			80
2	Grit Chamber	1	6.0	1.2	0.9	1.3	2.2	0.2	0.3	0.1	0.1	0.2	0.2	0.1			80
3	Raw Sewage Sump	1	7.0	7.0	3.0	1.3	4.3	0.2	0.3	0.1	0.1	0.2	0.4	0.3		0.2	100
4	TBF Bed 50 KLD	3	11.0	4.0			1.2	0.2	0.3	0.1	0.1	0.2	0.1		0.2		60
5	Filter Feed tank	1	6.5	6.5	3.0	0.5	3.5	0.2	0.3	0.1	0.1	0.2	0.4	0.3		0.2	100
6	Filter Platform	1	8.8	4.8				0.2	0.3	0.1	0.1	0.2	0.1				80

Assumptions

Incoming Sewer Invert 1.0 m Below Ground level

Method of excavation Mechanical means

Underground strata		soil	Muru m	Soft roc	har d	Tota l
0.0 to 1.5 m	=	25	25	25	25	100
1.5 m to 3.0 m	=	25	25	25	25	100
3.0 to 4.5 m	=	25	25	25	25	100
4.5 to 6.0	=	25	25	25	25	100

**TIGER BIO FILTER OF 1750 KLD CAPACITY
BILL OF QUANTITIES**

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
1	Excavation for foundation / pipe trenches in earth, soils of all types, sand, gravel and soft murum, including removing the excavated material upto a distance of 50 metres and lifts as below, stacking and spreading as directed, normal dewatering, preparing the bed for foundation and excluding backfilling, etc. complete. (Bd-A-1/259)				
	0.0 to 1.5 m	416.39	Cum	150.00	62,458.50
	1.5 to 3.0 m	81.34	Cum	164.00	13,339.80
	3.0 to 4.5 m	63.62	Cum	178.00	11,324.40
	4.5 to 6.0 m	12.70	Cum	192.00	2,438.40
	MJP/ SSR/ 2021-22 / Section E / Excavation Item No.1/ Page no. 42				
2	Excavation for foundation / pipe trenches in hard murum and boulders, W.B.M. road including removing the excavated material upto a distance of 50 M beyond the area and lifts as below, stacking and spreading as directed by Engineer-in-charge, normal dewatering, preparing the bed for foundation and excluding backfilling, etc. complete. (Bd-A-3/259)			8.00	
	0.0 to 1.5 m	416.39	Cum	192.00	79,946.90
	1.5 to 3.0 m	81.34	Cum	206.00	16,756.10
	3.0 to 4.5 m	63.62	Cum	220.00	13,996.40
	4.5 to 6.0 m	12.70	Cum	234.00	2,971.80
	MJP/ SSR/ 2021-22/ Section E/ Excavation Item No.3, Page no. 42				
3	Excavation for foundation / pipe trenches in soft rock and old cement and lime masonry foundation asphalt road including removing the excavated material upto a distance of 50 M beyond the area and lifts as below, stacking as directed by Engineer-in-charge, normal dewatering, preparing the bed for foundation and excluding backfilling, etc. complete. (Bd-A- 4/259)				
	0.0 to 1.5 m	416.39	Cum	572.00	238,175.10
	1.5 to 3.0 m	81.34	Cum	597.00	48,560.00
	3.0 to 4.5 m	63.62	Cum	622.00	39,571.70
	4.5 to 6.0 m	12.70	Cum	647.00	8,216.90
	MJP/ SSR/ 2021-22 / Section E/ Excavation Item No.5, Page no. 42				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
4	Excavation for foundation / pipe trenches in hard rock and concrete road by chiselling, wedging, line drilling by mechanical means or by all means other than blasting including trimming and levelling the bed, removing the excavated material upto a distance of 50 metres beyond the area and lifts as below, stacking as directed by Engineer-in-charge, normal dewatering, excluding backfilling, etc. complete by all means. (Bd-A-6/259)				
	0.0 to 1.5 m	416.39	Cum	1,017.00	423,468.70
	1.5 to 3.0 m	81.34	Cum	1,042.00	84,756.30
	3.0 to 4.5 m	63.62	Cum	1,067.00	67,882.60
	4.5 to 6.0 m	12.70	Cum	1,092.00	13,868.40
	MJP/ SSR/ 2021-22 / Section E/ Excavation Item No.7, Page no. 43j				
5	Providing dry trap/ granite/ quartzite/ gneiss, rubble stone soling in 15 cm to 20 cm thick layers including hand packing and compacting, etc. complete. (Bd-A-12/264)	778.58	Cum	1,175.00	914,831.50
	MJP/ SSR/ 2021-22 / Section E/ Excavat				
6	Providing and laying in situ Cement Concrete M- 15 of trap/ granite / quartzite / gneiss metal for foundation and bedding including bailing out water, form work, compaction, curing, etc. complete. (Cement 5.90 bags / cum) Spec. No. - Bd E /1 Page No. 287 and B- 7, Page No. 38	234.15	Cum	5,640.00	1,320,606.00
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.1, Page no.49				
7	Providing and laying in situ Cement Concrete of trap/ granite / quartzite / gneiss metal for RCC work in foundation like raft, grillage, strip foundation and footing of RCC columns and steel stanchions including normal dewatering, form work, compaction, finishing and curing, etc. complete. (By weigh batching and mix design for M250 and M-300 only. Use of L&T, A.C.C., Ambuja, Birla Gold, Manikgad, Rajashree, etc. cement is permitted.) (Excluding M.S. or Tor reinforcement)	259.77	Cum	7,448.00	1,934,767.00
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE/ Item No.2, Page no. 49				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
8	Providing and casting in situ C.C. of trap / granite/ quartzite / gneiss metal of approved quality for RCC works as per detailed drawings and designs or as directed by Engineer-in- charge including normal dewatering, centering, form work, compaction, finishing the formed surfaces with C.M. 1:3 of sufficient minimum thickness to give a smooth and even surface wherever necessary or roughening if special finish is to be provided and curing, etc. complete. (By weigh batching and mix design for M-250 and M-300 only. Use of L&T, A.C.C., Ambuja, Birla Gold, Manikgad, Rajashree, etc. cement is permitted.) (Excluding M.S. or Tor reinforcement)	4.86	Cum	8,624.00	41,912.70
	For Beams / Braces / Lintels In RCC M-300				
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.4, Page no. 50				
9	Providing and casting in situ C.C. of trap / granite/ quartzite / gneiss metal of approved quality for RCC works as per detailed drawings and designs or as directed by Engineer-in- charge including normal dewatering, centering, form work, compaction, finishing the formed surfaces with C.M. 1:3 of sufficient minimum thickness to give a smooth and even surface wherever necessary or roughening if special finish is to be provided and curing, etc. complete. (By weigh batching and mix design for M-250 and M-300 only. Use of L&T, A.C.C., Ambuja, Birla Gold, Manikgad, Rajashree, etc. cement is permitted.) (Excluding M.S. or Tor reinforcement)	20.43	Cum	9,247.00	188,916.30
	Slabs / Landings / Vertical Walls / Waist Slabs / Steps for Staircase In RCC M-300				
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.5, / Page no. 50				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
10	Providing and casting in situ C.C. of trap / granite/ quartzite / gneiss metal of approved quality for RCC works as per detailed drawings and designs or as directed by Engineer-in- charge including normal dewatering, centering, form work, compaction, finishing the formed surfaces with C.M. 1:3 of sufficient minimum thickness to give a smooth and even surface wherever necessary or roughening if special finish is to be provided and curing, etc. complete. (By weigh batching and mix design for M-250 and M-300 only. Use of L&T, A.C.C., Ambuja, Birla Gold, Manikgad, Rajashree, etc. cement is permitted.) (Excluding M.S. or Tor reinforcement)	73.60	Cum	9,218.00	678,444.80
	Chajjas / Parapets / Curtain Walls /Partition Walls / Pardies In RCC M-300				
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.6 / Page no. 51				
11	Providing and fixing in position steel bar reinforcement of various diameters for RCC piles, caps, footings, foundations, slabs, beams, columns, canopies, staircases, newels, chajjas, lintels, pardies, copings, fins, arches, etc. as per detailed designs, drawings and schedules; including cutting, bending, hooking the bars, binding with wires or tack welding and supporting as required, etc. complete (including cost of binding wire). (Bd-F-17/306)				
	c) Corrosion Resistant Steel (Fe 500)	27.67	MT	70,658.00	1,955,106.90
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.8 / Page no. 52				
12	Providing and fixing mild steel grill work for windows/ ventilators of 20 Kg/Sqm. As per drawings including necessary welding and painting with one coat of anticorrosive paint and two coats of oil painting, etc. complete. (Bd-U- 1/537)	18.83	Sqm	1,895.00	35,682.90
	MJP/ SSR/ 2021-22 / SECTION - F : IRON AND STRUCTURAL STEEL WORK Item No.1 / Page				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
13	Providing structural steel work in rolled stanchions fixed with connecting plates or angle cleats as in main and cross beams, hip and jack rafters, purlins connecting to truss members and like as per detailed designs and drawings or as directed by Engineer-in-charge including cutting, fabricating, hoisting, erecting, fixing in position, making riveted / bolted / welded connections and one coat of anticorrosive paint and over it two coats of oil painting, etc. complete. (Bd-C- 3/275)	26.15	MT	71,286.00	1,863,872.30
	MJP/ SSR/ 2021-22 / SECTION - F :: IRON AND STRUCTURAL STEEL WORK Item No.3,				
14	Providing and fixing corrugated galvanised iron sheets of 0.63 mm thick (24B .W .G.) for roofing without wind tiles including fastening with galvanised iron screws and bolts , lead and bitumen washers as per drawing etc. complete. (Weight of 5.5 kg/sq.m.).	2639.00	Sqm	777.00	2,050,503.00
	PWD / SSR 2020-21 / Roofing and Ceiling SSR Item No.38.04 Reference No. Bd.R.5, Page No. 453 Item No.1133, Page no. 224				
15	Providing fly ash brick masonry with conventional / I.S. type bricks in cement mortar 1:6 in superstructure including striking joints, raking out joints, watering and scaffolding etc. Complete	520.45	Cum	6,305.00	3,281,437.30
	PWD / SSR 2020-21 / Brick Masonry SSR Item No.27.13 Reference No. As director by engineer incharge and BDG- 2 and 5 Item No.893, Page no. 190				
16	Providing internal cement plaster 12 mm thick in single coat in cement mortar 1:5 without neeru finish to concrete or brick surfaces, in all positions including scaffolding and curing etc. complete.	2857.75	Sqm	257.00	734,441.80
	PWD / SSR 2020-21 / Plastering and Pointing SSR Item No. 32.03 Reference No. Bd. L.2 Page No. 368 Item No.950, Page no. 201				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
17	Providing rough cast cement plaster externally in two coats to concrete, brick or stone masonry surfaces in all positions with base coat of 12 to 15 mm thick in C.M. 1:4 and rough cast treatment 12 mm thick in proportion 1:11 / 2:3 including scaffolding and fourteen days curing complete.	1662.50	Sqm	529.00	879,462.50
	PWD / SSR 2020-21 / Plastering and Pointing SSR Item No. 32.12 Reference No. Bd.L.8 Page No. 370 Item No.957, Page no. 201				
18	Providing and applying white-wash in two coats on old / new plastered or masonry surfaces and asbestos cement sheets including scaffolding and preparing the surface by brushing and brooming down etc. complete.	1662.50	Sqm	10.00	16,625.00
	PWD / SSR 2020-21 / Colouring SSR Item No. 36.03 Reference No. Bd. P. I Page No. 411				
19	Providing and applying colour-wash of approved colour and shade in one coat to new surface including scaffolding, brushing and brooming down (excluding base coats of white wash) etc. complete.	1662.50	Sqm	8.00	13,300.00
	PWD / SSR 2020-21 / Colouring SSR Item No. 36.04 Reference No. Bd. P.2 Page No. 412				
20	Dewatering the excavated trenches and pools of water in the building trenches / pipeline trenches, well works by using pumps and other devices including disposing off water to safe distance as directed by Engineer-in-charge (including cost of machinery, labour, fuel), etc. complete. (Bd-A-9/261)	240.00	HP/ Hr.	77.00	18,480.00
	MJP/ SSR/ 2021-22 / Section E/ Excava				
21	Refilling the trenches with available excavated stuff with soft material first over pipeline and then hard material in 15 cm layers with all leads and lifts including consolidation, surcharging, etc. complete.	584.47	Cum	84.00	49,095.50
	MJP/ SSR/ 2021-22 / Section E/ Excava				
22	Transportation as per STATEMENT VI Including loading, unloading and stacking Earth (4.8 Cum) lead 15 Km	2395.98	Cum	604.45	1,448,250.20

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
	Electromechanical Items				
23	Screen (Manual) of size 1.8 m length x 0.5 m width of SS 304 MOC and Manual hand rake for cleaning screen of SS handle 1 m in length and cleaning area of 6 nos 5 mm SS rod of total length 200 mm straight and 50 mm of 90 degree bend.	0.90	Sqm	35,000.00	31,500.00
24	Grit pump				
	Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below				
	MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION - Pumps, Page no. 6, 7 of size 1.8 m length				
	1 HP (Up to 9000 LPH)	1.00	No	68,654.00	68,654.00
25	Raw Sewage Pumps				
	Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below				
	MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION -				
	15 HP (Up to 132000 LPH)	2.00	Nos	184,154.00	368,308.00
26	TTU Feed pumps				
	Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below				
	MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION -				
	15 HP (Up to 132000 LPH)	2.00	Nos	184,154.00	368,308.00
27	Pressure Sand Filter of FRP / MSEP vessel with suitable thickness to withstand a water pressure including MPV or 5 Valve system and PVC / UPVC / MSEP interconnecting and underdrain piping including fittings, with standard filter media layer with minimum depth of filter sand 1.0 m supported by gravels. The piping arrangement should provide sufficient pressure for backwash operations and avoid loss of sand during backwash operation. Suitable openings to be provided to ease addition and removal the media.				
	Dia 1.8 m x 2 m minimum height	4.00	Nos	620,000.00	2,480,000.00

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
28	Activated Carbon Filter of FRP / MSEP vessel with suitable thickness to withstand a water pressure including MPV or 5 Valve system and PVC / UPVC / MSEP interconnecting and underdrain piping including fittings, with standard filter media layer with minimum depth of Activated Carbon 1.0 m supported by gravels. The piping arrangement should provide sufficient pressure for backwash operations and avoid loss of Activated carbon during backwash operation. Suitable openings to be provided to ease addition and				
	Dia 1.8 m x 2 m minimum height	4.00	Nos	620,000.00	2,480,000.00
29	NaOCl Chlorinator Pump Diaphragm Type / peristaltic type / Solenoid Max Flow Rate Upto 10LPH Power Source Electric Phase Single Material PP / PTFE(Teflon) Voltage 230 Volt Frequency				
	Mixing Tank of 100 Ltrs capacity	100.00	Ltrs	8.00	800.00
	Dosing Pump	2.00	Nos	15,000.00	30,000.00
30	Control Panel				
	Design, Supply, Installing, Commissioning & Testing of Master PLC control monitoring and communication panel as per IEC 61131 at Pure Water Sump suitable for monitoring and control of pure water Pumps. Pressure Transmitters, Level Transmitter, PH Transmitter, Turbidity Transmitter ,for all pumps installed.	1.00	No	50,041.00	50,041.00
	MJP/ MECH/ ELECT / SSR/ 2021-22/ SECTION 19 - SA [SCADA & AUTOMATION]				
31	Supplying and erecting Fully Automatic Star Delta starter to operate squirrel cage induction motor working on 380- 440 Volt, 3 phase, 50 Hz with no volt coil, over load element, and ON - OFF push buttons, with necessary material and connected to supply, etc complete. Starter with original sheet steel encloser.				
	> 12.5 HP & Up to 20 HP	6.00	nos	8,696.00	52,176.00

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
	MJP /MECH/ ELECT/ SSR/ 2021-22 SECTION 10 - LG [L.T. SWITCHGEAR AND PROTECTION] Item no. LG 3 Page no. 27				
32	Main power supply cable				
	3 core PVC insulated, PVC sheathed copper conductor flat submersible cable				
	Supplying and erecting, Flat flexible submersible cable with, Copper Conductor, PVC insulated, and PVC sheathed.				
	3 core 16 sq mm	40.00	m	549.00	21,960.00
33	Power cables				
	Aluminium conductor 4 Core, XLPE / PVC insulated & armoured cable				
	Supplying and erecting, XLPE / PVC insulated, armoured cable 1100 V grade with ISI mark Four core, solid / stranded aluminium conductor with 6 mm thick 25 mm width M.S. spacer with G.I. Earth wire 6 sq mm, complete erected on wall / on pole with 25 X 3 mm M.S. clamps or in provided trench in an approved				
	4 Core 6 sq mm	220.00	m	137.00	30,140.00
	MJP MECH/ ELECT/ SSR/ 2021-22 SECTION 12 - CB [L.T. CABLE] Item no. CB 6 Page				
34	Control Cables				
	Copper conductor PVC insulated, Unarmoured control cable				
	Supplying and erecting Un-armoured control cable with ISI mark stranded / solid copper conductor 1.1 kV grade complete erected on wall / panel or in provided trench in an approved manner.				
	4 core 2.5 sq mm	220.00	m	137.00	30,140.00
	MJP MECH/ ELECT/ SSR/ 2021-22/ SECTION 12 - CB [L.T. CABLE] Item no. CB 8-				

Plumbing Items					
Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
35	Providing and supplying in standard lengths ISI mark rigid unplasticised PVC pipes suitable for potable water with solvent cement joints including cost of couplers, as per IS specification no. 4985 / 1988 excluding GST levied by GOI and GOM in all respect, including transportation, freight charges, inspection charges, loading, unloading, conveyance to the departmental stores and stacking the same in closed shed duly protected from sun rays and rains including cost of jointing material i.e. solvent cement, etc. complete (selffit type to be jointed with cement solvent).				
	1) 10% of cost of pipes shall be considered for cost of PVC specials for estimate purpose only. 2) One coupler and required cement solvent shall be provided with each full length pipe cost of which is included in rates below.				
	MJP/ SSR/ 2021-22 / SECTION – I(II) P.V.C. PIPES, Page no.77				
1	Raw Sewage pump to TBF Distribution				
a	Main header				
	225 mm.	95.00	m	1,969.00	187,055.00
	PVC Specials- 10%				18,705.50
b	Distribution				
	160 mm.	140.00	m	906.00	126,840.00
	PVC Specials- 10%				12,684.00
2	TBF collection to FFT (gravity)				
a	Main header				
	160 mm.	250.00	m	906.00	226,500.00
	PVC Specials- 10%				22,650.00
b	collection tributary				
	75 mm.	65.00	m	211.00	13,715.00
	PVC Specials- 10%				1,371.50
3	TTU Plumbing				
	200 mm.	40.00	m	1,544.00	61,760.00
	PVC Specials- 10%				6,176.00
4	TBF distribution				
	75 mm.	175.00	m	211.00	36,925.00
	PVC Specials- 10%				3,692.50
36	Labour				
	Plumber	50.00	days	641.00	32,050.00
	Helper	100.00	days	579.00	57,900.00

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
	MJP/ SSR/ 2021-22 / SECTION - B LABOUR & MACHINERY , Page no. 14				
37	Providing double flange sluice valve confirming for IS- 14846 including worn gear arrangements as per test pressure, stainless steel spindle, caps, including inspection charges, transportation upto departmental store, unloading, stacking excluding GST levied by GOI & GOM in all respect etc. complete.				
	Sluice valves - PN -1 (Without by pass)				
	Raw Sewage pump				
	250 mm.	2.00	Nos	28,727.00	57,454.00
	Filter Feed Pump				
	200 mm.	2.00	Nos	18,581.00	37,162.00
	MJP/ SSR/ 2021-22 / SECTION - I(XII) : PIPES APPURTENANCES , Page no. 132				
38	Providing and supplying ISI mark CI D/F reflux valves (non-return valves) of following dia including railway freight, inspection charges, unloading from railway wagon, loading into truck, transportation upto departmental stores, unloading, stacking excluding GST levied by GOI & GOM in all respect etc. complete. Reflux valves as per I.S.5312 Part I (1984)				
	Without by pass arrangement -PN -1				
	Raw Sewage pump				
	250 mm.	2.00	Nos	30,294.00	60,588.00
	Filter Feed Pump				
	200 mm.	2.00	Nos	17,751.00	35,502.00
	MJP/ SSR/ 2021-22 / SECTION - I(XII) : PIPES APPURTENANCES , Page no. 131				
	Bio media Items				
39	Supplying of Specially designed container for holding Filter media including Lightweight Expanded Clay Aggregates size (8-30 mm) and Bio media including mixture of woodchips Vermicompost, cocopeat and bacterial culture with special worms per designed quantity including transportation & fixing in position as directed etc. complete.	2520.00	Nos	4,750.00	11,970,000.00
	Market rate				
40	Rapid sand Gravity filter sand At Source (Godhara, Gokak, Kanhan,	239.71	Cum	1,730.00	414,698.30
	MJP/ SSR/ 2021-22 / SECTION- A MATERIALS				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
41	Trasnsportation Godhara to Pune distance by Road 660 Km.	239.71	Cum	11,031.37	2,644,329.80
	MJP/ SSR/ 2021-22 / SECTION - C : TRANSPORTATION Page no.				
42	Stone Aggregate 20 mm	239.71	Cum	900.00	215,739.00
	MJP/ SSR/ 2021-22 / SECTION- A MATERIALS				
43	Transportation as per STATEMENT VI Including loading, unloading and stacking				
	Manure or sludge (5.52 Cum) lead 25 Km	925.75	Cum	747.48	691,979.70
	MJP/ SSR/ 2021-22 / SECTION - C : TRANSPORTATION Page no.				
NET TOTAL Rs.					41,500,972.00

MEASUREMENT SHEET - SCREEN CHAMBER, GRIT CHAMBER AND RAW SEWAGE SUMP

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	Short Wall	2	0.80	0.15	1.50	0.36	Cum
				Total for screen		2.75	Cum
	Grit						
	Long Wall (extra than screen chamber)	1	1.00	0.15	2.40	0.36	Cum
	Short Wall	2	1.20	0.15	2.40	0.87	Cum
				Total for grit		1.23	Cum
6	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	80	Cum	6.52	0.53	MT
7	Fabrication work in Frame and Grating for Access						
	Screen	1	5.30	0.80		4.24	Sqm
	Grit	1	6.30	1.35		8.51	Sqm
					Total	12.75	Sqm
8	Removing excess excavated material out of site						
	Screen chamber	1	5.30	0.80	1.30	5.52	Cum
	Grit Chamber	1	6.30	1.20	2.20	16.64	Cum
	soling, PCC, Raft volume					9.4	Cum
	Total Volume					31.56	Cum
	bulkage @ 40%					44.19	Cum
9	Refilling and compaction						
	Total Excavation					91.15	Cum
	Deduction for tank volume, soling, PCC, Raft					31.56	Cum
	Refilling and compaction volume					59.59	Cum

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	Raw Sewage Sump						
1	Excavation				5.10		
A	0.0 to 1.5 m	1	11.2	11.20	1.5	188.16	Cum
	soil					47.04	Cum
	Murum					47.04	Cum
	Soft rock					47.04	Cum
	hard rock					47.04	Cum
B	1.5 to 3.0 m	1	10.20	10.20	1.5	156.06	Cum
	soil					39.02	Cum
	Murum					39.02	Cum
	Soft rock					39.02	Cum
	hard rock					39.02	Cum
C	3.0 to 4.5 m	1	10.20	10.20	1.5	156.06	Cum

MEASUREMENT SHEET - SCREEN CHAMBER, GRIT CHAMBER AND RAW SEWAGE SUMP

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	soil					39.02	Cum
	Murum					39.02	Cum
	Soft rock					39.02	Cum
	hard rock					39.02	Cum
D	4.5 to 6.0 m	1	9.20	9.20	0.6	50.79	Cum
	soil					12.7	Cum
	Murum					12.7	Cum
	Soft rock					12.7	Cum
	hard rock					12.7	Cum
2	Soling						
	RSS	1	8.60	8.60	0.30	22.19	Cum
3	PCC M20						
	RSS	1	8.20	8.20	0.10	6.73	Cum
4	Raft M30						
	RSS	1	8.00	8.00	0.40	25.6	Cum
5	RCC Wall						
	Long Wall	2	7.60	0.30	4.50	20.52	Cum
	Short Wall	2	7.00	0.30	4.50	18.9	Cum
					Total	39.42	Cum
6	Beams						
	Beam 1	3	7.00	0.2	0.3	1.26	Cum
	Beam 2	3	7.00	0.2	0.3	1.26	Cum
					Total	2.52	Cum
7	Slab	1	7.60	7.60	0.2	11.56	Cum
	Deduction for manhole	-2	2.20	1.00	0.2	-0.88	Cum
					Total	10.68	Cum
8	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	100	Cum	78.22	7.83	MT
9	Fabrication work in Frame and Grating for Access						
	RSS	2	2.20	1.00		4.4	Sqm
10	Removing excess excavated material out of site						
	RSS	1	7.60	7.60	4.30	248.37	Cum
	soling, PCC, Raft volume					54.52	Cum
	Total Volume					302.89	Cum
	bulkage @ 40%					424.05	Cum
11	Refilling and compaction						

MEASUREMENT SHEET - SCREEN CHAMBER, GRIT CHAMBER AND RAW SEWAGE SUMP

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	Total Excavation					551.07	Cum
	Deduction for tank volume, soling, PCC, Raft					302.89	Cum
	Refilling and compaction volume					248.18	Cum
12	Dewatering						
	30 Days x 4 hours/day	days	30	hours / day	4	120	Hrs

MEASUREMENT SHEET - TIGER BIO FILTER

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	TIGER BIO FILTER						
1	Excavation				0.50		
A	0.0 to 1.5 m	1	12.66	5.66	0.5	35.83	Cum
	soil					8.96	Cum
	Murum					8.96	Cum
	Soft rock					8.96	Cum
	hard rock					8.96	Cum
2	Soling						
	TBF	1	12.46	5.46	0.30	20.41	Cum
3	PCC M20						
	TBF	1	12.06	5.06	0.10	6.11	Cum
4	Raft M30						
	TBF	1	11.86	4.86	0.10	5.77	Cum
5	Brick Wall						
	TBF						
	Long Wall	2	11.46	0.23	1.20	6.33	Cum
	Short Wall	2	4.00	0.23	1.20	2.21	Cum
	Crate Support Wall	5	11.00	0.23	0.50	6.33	Cum
						Total for T	14.87
							Cum
6	Plaster						
	Internal						
	Crate Support Wall						
	Long Wall	6	11.00		0.50	33	Sqm
	Wall top	5	11.00		0.23	12.65	Sqm
	Long Wall	2	11.00		1.20	26.4	Sqm
	Short Wall	2	4.00		1.20	9.6	Sqm
						Total	81.65
							Sqm
	External						
	Long Wall	2	11.46		1.20	27.51	Sqm
	Short Wall	2	4.46		1.20	10.71	Sqm
	Wall Top	1	30.92	0.3		9.28	Sqm
						Total	47.50
							Sqm
7	External-white-wash	1				47.50	Sqm
8	External-colour-wash	1				47.50	Sqm
9	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	60	Cum	5.77	0.35	MT
10	Removing excess excavated material out of site						
	soling, PCC, Raft volume					32.29	Cum
	Total Volume					32.29	Cum
	bulkage @ 40%					45.21	Cum

MEASUREMENT SHEET - TIGER BIO FILTER

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
11	Refilling and compaction						
	Total Excavation					35.83	Cum
	Deduction for tank volume, soling, PCC, Raft					32.29	Cum
	Refilling and compaction volume					3.54	Cum
12	MS Fabricated Shed						
	TBF-II Shed in Fabrication work Shed Size-12 m X 5 m x		12.00	5.00	3.00		
	for column 50*50*5 Unit Weight 6.97 kg/m	10	3.00	6.97	kg/m	209.10	KG
	for truss 50*50*3 Unit Weight 3.71 kg/m	5	5.00	3.71	kg/m	92.75	KG
	for principle rafter 50*50*3 Unit Weight	10	2.90	3.71	kg/m	107.59	KG
	for strut rafter 50*50*3 Unit Weight 3.71 kg/m	10	0.20	3.71	kg/m	7.42	KG
	for central strut rafter 50*50*3 Unit Weight	5	0.30	3.71	kg/m	5.57	KG
	for bottom frame below truss 50*50*3 Unit Weight 3.71 kg/m	1	34.00	3.71	kg/m	126.14	KG
	for perlin 30*30*3 Unit Weight 2.51 kg/m	5	13.00	2.51	kg/m	163.15	KG
	for Base Plate 150*150*10 mm	20	0.15	0.15	0.010	35.33	KG
					Total Wei	747.04	Kg
						0.75	MT
13	corrugated galvanised iron sheets	2	13.00	2.90		75.4	Sqm

MEASUREMENT SHEET - FILTER FEED TANK

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
8	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	100	Cum	64.79	6.48	MT
9	Fabrication work in Frame and Grating for Access						
	FFT	2	1.20	0.70		1.68	Sqm
10	Removing excess excavated material out of site						
	FFT	1	7.10	7.10	3.50	176.44	Cum
	soling, PCC, Raft volume					48.12	Cum
	Total Volume					224.56	Cum
	bulkage @ 40%					314.39	Cum
11	Refilling and compaction						
	Total Excavation					366.5	Cum
	Deduction for tank volume, soling, PCC, Raft					224.56	Cum
	Refilling and compaction volume					141.94	Cum
12	Dewatering						
	30 Days x 4 hours/day	days	30	hours/day	4	120	Hrs

MEASUREMENT SHEET - FILTER PLATFORM

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	FILTER PLATFORM						
1	Excavation				0.55		
A	0.0 to 1.5 m	1	10.0	6.00	0.55	33	Cum
	soil					8.25	Cum
	Murum					8.25	Cum
	Soft rock					8.25	Cum
	hard rock					8.25	Cum
2	Soling						
	Filter Platform	1	9.80	5.80	0.30	17.06	Cum
3	PCC M20						
	Filter Platform	1	9.40	5.40	0.10	5.08	Cum
4	Raft M30						
	Filter Platform	1	9.20	5.20	0.15	7.18	Cum
5	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	80	Cum	7.18	0.58	MT
6	Removing excess excavated material out of site						
	soling and PCC volume					22.14	Cum
	Total Volume					22.14	Cum
	bulkage @ 40%					31	Cum
7	Refilling and compaction						
	Total Excavation					33	Cum
	Deduction for tank volume, soling, PCC, Raft					22.14	Cum
	Refilling and compaction volume					10.86	Cum

MEASUREMENT SHEET - ELECTROMECHANICAL WORKS

Sr. No.	Item Description	Nos.	Unit
1	Screen (Manual) of size 1.8 m length x 0.5 m width of SS 304 MOC and Manual hand rake for cleaning screen of SS handle 1 m in length and cleaning area of 6 nos 5 mm SS rod of total length 200 mm straight and 50 mm of 90 degree bend.	1	No
2	Grit pump Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION - Pumps, Page no. 6, 7 of size 1.8 m length x 0.5 m width of SS304 MOC 1 HP (Up to 9000 LPH)	1	No
3	Raw Sewage Pumps Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION - Pumps, Page no. 6, 7 15 HP (Up to 132000 LPH)	2	Nos
4	TTU Feed pumps Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION - Pumps, Page no. 6, 7 15 HP (Up to 132000 LPH)	2	Nos
5	Pressure Sand Filter of FRP / MSEP vessel with suitable thickness to withstand a water pressure including MPV or 5 Valve system and PVC / UPVC / MSEP interconnecting and underdrain piping including fittings, with standard filter media layer with minimum depth of filter sand 1.0 m supported by gravels. The piping arrangement should provide sufficient pressure for backwash operations and avoid loss of sand during backwash operation. Suitable openings to be provided to ease addition and removal the media. Dia 1.8 m x 2 m minimum height	4	Nos
6	Activated Carbon Filter of FRP / MSEP vessel with suitable thickness to withstand a water pressure including MPV or 5 Valve system and PVC / UPVC / MSEP interconnecting and underdrain piping including fittings, with standard filter media layer with minimum depth of Activated Carbon 1.0 m supported by gravels. The piping arrangement should provide sufficient pressure for backwash operations and avoid loss of Activated carbon during backwash operation. Suitable openings to be provided to ease addition and removal the media. Dia 1.8 m x 2 m minimum height	4	Nos
7	PurAll Tablet Chlorinator + cartridge	0	nos

MEASUREMENT SHEET - ELECTROMECHANICAL WORKS

Sr. No.	Item Description	Nos.	Unit
7	NaOCl Chlorinator Pump Diaphragm Type / peristaltic type / Solenoid Max Flow Rate Upto 10LPH Power Source Electric Phase Single Material PP / PTFE(Teflon) Voltage 230 Volt Frequency 50Hz		
a	Mixing Tank of 100 Ltrs capacity	1	Nos
b	Dosing Pump	2	Nos
8	Control Panel		
	Design, Supply, Installing, Commissioning & Testing of Master PLC control monitoring and communication panel as per IEC 61131 at Pure Water Sump suitable for monitoring and control of pure water Pumps. Pressure Transmitters, Level Transmitter, PH Transmitter, Turbidity Transmitter ,for all pumps installed.		
	Master PLC Panel	1	No
	MJP/ MECH/ ELECT / SSR/ 2021-22/ SECTION 19 - SA [SCADA & AUTOMATION] Item no. 2.7 Page no. 72		
9	Supplying and erecting Fully Automatic Star Delta starter to operate squirrel cage induction motor working on 380- 440 Volt, 3 phase, 50 Hz with no volt coil, over load element, and ON - OFF push buttons, with necessary material and connected to supply, etc complete. Starter with original sheet steel encloser.		
	> 12.5 HP & Up to 20 HP	6	nos
	1 nos extra starter considered as spare.		
	MJP /MECH/ ELECT/ SSR/ 2021-22 SECTION 10 - LG [L.T. SWITCHGEAR AND PROTECTION] Item no. LG 3 Page no. 27		
10	Main power supply cable		
	3 core PVC insulated, PVC sheathed copper conductor flat submersible cable		
	Supplying and erecting, Flat flexible submersible cable with, Copper Conductor, PVC insulated, and PVC sheathed.		
	3 core 16 sq mm	40	m
11	Power cables		
	Aluminium conductor 4 Core, XLPE / PVC insulated & armoured cable		
	Supplying and erecting, XLPE / PVC insulated, armoured cable 1100 V grade with ISI mark Four core, solid / stranded aluminium conductor with 6 mm thick 25 mm width M.S. spacer with G.I. Earth wire 6 sq mm, complete erected on wall / on pole with 25 X 3 mm M.S. clamps or in provided trench in an approved manner.		
	4 Core 6 sq mm	220	m
	MJP MECH/ ELECT/ SSR/ 2021-22 SECTION 12 - CB [L.T. CABLE] Item no. CB 6 Page no. 35		
12	Control Cables		
	Copper conductor PVC insulated, Unarmoured control cable		

MEASUREMENT SHEET - ELECTROMECHANICAL WORKS

Sr. No.	Item Description	Nos.	Unit
	Supplying and erecting Un-armoured control cable with ISI mark stranded / solid copper conductor 1.1 kV grade complete erected on wall / panel or in provided trench in an approved manner.		
	4 core 2.5 sq mm	220	m
	MJP MECH/ ELECT/ SSR/ 2021-22/ SECTION 12 - CB [L.T. CABLE] Item no. CB 8-2 Page no. 36		

MEASUREMENT SHEET - PLUMBING

Sr. No.	Item Description	Nos.	L (m)	B (m)	Quantity	Unit
	Providing and supplying in standard lengths ISI mark rigid unplasticised PVC pipes suitable for potable water with solvent cement joints including cost of couplers, as per IS specification no. 4985 / 1988 excluding GST levied by GOI and GOM in all respect, including transportation, freight charges, inspection charges, loading, unloading, conveyance to the departmental stores and stacking the same in closed shed duly protected from sun rays and rains including cost of jointing material i.e. solvent cement, etc. complete (selffit type to be jointed with cement solvent).					
	1) 10% of cost of pipes shall be considered for cost of PVC specials for estimate purpose only. 2) One coupler and required cement solvent shall be provided with each full length pipe cost of which is included in rates below.					
	MJP/ SSR/ 2021-22 / SECTION – I(II) P.V.C. PIPES,					
1	Raw Sewage pump to TBF Distribution					
a	Main header	Dia	225			
	225 mm.	1	95		95	m
	PVC Specials- 10%					
b	Distribution					
	160 mm.	1	140		140	m
	PVC Specials- 10%					
2	TBF collection to FFT (gravity)					
a	Main header					
	160 mm.	1	250		250	m
	PVC Specials- 10%					
b	collection tributary					
	75 mm.	1	65		65	m
	PVC Specials- 10%					
3	TTU Plumbing	Dia	200			
	200 mm.	1	40		40	m
	PVC Specials- 10%					
4	TBF distribution			No. of beds		
	75 mm.	1	5	35	175	m
	PVC Specials- 10%					
5	Labour	Nos	Days			
	Plumber	5	10		50	days
	Helper	10	10		100	days
6	Sluice valves					

MEASUREMENT SHEET - PLUMBING

Sr. No.	Item Description	Nos.	L (m)	B (m)	Quantity	Unit
	Providing double flange sluice valve confirming for IS- 14846 including worn gear arrangements as per test pressure, stainless steel spindle, caps, including inspection charges, transportation upto departmental store, unloading, stacking excluding GST levied by GOI & GOM in all respect etc. complete.					
	MJP/ SSR/ 2021-22 / SECTION - I(XII) : PIPES APPURTENANCES , Page no. 132					
	Raw Sewage pump					
	250 mm.	2			2	Nos
	Filter Feed Pump					
	200 mm.	2			2	Nos
7	Reflux valves (non-return valves)					
	Providing and supplying ISI mark CI jD/F reflux valves (non-return valves) of following dia including railway freight, inspection charges, unloading from railway wagon, loading into truck, transportation upto departmental stores, unloading, stacking excluding GST levied by GOI & GOM in all respect etc. complete. Reflux valves as per I.S.5312 Part I (1984)					
	MJP/ SSR/ 2021-22 / SECTION - I(XII) : PIPES APPURTENANCES , Page no. 131					
	Raw Sewage pump					
	250 mm.	2			2	Nos
	Filter Feed Pump					
	200 mm.	2			2	Nos

PROJECT NAME :

1750 KLD SEWAGE TREATMENT PLANT
BASED ON TIGER BIO FILTER
TECHNOLOGY.

NOTES

- All dimensions are in 'mm' unless mentioned otherwise.
- All dimensions are checked and co-related with the design and structural drawings and any discrepancy or omission shall be brought to the notice.
- All linear dimensions are including plastering in structural drawings unless otherwise mentioned.
- The structural component and BOQ prepared considering Finished Ground Level (+00.00) and Existing Ground Level (+00.00). Temporary Bench Mark 1 (xxx.000) Kept on the Top level of Road on North East side of the site.
- BIS Grade Cement to be used for all concrete and plastering applications.
- All water treatment structure to be checked for water leakages.
- This drawing should be read in conjunction with relevant detailed Design and Structural drawings. All dimensions shall be verified on site prior to commencement of work.
- This Drawing is the property of TBF Environmental Solutions Pvt. Ltd. It is not to be copied or produced or handed over to third party or used for any other purpose other than which it is intended. This drawing together with any copies made by the recipient shall be returned on demand to us.

REVISION		
DATE	REMARKS	SIGNATURE

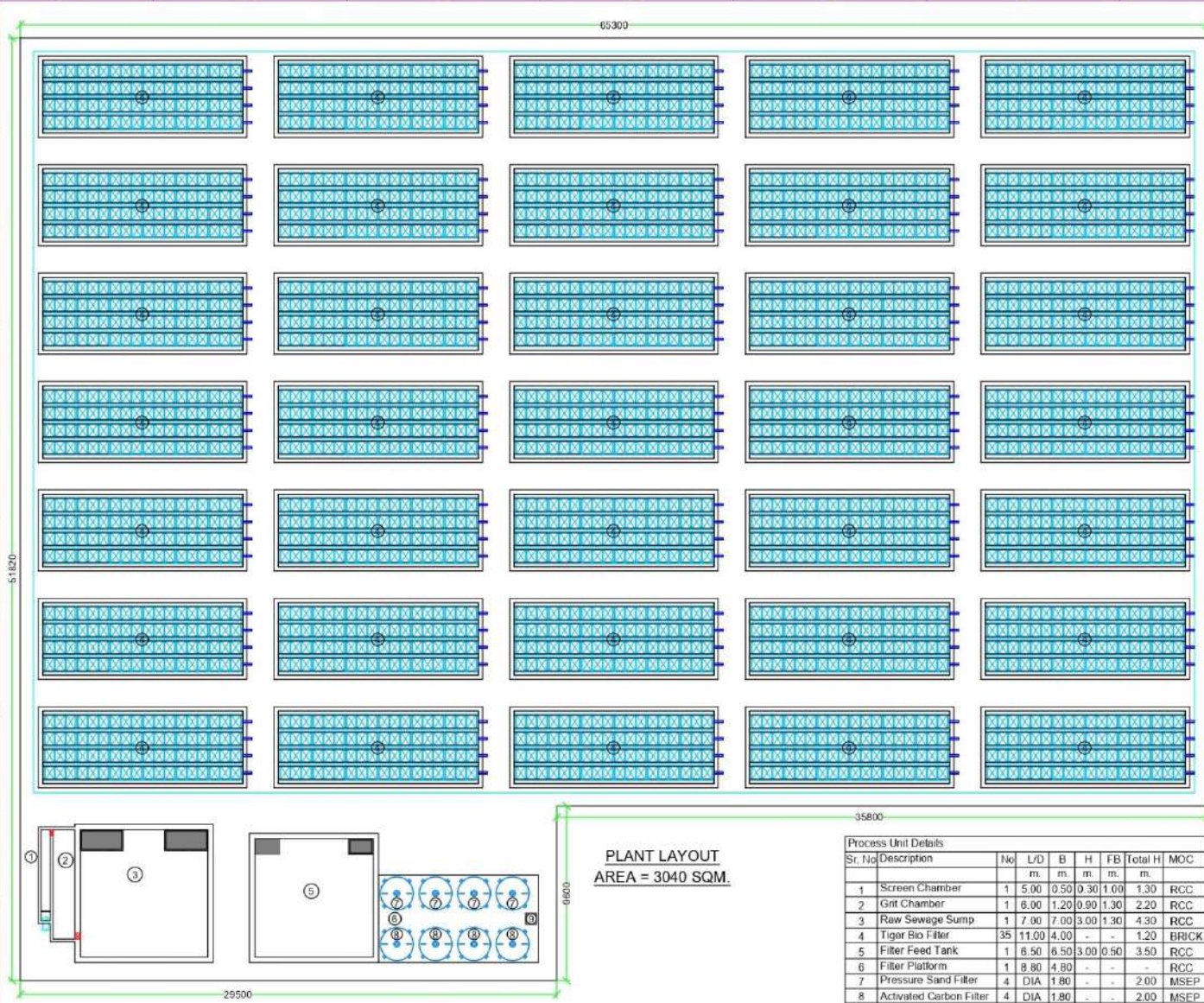
CLIENT : SWSM, MAHARASHTRA

DRAWING NAME:

PLANT LAYOUT

PROJECT CODE : TBF-	DRAWING NO : D-01/PL/01	DATE : JUNE-2021
DRAWN BY : L.D.B.	CHECKED BY : S.B.	SCALE : NTS.

TBF ENVIRONMENTAL SOLUTIONS PVT. LTD.
G-3, 304 B, Saudamini Complex, Shrushti Colony, Paud Road, Kothrud, Pune - 411038
Tel : +91 - 20 - 25280201
Fax : +91 - 20 - 25280200
Email : info@tbfenvironmental.in
Web : www.tbfenvironmental.in



65300

51820

47220

35800

PLANT LAYOUT
AREA = 3040 SQM.

Process Unit Details								
Sr. No	Description	No	L/D m.	B m.	H m.	FB m.	Total H m.	MOC
1	Screen Chamber	1	5.00	0.50	0.30	1.00	1.30	RCC
2	Grit Chamber	1	6.00	1.20	0.90	1.30	2.20	RCC
3	Raw Sewage Sump	1	7.00	7.00	3.00	1.30	4.30	RCC
4	Tiger Bio Filter	35	11.00	4.00	-	-	1.20	BRICK
5	Filter Feed Tank	1	6.50	6.50	3.00	0.50	3.50	RCC
6	Filter Platform	1	8.80	4.80	-	-	-	RCC
7	Pressure Sand Filter	4	DIA	1.80	-	-	2.00	MSEF
8	Activated Carbon Filter	4	DIA	1.80	-	-	2.00	MSEF
9	Chlorination Unit	1	-	-	-	-	-	-

29500

6600

PROJECT NAME :

1750 KLD SEWAGE TREATMENT PLANT
BASED ON TIGER BIO FILTER
TECHNOLOGY.

NOTES

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3. All linear dimensions are including plastering in structural drawings unless otherwise mentioned.
4. The structural component and BOQ prepared considering Finished Ground Level (+100.00) and Existing Ground Level (+00.00). Temporary Bench Mark 1 (xxx.000) Kept on the Top level of Road on North East side of the site.
5. BIS Grade Cement to be used for all concrete and plastering applications.
6. All water treatment structure to be checked for water leakages.
7. This drawing should be read in conjunction with relevant detailed Design and Structural drawings. All dimensions shall be verified on site prior to commencement of work.
8. This Drawing is the property of TBF Environmental Solutions Pvt. Ltd. It is not to be copied or produced or handed over to third party or used for any other purpose other than which it is intended. This drawing together with any copies made by the recipient shall be returned on demand to us.

REVISION		
DATE	REMARKS	SIGNATURE

CLIENT : SWSM, MAHARASHTRA

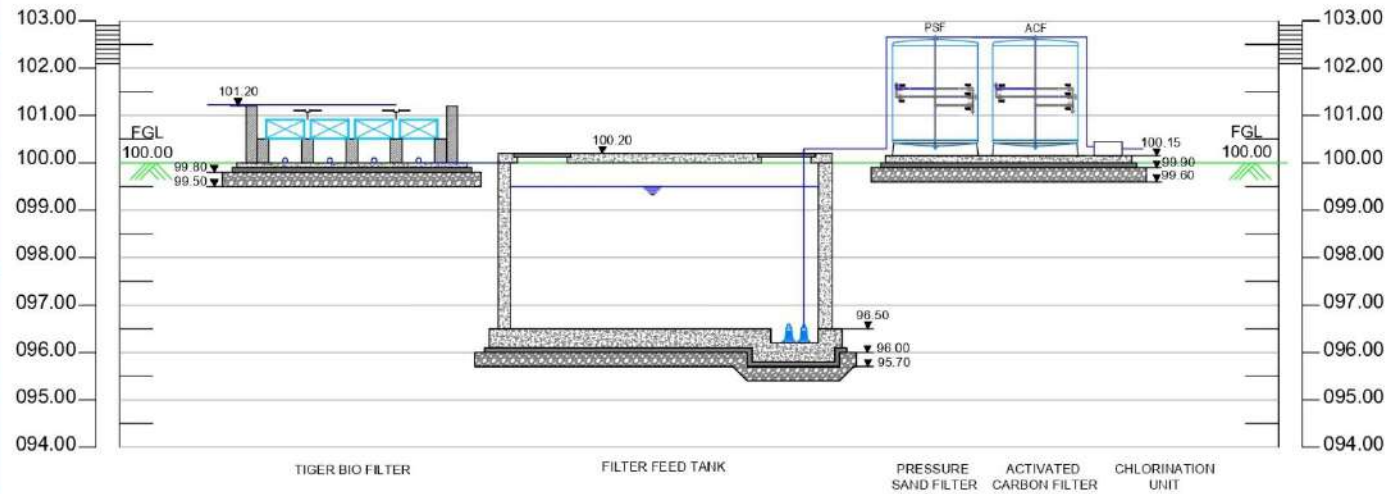
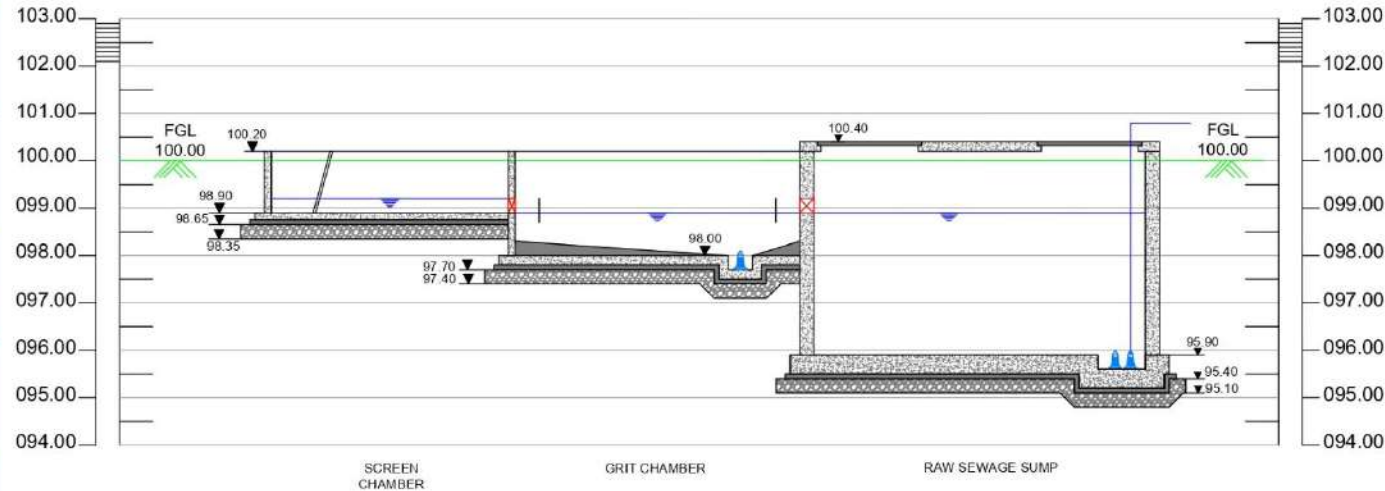
DRAWING NAME :

HYDRAULIC FLOW DIAGRAM

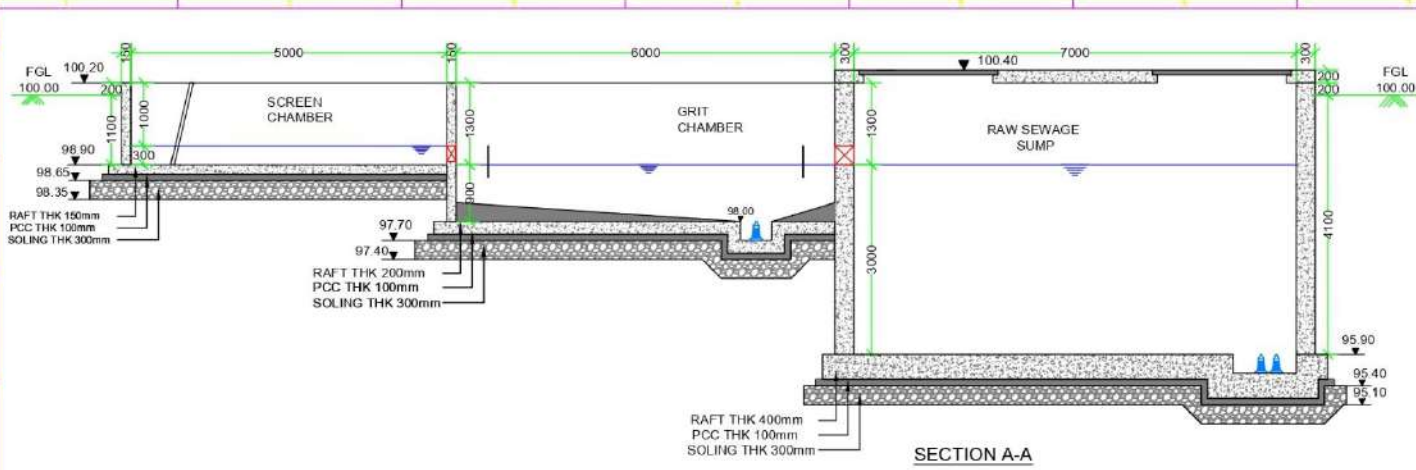
PROJECT CODE : TBF-	DRAWING NO : D-02/HFD/01	DATE : JUNE-2021
DRAWN BY : L.D.B.	CHECKED BY : S.B.	SCALE : NTS.



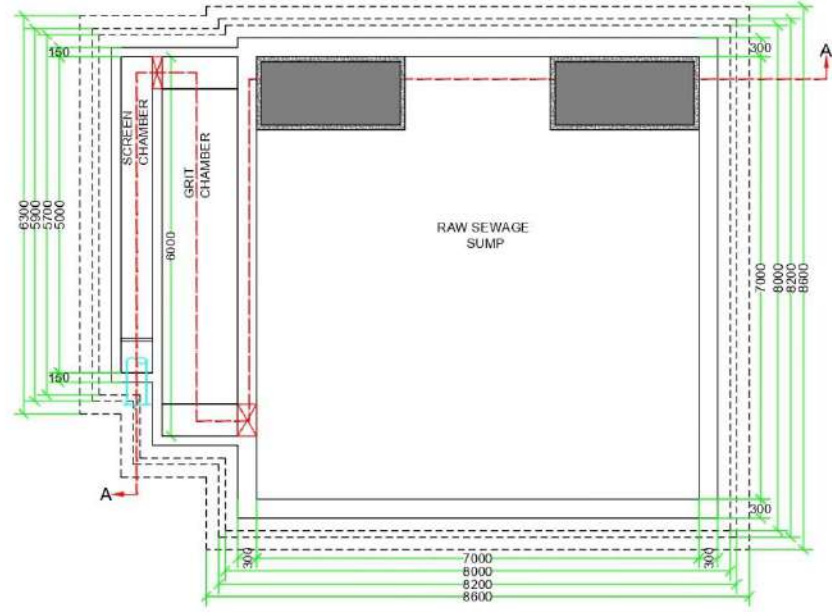
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Web : www.tbfenvironmental.in



HYDRAULIC FLOW DIAGRAM



SECTION A-A



PLAN

SCREEN CHAMBER, GRIT CHAMBER & RAW SEWAGE SUMP

PROJECT NAME :
1750 KLD SEWAGE TREATMENT PLANT
BASED ON TIGER BIO FILTER
TECHNOLOGY.

- NOTES**
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 2. All dimensions are checked and co-related with the design and structural drawings and any discrepancy or omission shall be brought to the notice.
 3. All layer dimensions are including plastering in structural drawings unless otherwise mentioned.
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REVISION		
DATE	REMARKS	SIGNATURE

CLIENT : SWSM, MAHARASHTRA

DRAWING NAME :
SCREEN CHAMBER, GRIT CHAMBER
& RAW SEWAGE SUMP

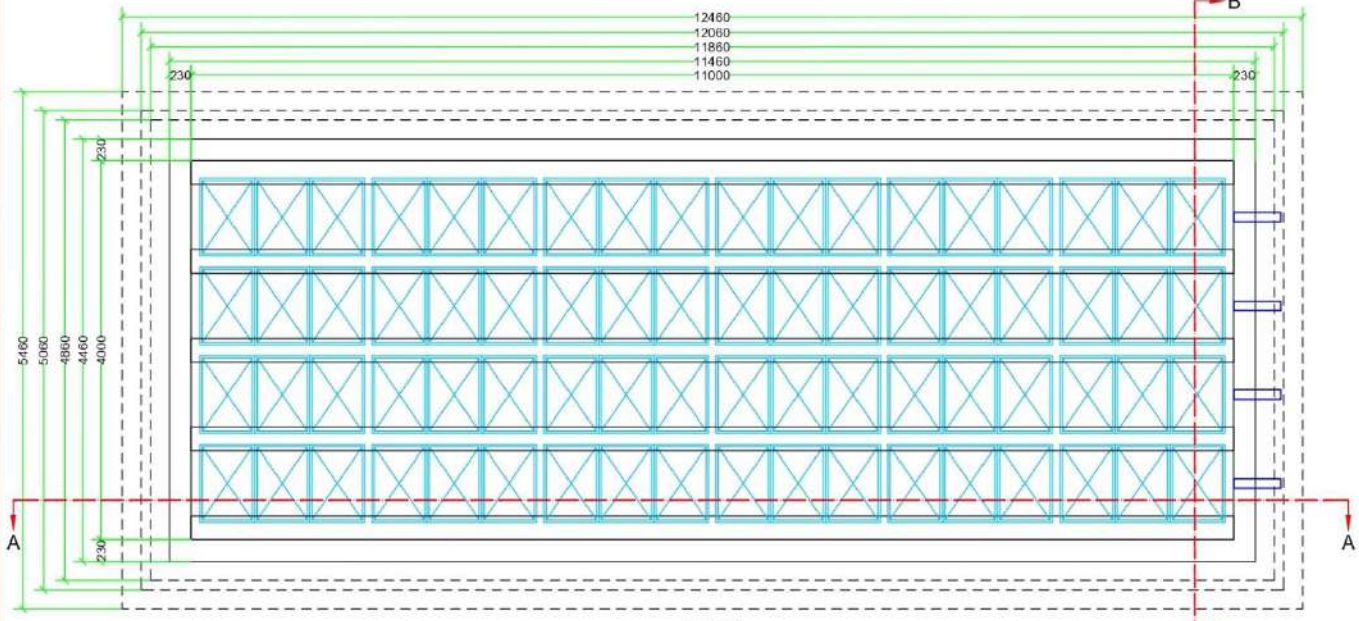
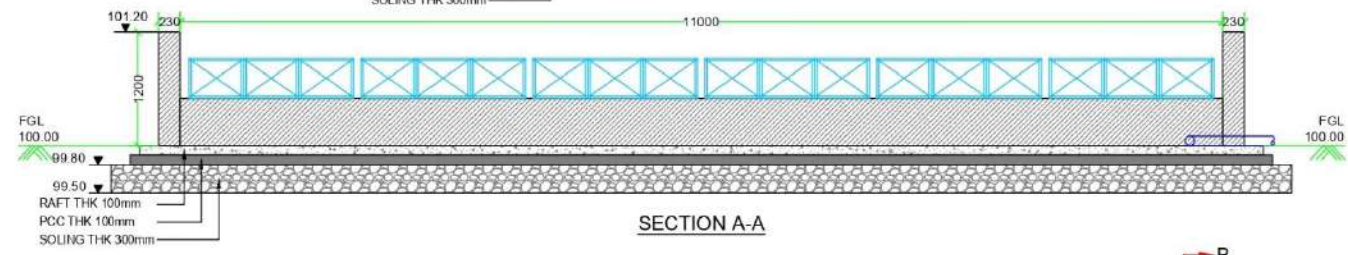
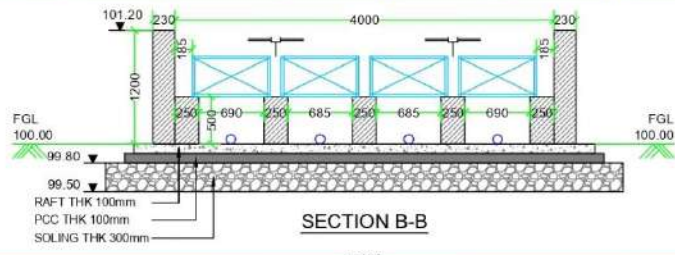
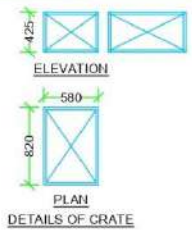
PROJECT CODE : TBF-	DRAWING NO : D.03/SC,GC&RS/04	DATE : JUNE-2021
DRAWN BY : L.D.B.	CHECKED BY : S.B.	SCALE : NTS.


TBF ENVIRONMENTAL SOLUTIONS PVT. LTD.
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Tel : +91 - 20 - 25280201
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Email : info@tbfenvironmental.in
Web : www.tbfenvironmental.in

PROJECT NAME :
1750 KLD SEWAGE TREATMENT PLANT
BASED ON TIGER BIO FILTER
TECHNOLOGY.

NOTES

1. All dimensions are in 'mm' unless mentioned otherwise.
2. All dimensions are checked and co-related with the design and structural drawings and any discrepancy or omission shall be brought to the notice.
3. All linear dimensions are including plastering in structural drawings unless otherwise mentioned.
4. The structural component and BOQ prepared considering Finished Ground Level (+00.00) and Existing Ground Level (+00.00). Temporary Bench Mark 1 (xxx.000) Kept on the Top level of Road on North East side of the site.
5. BIS Grade Cement to be used for all concrete and plastering applications.
6. All water treatment structure to be checked for water leakages.
7. This drawing should be read in conjunction with relevant detailed Design and Structural drawings. All dimensions shall be verified on site prior to commencement of work.
8. This Drawing is the property of TBF Environmental Solutions Pvt. Ltd. It is not to be copied or produced or handed over to third party or used for any other purpose other than which it is intended. This drawing together with any copies made by the recipient shall be returned on demand to us.

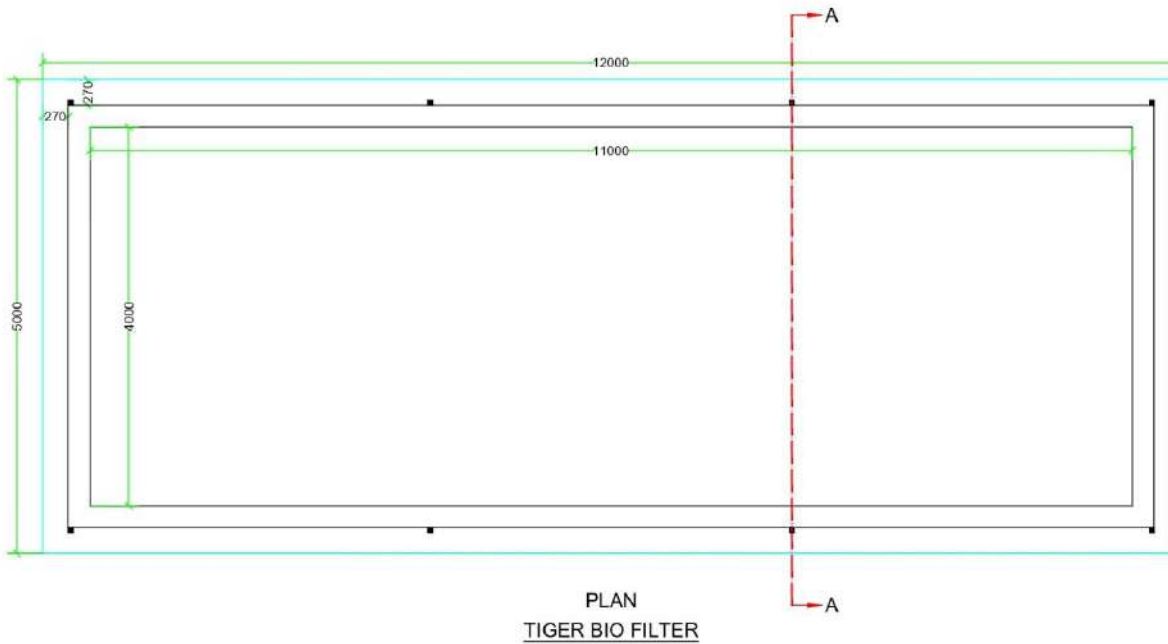
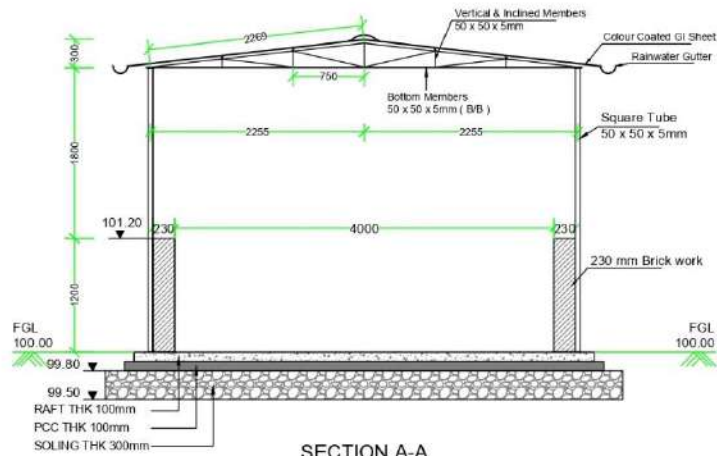


REVISION		
DATE	REMARKS	SIGNATURE

CLIENT : SWSM, MAHARASHTRA
DRAWING NAME :
TIGER BIO FILTER

PROJECT CODE : TBF-	DRAWING NO : D-04/TBF/01	DATE : JUNE 2021
DRAWN BY : L.D.B.	CHECKED BY : S.B.	SCALE : NTS.

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REVISION		
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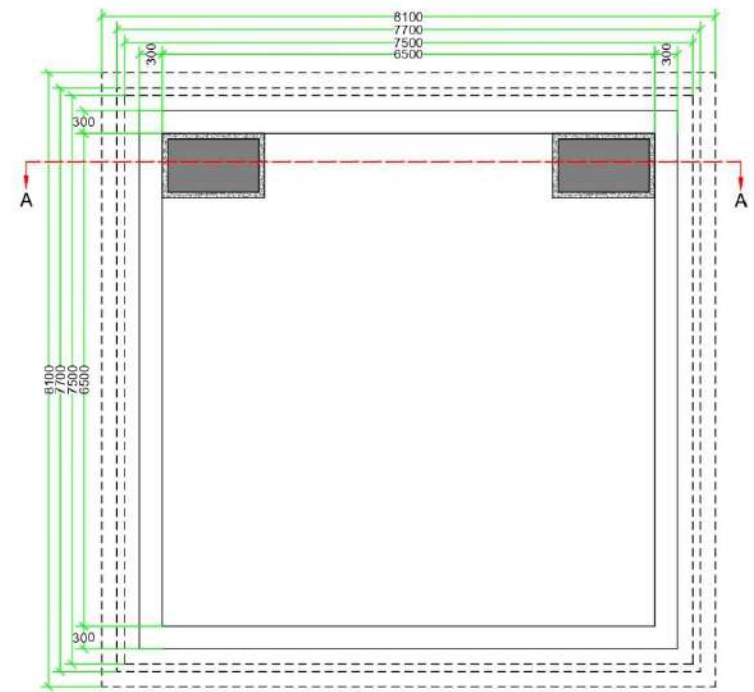
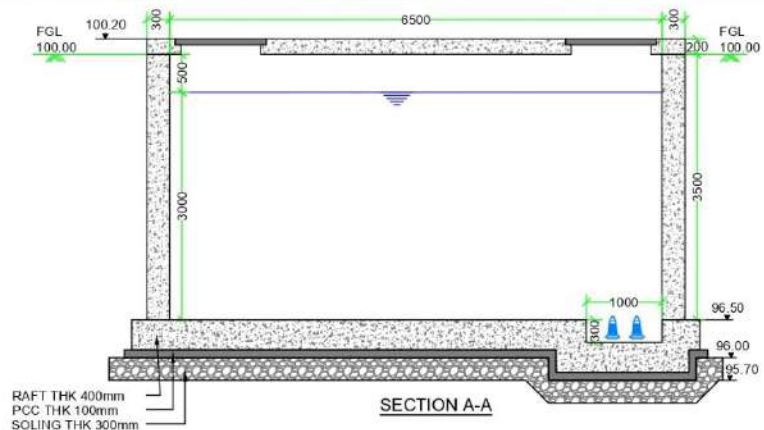
CLIENT : SWSM, MAHARASHTRA

DRAWING NAME:

TIGER BIO FILTER

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PLAN
FILTER FEED TANK

PROJECT NAME :
1750 KLD SEWAGE TREATMENT PLANT
BASED ON TIGER BIO FILTER
TECHNOLOGY.

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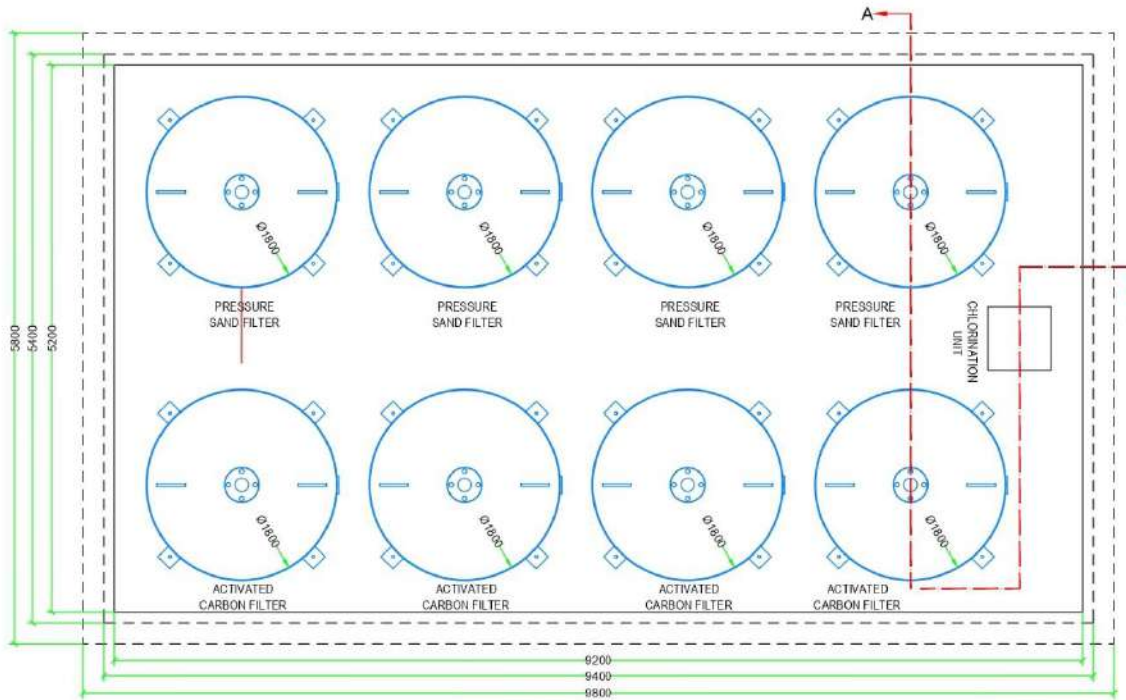
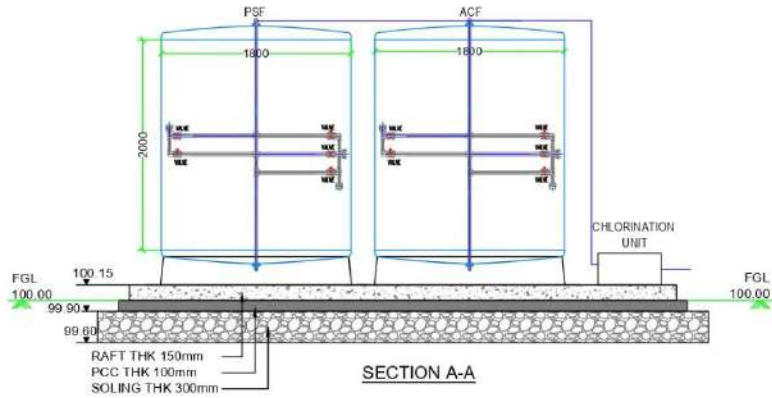
REVISION		
DATE	REMARKS	SIGNATURE

CLIENT : SWSM, MAHARASHTRA

DRAWING NAME:
FILTER FEED TANK

PROJECT CODE : TBF-	DRAWING NO : D-05/FF TAD1	DATE : JUNE-2021
DRAWN BY : L.D.B.	CHECKED BY : S.B.	SCALE : NTS.


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**PRESSURE SAND FILTER,
ACTIVATED CARBON FILTER & CHLORINATION UNIT**

PROJECT NAME :
1750 KLD SEWAGE TREATMENT PLANT
BASED ON TIGER BIO FILTER
TECHNOLOGY.

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REVISION		
DATE	REMARKS	SIGNATURE

CLIENT : SWSM, MAHARASHTRA

DRAWING NAME:
PRESSURE SAND FILTER,
ACTIVATED CARBON FILTER
& CHLORINATION UNIT

PROJECT CODE : TBF-	DRAWING NO : D-06PSF,ACF&CU01	DATE : JUNE-2021
DRAWN BY : L.D.B.	CHECKED BY : S.B.	SCALE : NTS.


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**2000 KLD STP BASED ON
TBF TECHNOLOGY**

PROCESS CALCULATIONS
TIGER BIO FILTER OF 2000 KLD CAPACITY

Design flow	=	2000.00	KLD
	=	2.000	MLD
Peak flow factor	=	3.00	
1 SCREEN CHANNELS: MANUAL			
No. of Manual Screen	=	1	No.
Average Flow	=	2.00	MLD
Peak Flow Factor	=	3.00	
Design Flow	=	Peak Flow	
	=	6.00	MLD
	=	250.00	m ³ /hr
	=	0.069	m ³ /sec
Average Flow	=	2.00	MLD
	=	83.333	m ³ /hr
	=	0.023	m ³ /sec
Design Flow in each Screen	=	0.069	m ³ /sec
		1	No.
	=	0.069	m ³ /sec
Average Flow in each Screen	=	0.023	m ³ /sec
		1	No.
	=	0.023	m ³ /sec
Maximum Velocity through Screen at Peak Flow	=	1.2	m/sec
Minimum Velocity through Screen at Average Flow	=	0.6	m/sec
Clear Area of Opening through Screen for Peak Flow	=	0.069	m ³ /sec
		1.2	m/sec
	=	0.058	m ²
Clear Area of Opening through Screen for Average Flow	=	0.023	m ³ /sec
		0.6	m/sec
	=	0.038	m ²
Considering maximum Area of Opening through Screen	=	0.058	m ²
Clear Spacing of Bars	=	10	mm

Thickness of Bars	=	5	mm	
Gross Area of Screen	=	$0.058 \times (10+5) / 10$		
	=	0.087	m ²	
Assuming Depth of Screen Channel	=	300.00	mm	
Gross Width of Screen	=	$0.087 / 0.3$		
	=	0.290	m	
No. of Bars	=	(Gross Width of Screen / Center to Center Spacing of Bars) - 1		
	=	$0.29 / ((10+5) / 1000)$		
	=	-1		
	=	18.3	Nos.	
Say	=	19	Nos.	
Width of Screen provided	=	(Number of Bars+1) x Clear Spacing + (Number of Bars x Bar Thickness)		
	=	$(19+1) \times 10 + (19 \times 5)$		
	=	295	mm	
Width Say	=	0.50	m	
Liquid Depth of Screen Channel provided	=	0.30	m	
L:B	=	10.00		
Length of Screen Channel provided	=	5.00	m	
Freeboard provided	=	1.00	m	Invert Depth of incoming sewer
Total Depth of Screen Chamber	=	1.30	m	
Velocity in Channel at Average Flow	=	Average Flow / Cross Sectional Area of Screen Channel		
	=	$0.023 / ((0.5 \times 0.3) / 1000 \times 1000)$		
	=	0.153	m/sec	
	>	0.300	m/sec	
Head Loss across Screen				
Head Loss across Screen	=	$0.0728 (V^2 - v^2)$		
V = Velocity through Screen at Peak Flow	=	Peak Flow through Screen Channel / Clear Area of Opening through Screen		
	=	1.150	m/sec	
v = Velocity in approach Channel at Peak Flow	=	Peak Flow through Screen Channel / Cross Sectional Area of Screen Channel		
	=	0.8	m/sec	
Head Loss across Screen at Peak Flow	=	0.050	m	
Head Loss across Screen at 50% Clogged Condition				
Velocity through Screen at 50% Clogged Condition at Peak Flow	=	2.300	m/sec	
Head Loss across screen at 50% Clogged Condition at Peak Flow	=	0.339	m	
	>	0.300	m/sec	OK

2 CONVENTIONAL GRIT CHAMBER: MANUAL

No. of Grit Chamber	=	1	
Average Flow	=	2.00	MLD
Peak Flow Factor	=	3.00	
Design Flow	=	Peak Flow	
Peak Flow	=	6.00	MLD
	=	6000	m ³ /day
	=	250	m ³ /hr
	=	0.069	m ³ /sec
Design Flow to each Grit Chamber	=	6000/1	
	=	6000	m ³ /day
	=	250	m ³ /hr
	=	0.069	m ³ /sec
According to CPHEEO Manual			
Particle Size	=	0.15	mm
Specific Gravity	=	2.65	
Surface Overflow Rate for 100% removal efficiency in an ideal Grit Chamber	=	Settling Velocity of the minimum size of Particles to be removed	
	=	1.5	m/s
	=	1296	m ³ /m ² /day
Considering Efficiency of removal of desired Particles, $\eta = 75\%$	=	75%	
and Measure of Settling Basin Performance, $n = 1/8$ for very good performance	=	0.125	
Design Overflow Rate	=	857	m ³ /m ² /day
Surface Overflow Rate for 0.15 mm dia. Particle Size with Specific Gravity $S_s > 2.65$ Table 5.6	=	1555	m ³ /m ² /day
Considering Design Overflow Rate	=	960	m ³ /m ² /day
Area of Grit Chamber required	=	6000	m ³ /day
		960	m ³ /m ² /day
	=	6.25	m ²
L:B ratio	=	4	
Length of Chamber provided	=	6.00	m
Width of Chamber provided	=	1.30	m
Hydraulic Retention Time (HRT) in Grit Chamber at Peak Flow	=	60	sec
Volume of Grit Chamber required	=	0.069x60	
	=	4.14	m ³
Depth required in Grit Chamber	=	4.14 / (6x1.3)	

	=	0.53	m
Say	=	0.60	m
Grit Storage Depth	=	0.30	m
Total Liquid Depth required	=	0.90	m
Length of Grit Pit	=	0.50	m
Width of Grit Pit	=	0.50	m
Depth of Grit Pit	=	0.30	m
Free Board	=	1.30	m

3 RAW SEWAGE SUMP (WET WELL)

No. of Units	=	1	No.
Average Flow	=	2.00	MLD
	=	83.333	m ³ /hr
	=	0.0231	m ³ /sec

Peak Flow Factor	=	3.00	
------------------	---	------	--

Design Flow	=	Peak Flow	
	=	6.00	MLD
	=	250	m ³ /hr
	=	0.069	m ³ /sec

Hydraulic Retention Time (HRT) at Average Flow	=	120	min
--	---	-----	-----

Volume required	=	0.0231 x 120 x 60	
	=	166	m ³

Hydraulic Retention Time (HRT) at Peak Flow	=	Volume / Average Flow	
	=	40	min
	<	30	min

Total Volume of Wet Well	=	166	m ³
--------------------------	---	-----	----------------

Side Water Depth (SWD) provided	=	3.00	m
Plan Area of Wet Well	=	55.44	m ²
Length/width of Sump required	=	7.45	m
Length/width of Sump provided	=	7.50	m
Volume of Sump provided	=	168.75	m ³
Length of Pump Pit	=	2.00	m
Width of Pump Pit	=	0.80	m
Depth of Pump Pit	=	0.30	m
Free Board	=	1.30	m

3.1 DESIGN STATEMENT-RSS E&M

Design Considerations

Design flow	=	2.00	MLD
	=	2000.00	Cum/Day
Peak flow factor	=	3.00	

Pumping machinery

Friction factor for Fittings in Pressure Mains

Elbow 90 degrees	=	35
Friction Factor for each	=	1
Friction factor for all	=	35
Elbow 45 degrees	=	0
Friction Factor for each	=	0.75
Friction factor for all	=	0
Elbow 22 degrees	=	0
Friction Factor for each	=	0.5
Friction factor for all	=	0
Tee 90 degrees	=	0
Friction Factor for each	=	1.5
Friction factor for all	=	0
Tee in straight pipe	=	20
Friction Factor for each	=	0.3
Friction factor for all	=	6
Gate valve open	=	1
Friction Factor for each	=	0.4
Friction factor for all	=	0.4
Swing check	=	1
Friction Factor for each	=	2.5
Friction factor for all	=	2.5
Total friction factor	=	43.9

Stage	low	ave	peak
Average flow, cum / day	=	2000.00	
Proportion	=	0.6	2
Design flow, cum / day	=	1200	4000
Hazen Williams C	=	140	140
Desired velocity, m/s	=	0.6	1.5
Number of Pumping hours	=	16.0	16.0
Area needed, sqm	=	0.0347	0.0463
Dia needed, m	=	0.210	0.243
Dia needed, mm	=	210	243
Dia provided, mm (User)	=	225	225
Radius, m	=	0.113	0.113
Radius power 0.63	=	0.252	0.252
S power 0.54	=	0.020	0.050
S	=	0.001	0.004
Slope 1 in length, m	=	1398.1	256.2
Friction in pipeline, m	=	100	100
Friction in fittings, m	=	0.1	0.4
Velocity head, m	=	0.018	0.115
Friction factor in fittings	=	43.9	43.9
Friction in fittings, m	=	0.8	5.0
Static lift, m	=	5.0	5.0
Total head, m	=	5.8	10.0
Efficiency of pumpset	=	0.8	0.8
Discharge, lps	=	20.8	69.4
Discharge, Cum/Hr	=	75.0	250.0

Kw required	=	3.225	5.375	10.751
HP required	=	4.5	7.5	14.5
Number of Pumps	=	2	2	2

4 TIGER BIO FILTER DESIGN STATEMENT-TBF1- 50 KLD

Number of pumping hours	=	16	Hrs	
Number of BMF tanks provided	=	40	Nos	
Design flow to each tank	=	50.00	Cum/day	
	=	3.13	Cum/ Hr for 16 Hr	
	=	0.87	lps	
Inlet BOD	=	250.00	mg/l	
Inlet TSS	=	400.00	mg/l	
BOD load applied	=	12.5	kg/day	
BOD uptake rate	=	0.1	Kg of BOD / Kg of worms	(0.5 - 1.0)
Worms required	=	125	Kg worms	
Sewage application rate	=	1.85	Cum/Sqm/day	(1 - 2 Cum/Sqm/day)
Area required	=	27.03	Sqm	
Area Provided	=	28	Sqm	
Area of each crate	=	0.4	Sqm	
Number of crates	=	70	Nos	
say	=	72	Nos	
Crate in longitudinal direction	=	18	Nos	
Crate in travers direction	=	4	Nos	
crates provided	=	72	Nos	OK
Width provided	=	4.00	m	
Length required	=	11.00	m	
Depth provided	=	1.2	m	

5 TERTIARY TREATMENT UNIT

Design Considerations

Design flow	=	2.00	MLD
	=	2000.00	Cum/Day
Peak flow factor	=	3.00	

5.1 FILTER FEED TANK

Number of FFT provided	=	1	Nos
Number of operating hours	=	16	Hrs
Design flow	=	2000.00	Cum/Day
	=	125.00	Cum/Hr
	=	0.03472	Cum/Sec
Hydraulic Retention time	=	60	min
Volume required	=	125.00	Cum
Depth	=	3.00	m
Civil Tanks			
Area	=	41.67	Sqm

Length/Width required	=	6.46	m
Length/Width provided	=	6.50	m
Freeboard provided	=	0.50	m
Volume Provided		126.75	Cum

DESIGN STATEMENT-TTU E&M

Design Considerations

Design flow	=	2.00	MLD
	=	2000.00	Cum/Day
Peak flow factor	=	3.00	

Pumping machinery

Friction factor for Fittings in Pressure Mains

Elbow 90 degrees	=	10
Friction Factor for each	=	1
Friction factor for all	=	10
Elbow 45 degrees	=	0
Friction Factor for each	=	0.75
Friction factor for all	=	0
Elbow 22 degrees	=	0
Friction Factor for each	=	0.5
Friction factor for all	=	0
Tee 90 degrees	=	0
Friction Factor for each	=	1.5
Friction factor for all	=	0
Tee in straight pipe	=	10
Friction Factor for each	=	0.3
Friction factor for all	=	3
Gate valve open	=	1
Friction Factor for each	=	0.4
Friction factor for all	=	0.4
Swing check	=	1
Friction Factor for each	=	2.5
Friction factor for all	=	2.5
Total friction factor	=	15.9

Stage	low	ave	peak	
Average flow, cum / day	=	2000.00		
Proportion	=	0.6	2	
Design flow, cum / day	=	1200	4000	
Hazen Williams C	=	140	140	
Desired velocity, m/s	=	0.8	1.5	
Number of Pumping hours	=	16.0	16.0	
Area needed, sqm	=	0.0260	0.0347	0.0463
Dia needed, m	=	0.182	0.210	0.243
Dia needed, mm	=	182	210	243
Dia provided, mm (User)	=	225	225	225
Radius, m	=	0.113	0.113	0.113
Radius power 0.63	=	0.252	0.252	0.252
S power 0.54	=	0.027	0.033	0.050

S	=	0.001	0.002	0.004
Slope 1 in length, m	=	820.7	542.9	256.2
Friction in pipeline, m	=	45	45	45
Velocity head, m	=	0.1	0.1	0.2
Friction factor in fittings	=	0.033	0.051	0.115
Friction in fittings, m	=	15.9	15.9	15.9
Static lift, m	=	0.5	0.8	1.8
Total head, m	=	12.0	12.0	12.0
Efficiency of pumpset	=	12.5	12.8	13.8
Discharge, lps	=	0.8	0.8	0.8
Discharge, Cum/Hr	=	20.8	34.7	69.4
Kw required	=	75.0	125.0	250.0
HP provided	=	5.529	9.215	18.430
Number of Pumps	=	7.5	12.5	25.0
	=	2	2	2

5.2 PRESSURE SAND FILTER

Number of unit provided	=	4	Nos.
Designed @ 16 hrs working for flow of	=	31.25	m3/h
Loading rate	=	12.00	m3/m2/h
Area of DMF	=	2.60	m2
Dia of DMF	=	1.82	m
Provided	=	1.900	m
Backwash water			
Backwash velocity	=	15.00	m/hr
backwash flowrate	=	40.74	m3/h
Backwash volume for 20 mins	=	13.58	m3

5.3 ACTIVATED CARBON FILTER

Number of unit provided	=	4	Nos.
Designed @ 16 hrs working for flow of	=	31.25	m3/h
Loading rate	=	12.00	m3/m2/h
Area of ACF	=	2.60	m2
Dia of ACF	=	1.82	m
Provided	=	1.900	m
Backwash water			
Backwash velocity	=	15.00	m/hr
backwash flowrate	=	40.74	m3/h
Backwash volume for 20 mins	=	13.58	m3

5.4 CHLORINE DOSING SYSTEM NaOCl DOSING SYSTEM

Average Flow	=	125.00	m3/hr
Design Chlorine Dosage (Max)	=	3	mg/l
Concentration of Chlorine in commercially available NaOCl	=	10%	
Design NaOCl Dosage	=	30	mg/l

Operating hours	=	16.0	hr
Quantity of NaOCl required	=	$125 \times 30 \times 16 / 1000$	
	=	60.00	Kg/day
	=		
Design Strength of NaOCl Solution	=	100%	
Volume of NaOCl Solution	=	$60 / (1 \times 1000)$	
	=	0.060	m ³
	=		
No. of Dosing Tanks provided	=	1	Nos.
	=		
Volume of each Dosing Tank	=	$0.06 / 1$	
	=	0.06	m ³
	=		
	=	100	Litres
	=		
No. of Working NaOCl Dosing Pump provided	=	1	No.
Capacity of each NaOCl Dosing Pump required	=	$\frac{\text{Total Volume of NaOCl Solution}}{\text{(No. of Dosing pumps)}}$	
	=	$0.06 / (1 \times 16)$	
	=	0.004	m ³ /hr
	=		
	=	4.00	LPH
	=		
Capacity of each NaOCl Dosing Pump provided	=	4.00	LPH
	=		
No. of Standby NaOCl Dosing Pump provided	=	1	No.

SIZING DETAILS (CIVIL)
TIGER BIO FILTER OF 2000 KLD CAPACITY

S I. N o	Unit name	N o s	Leng th	Widt h	Height			Soling		PCC		Raft		RCC Wall thk	Bric k Wall thk	Slab Thk	Steel - HCR M/ Kg/C
					SW	FB	Tota	offs	Thk	offs	Thk	offs	Thk				
		N	m	m	m	m	m	m	m	m	m	m	m	m	m		
1	Screen Chamber	1	5.0	0.5	0.3	1.0	1.3	0.2	0.3	0.1	0.1	0.2	0.1	0.1		80	
2	Grit Chamber	1	6.0	1.3	0.9	1.3	2.2	0.2	0.3	0.1	0.1	0.2	0.2	0.1		80	
3	Raw Sewage Sump	1	7.5	7.5	3.0	1.3	4.3	0.2	0.3	0.1	0.1	0.2	0.4	0.3	0.2	100	
4	TBF Bed 50 KLD	4	11.0	4.0			1.2	0.2	0.3	0.1	0.1	0.2	0.1		0.2	60	
5	Filter Feed tank	1	6.5	6.5	3.0	0.5	3.5	0.2	0.3	0.1	0.1	0.2	0.4	0.3	0.2	100	
6	Filter Platform	1	9.2	5.0				0.2	0.3	0.1	0.1	0.2	0.1			80	

Assumptions

Incoming Sewer Invert 1.0 m Below Ground level
Method of excavation Mechanical means

Underground strata		soil	Muru m	Soft roc	hard	Total
0.0 to 1.5 m	=	25	25	25	25	100
1.5 m to 3.0 m	=	25	25	25	25	100
3.0 to 4.5 m	=	25	25	25	25	100
4.5 to 6.0	=	25	25	25	25	100

**TIGER BIO FILTER OF 2000 KLD CAPACITY
BILL OF QUANTITIES**

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
1	Excavation for foundation / pipe trenches in earth, soils of all types, sand, gravel and soft murum, including removing the excavated material upto a distance of 50 metres and lifts as below, stacking and spreading as directed, normal dewatering, preparing the bed for foundation and excluding backfilling, etc. complete. (Bd-A-1/259)				
	0.0 to 1.5 m	466.46	Cum	150.00	69,969.00
	1.5 to 3.0 m	85.57	Cum	164.00	14,033.50
	3.0 to 4.5 m	67.54	Cum	178.00	12,022.20
	4.5 to 6.0 m	14.12	Cum	192.00	2,711.10
	MJP/ SSR/ 2021-22 / Section E / Excavation Item No.1/ Page no. 42				
2	Excavation for foundation / pipe trenches in hard murum and boulders, W.B.M. road including removing the excavated material upto a distance of 50 M beyond the area and lifts as below, stacking and spreading as directed by Engineer-in-charge, normal dewatering, preparing the bed for foundation and excluding backfilling, etc. complete. (Bd-A-3/259)			8.00	
	0.0 to 1.5 m	466.46	Cum	192.00	89,560.40
	1.5 to 3.0 m	85.57	Cum	206.00	17,627.50
	3.0 to 4.5 m	67.54	Cum	220.00	14,858.80
	4.5 to 6.0 m	14.12	Cum	234.00	3,304.10
	MJP/ SSR/ 2021-22/ Section E/ Excavation Item No.3, Page no. 42				
3	Excavation for foundation / pipe trenches in soft rock and old cement and lime masonry foundation asphalt road including removing the excavated material upto a distance of 50 M beyond the area and lifts as below, stacking as directed by Engineer-in-charge, normal dewatering, preparing the bed for foundation and excluding backfilling, etc. complete. (Bd-A- 4/259)				
	0.0 to 1.5 m	466.46	Cum	572.00	266,815.20
	1.5 to 3.0 m	85.57	Cum	597.00	51,085.30
	3.0 to 4.5 m	67.54	Cum	622.00	42,009.90
	4.5 to 6.0 m	14.12	Cum	647.00	9,135.70
	MJP/ SSR/ 2021-22 / Section E/ Excavation Item No.5, Page no. 42				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
4	Excavation for foundation / pipe trenches in hard rock and concrete road by chiselling, wedging, line drilling by mechanical means or by all means other than blasting including trimming and levelling the bed, removing the excavated material upto a distance of 50 metres beyond the area and lifts as below, stacking as directed by Engineer-in-charge, normal dewatering, excluding backfilling, etc. complete by all means. (Bd-A-6/259)				
	0.0 to 1.5 m	466.46	Cum	1,017.00	474,389.90
	1.5 to 3.0 m	85.57	Cum	1,042.00	89,164.00
	3.0 to 4.5 m	67.54	Cum	1,067.00	72,065.20
	4.5 to 6.0 m	14.12	Cum	1,092.00	15,419.10
	MJP/ SSR/ 2021-22 / Section E/ Excavation Item No.7, Page no. 43				
5	Providing dry trap/ granite/ quartzite/ gneiss, rubble stone soling in 15 cm to 20 cm thick layers including hand packing and compacting, etc. complete. (Bd-A-12/264)	884.81	Cum	1,175.00	1,039,651.80
	MJP/ SSR/ 2021-22 / Section E/ Excavat				
6	Providing and laying in situ Cement Concrete M- 15 of trap/ granite / quartzite / gneiss metal for foundation and bedding including bailing out water, form work, compaction, curing, etc. complete. (Cement 5.90 bags / cum) Spec. No. - Bd E /1 Page No. 287 and B- 7, Page No. 38	266.11	Cum	5,640.00	1,500,860.40
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.1, Page no.49				
7	Providing and laying in situ Cement Concrete of trap/ granite / quartzite / gneiss metal for RCC work in foundation like raft, grillage, strip foundation and footing of RCC columns and steel stanchions including normal dewatering, form work, compaction, finishing and curing, etc. complete. (By weigh batching and mix design for M250 and M-300 only. Use of L&T, A.C.C., Ambuja, Birla Gold, Manikgad, Rajashree, etc. cement is permitted.) (Excluding M.S. or Tor reinforcement)	292.66	Cum	7,448.00	2,179,731.70
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE/ Item No.2, Page no. 49				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
8	Providing and casting in situ C.C. of trap / granite/ quartzite / gneiss metal of approved quality for RCC works as per detailed drawings and designs or as directed by Engineer-in- charge including normal dewatering, centering, form work, compaction, finishing the formed surfaces with C.M. 1:3 of sufficient minimum thickness to give a smooth and even surface wherever necessary or roughening if special finish is to be provided and curing, etc. complete. (By weigh batching and mix design for M-250 and M-300 only. Use of L&T, A.C.C., Ambuja, Birla Gold, Manikgad, Rajashree, etc. cement is permitted.) (Excluding M.S. or Tor reinforcement)	5.04	Cum	8,624.00	43,465.00
	For Beams / Braces / Lintels In RCC M-300				
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.4, Page no. 50				
9	Providing and casting in situ C.C. of trap / granite/ quartzite / gneiss metal of approved quality for RCC works as per detailed drawings and designs or as directed by Engineer-in- charge including normal dewatering, centering, form work, compaction, finishing the formed surfaces with C.M. 1:3 of sufficient minimum thickness to give a smooth and even surface wherever necessary or roughening if special finish is to be provided and curing, etc. complete. (By weigh batching and mix design for M-250 and M-300 only. Use of L&T, A.C.C., Ambuja, Birla Gold, Manikgad, Rajashree, etc. cement is permitted.) (Excluding M.S. or Tor reinforcement)	22.00	Cum	9,247.00	203,434.00
	Slabs / Landings / Vertical Walls / Waist Slabs / Steps for Staircase In RCC M-300				
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.5, / Page no. 50				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
10	Providing and casting in situ C.C. of trap / granite/ quartzite / gneiss metal of approved quality for RCC works as per detailed drawings and designs or as directed by Engineer-in- charge including normal dewatering, centering, form work, compaction, finishing the formed surfaces with C.M. 1:3 of sufficient minimum thickness to give a smooth and even surface wherever necessary or roughening if special finish is to be provided and curing, etc. complete. (By weigh batching and mix design for M-250 and M-300 only. Use of L&T, A.C.C., Ambuja, Birla Gold, Manikgad, Rajashree, etc. cement is permitted.) (Excluding M.S. or Tor reinforcement)	76.37	Cum	9,218.00	703,978.70
	Chajjas / Parapets / Curtain Walls /Partition Walls / Pardies In RCC M-300				
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.6 / Page no. 51				
11	Providing and fixing in position steel bar reinforcement of various diameters for RCC piles, caps, footings, foundations, slabs, beams, columns, canopies, staircases, newels, chajjas, lintels, pardies, copings, fins, arches, etc. as per detailed designs, drawings and schedules; including cutting, bending, hooking the bars, binding with wires or tack welding and supporting as required, etc. complete (including cost of binding wire). (Bd-F-17/306)				
	c) Corrosion Resistant Steel (Fe 500)	30.25	MT	70,658.00	2,137,404.50
	MJP/ SSR/ 2021-22 / SECTION - G : PLAIN REINFORCED CEMENT CONCRETE, READY MIX CONCRETE Item No.8 / Page no. 52				
12	Providing and fixing mild steel grill work for windows/ ventilators of 20 Kg/Sqm. As per drawings including necessary welding and painting with one coat of anticorrosive paint and two coats of oil painting, etc. complete. (Bd-U- 1/537)	19.46	Sqm	1,895.00	36,876.70
	MJP/ SSR/ 2021-22 / SECTION - F : IRON AND STRUCTURAL STEEL WORK Item No.1 / Page				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
13	Providing structural steel work in rolled stanchions fixed with connecting plates or angle cleats as in main and cross beams, hip and jack rafters, purlins connecting to truss members and like as per detailed designs and drawings or as directed by Engineer-in-charge including cutting, fabricating, hoisting, erecting, fixing in position, making riveted / bolted / welded connections and one coat of anticorrosive paint and over it two coats of oil painting, etc. complete. (Bd-C- 3/275)	29.88	MT	71,286.00	2,130,139.80
	MJP/ SSR/ 2021-22 / SECTION - F :: IRON AND STRUCTURAL STEEL WORK Item No.3,				
14	Providing and fixing corrugated galvanised iron sheets of 0.63 mm thick (24B .W .G.) for roofing without wind tiles including fastening with galvanised iron screws and bolts , lead and bitumen washers as per drawing etc. complete. (Weight of 5.5 kg/sq.m.).	3016.00	Sqm	777.00	2,343,432.00
	PWD / SSR 2020-21 / Roofing and Ceiling SSR Item No.38.04 Reference No. Bd.R.5, Page No. 453 Item No.1133, Page no. 224				
15	Providing fly ash brick masonry with conventional / I.S. type bricks in cement mortar 1:6 in superstructure including striking joints, raking out joints, watering and scaffolding etc. Complete	594.80	Cum	6,305.00	3,750,214.00
	PWD / SSR 2020-21 / Brick Masonry SSR Item No.27.13 Reference No. As director by engineer incharge and BDG- 2 and 5 Item No.893, Page no. 190				
16	Providing internal cement plaster 12 mm thick in single coat in cement mortar 1:5 without neeru finish to concrete or brick surfaces, in all positions including scaffolding and curing etc. complete.	3266.00	Sqm	257.00	839,362.00
	PWD / SSR 2020-21 / Plastering and Pointing SSR Item No. 32.03 Reference No. Bd. L.2 Page No. 368 Item No.950, Page no. 201				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
17	Providing rough cast cement plaster externally in two coats to concrete, brick or stone masonry surfaces in all positions with base coat of 12 to 15 mm thick in C.M. 1:4 and rough cast treatment 12 mm thick in proportion 1:11 / 2:3 including scaffolding and fourteen days curing complete.	1900.00	Sqm	529.00	1,005,100.00
	PWD / SSR 2020-21 / Plastering and Pointing SSR Item No. 32.12 Reference No. Bd.L.8 Page No. 370 Item No.957, Page no. 201				
18	Providing and applying white-wash in two coats on old / new plastered or masonry surfaces and asbestos cement sheets including scaffolding and preparing the surface by brushing and brooming down etc. complete.	1900.00	Sqm	10.00	19,000.00
	PWD / SSR 2020-21 / Colouring SSR Item No. 36.03 Reference No. Bd. P. I Page No. 411				
19	Providing and applying colour-wash of approved colour and shade in one coat to new surface including scaffolding, brushing and brooming down (excluding base coats of white wash) etc. complete.	1900.00	Sqm	8.00	15,200.00
	PWD / SSR 2020-21 / Colouring SSR Item No. 36.04 Reference No. Bd. P.2 Page No. 412				
20	Dewatering the excavated trenches and pools of water in the building trenches / pipeline trenches, well works by using pumps and other devices including disposing off water to safe distance as directed by Engineer-in-charge (including cost of machinery, labour, fuel), etc. complete. (Bd-A-9/261)	280.00	HP/ Hr.	77.00	21,560.00
	MJP/ SSR/ 2021-22 / Section E/ Excava				
21	Refilling the trenches with available excavated stuff with soft material first over pipeline and then hard material in 15 cm layers with all leads and lifts including consolidation, surcharging, etc. complete.	617.37	Cum	84.00	51,859.10
	MJP/ SSR/ 2021-22 / Section E/ Excava				
22	Transportation as per STATEMENT VI Including loading, unloading and stacking Earth (4.8 Cum) lead 15 Km	2683.73	Cum	604.45	1,622,180.60

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
	Electromechanical Items				
23	Screen (Manual) of size 1.8 m length x 0.5 m width of SS 304 MOC and Manual hand rake for cleaning screen of SS handle 1 m in length and cleaning area of 6 nos 5 mm SS rod of total length 200 mm straight and 50 mm of 90 degree bend.	0.90	Sqm	35,000.00	31,500.00
24	Grit pump				
	Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below				
	MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION - Pumps, Page no. 6, 7 of size 1.8 m length				
	1 HP (Up to 9000 LPH)	1.00	No	68,654.00	68,654.00
25	Raw Sewage Pumps				
	Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below				
	MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION -				
	15 HP (Up to 132000 LPH)	2.00	Nos	184,154.00	368,308.00
26	TTU Feed pumps				
	Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below				
	MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION -				
	15 HP (Up to 132000 LPH)	2.00	Nos	184,154.00	368,308.00
27	Pressure Sand Filter of FRP / MSEP vessel with suitable thickness to withstand a water pressure including MPV or 5 Valve system and PVC / UPVC / MSEP interconnecting and underdrain piping including fittings, with standard filter media layer with minimum depth of filter sand 1.0 m supported by gravels. The piping arrangement should provide sufficient pressure for backwash operations and avoid loss of sand during backwash operation. Suitable openings to be provided to ease addition and removal the media.				
	Dia 1.9 m x 2 m minimum height	4.00	Nos	620,000.00	2,480,000.00

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
28	Activated Carbon Filter of FRP / MSEP vessel with suitable thickness to withstand a water pressure including MPV or 5 Valve system and PVC / UPVC / MSEP interconnecting and underdrain piping including fittings, with standard filter media layer with minimum depth of Activated Carbon 1.0 m supported by gravels. The piping arrangement should provide sufficient pressure for backwash operations and avoid loss of Activated carbon during backwash operation. Suitable openings to be provided to ease addition and				
	Dia 1.9 m x 2 m minimum height	4.00	Nos	620,000.00	2,480,000.00
29	NaOCl Chlorinator Pump Diaphragm Type / peristaltic type / Solenoid Max Flow Rate Upto 10LPH Power Source Electric Phase Single Material PP / PTFE(Teflon) Voltage 230 Volt Frequency				
	Mixing Tank of 100 Ltrs capacity	100.00	Ltrs	8.00	800.00
	Dosing Pump	2.00	Nos	15,000.00	30,000.00
30	Control Panel				
	Design, Supply, Installing, Commissioning & Testing of Master PLC control monitoring and communication panel as per IEC 61131 at Pure Water Sump suitable for monitoring and control of pure water Pumps. Pressure Transmitters, Level Transmitter, PH Transmitter, Turbidity Transmitter ,for all pumps installed.	1.00	No	50,041.00	50,041.00
	MJP/ MECH/ ELECT / SSR/ 2021-22/ SECTION 19 - SA [SCADA & AUTOMATION]				
31	Supplying and erecting Fully Automatic Star Delta starter to operate squirrel cage induction motor working on 380- 440 Volt, 3 phase, 50 Hz with no volt coil, over load element, and ON - OFF push buttons, with necessary material and connected to supply, etc complete. Starter with original sheet steel encloser.				
	> 12.5 HP & Up to 20 HP	6.00	nos	8,696.00	52,176.00

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
	MJP /MECH/ ELECT/ SSR/ 2021-22 SECTION 10 - LG [L.T. SWITCHGEAR AND PROTECTION] Item no. LG 3 Page no. 27				
32	Main power supply cable				
	3 core PVC insulated, PVC sheathed copper conductor flat submersible cable				
	Supplying and erecting, Flat flexible submersible cable with, Copper Conductor, PVC insulated, and PVC sheathed.				
	3 core 16 sq mm	40.00	m	549.00	21,960.00
33	Power cables				
	Aluminium conductor 4 Core, XLPE / PVC insulated & armoured cable				
	Supplying and erecting, XLPE / PVC insulated, armoured cable 1100 V grade with ISI mark Four core, solid / stranded aluminium conductor with 6 mm thick 25 mm width M.S. spacer with G.I. Earth wire 6 sq mm, complete erected on wall / on pole with 25 X 3 mm M.S. clamps or in provided trench in an approved				
	4 Core 6 sq mm	240.00	m	137.00	32,880.00
	MJP MECH/ ELECT/ SSR/ 2021-22 SECTION 12 - CB [L.T. CABLE] Item no. CB 6 Page				
34	Control Cables				
	Copper conductor PVC insulated, Unarmoured control cable				
	Supplying and erecting Un-armoured control cable with ISI mark stranded / solid copper conductor 1.1 kV grade complete erected on wall / panel or in provided trench in an approved manner.				
	4 core 2.5 sq mm	240.00	m	137.00	32,880.00
	MJP MECH/ ELECT/ SSR/ 2021-22/ SECTION 12 - CB [L.T. CABLE] Item no. CB 8-				

Plumbing Items					
Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
35	Providing and supplying in standard lengths ISI mark rigid unplasticised PVC pipes suitable for potable water with solvent cement joints including cost of couplers, as per IS specification no. 4985 / 1988 excluding GST levied by GOI and GOM in all respect, including transportation, freight charges, inspection charges, loading, unloading, conveyance to the departmental stores and stacking the same in closed shed duly protected from sun rays and rains including cost of jointing material i.e. solvent cement, etc. complete (selffit type to be jointed with cement solvent).				
	1) 10% of cost of pipes shall be considered for cost of PVC specials for estimate purpose only. 2) One coupler and required cement solvent shall be provided with each full length pipe				
	MJP/ SSR/ 2021-22 / SECTION – I(II) P.V.C. PIPES, Page no.77				
1	Raw Sewage pump to TBF Distribution				
a	Main header				
	225 mm.	100.00	m	1,969.00	196,900.00
	PVC Specials- 10%				19,690.00
b	Distribution				
	160 mm.	150.00	m	906.00	135,900.00
	PVC Specials- 10%				13,590.00
2	TBF collection to FFT (gravity)				
a	Main header				
	160 mm.	275.00	m	906.00	249,150.00
	PVC Specials- 10%				24,915.00
b	collection tributary				
	75 mm.	75.00	m	211.00	15,825.00
	PVC Specials- 10%				1,582.50
3	TTU Plumbing				
	225 mm.	45.00	m	1,969.00	88,605.00
	PVC Specials- 10%				8,860.50
4	TBF distribution				
	75 mm.	200.00	m	211.00	42,200.00
	PVC Specials- 10%				4,220.00
36	Labour				
	Plumber	60.00	days	641.00	38,460.00
	Helper	120.00	days	579.00	69,480.00

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
	MJP/ SSR/ 2021-22 / SECTION - B LABOUR & MACHINERY , Page no. 14				
37	Providing double flange sluice valve confirming for IS- 14846 including worn gear arrangements as per test pressure, stainless steel spindle, caps, including inspection charges, transportation upto departmental store, unloading, stacking excluding GST levied by GOI & GOM in all respect etc. complete.				
	Sluice valves - PN -1 (Without by pass)				
	Raw Sewage pump				
	250 mm.	2.00	Nos	28,727.00	57,454.00
	Filter Feed Pump				
	250 mm.	2.00	Nos	28,727.00	57,454.00
	MJP/ SSR/ 2021-22 / SECTION - I(XII) : PIPES APPURTENANCES , Page no. 132				
38	Providing and supplying ISI mark CI D/F reflux valves (non-return valves) of following dia including railway freight, inspection charges, unloading from railway wagon, loading into truck, transportation upto departmental stores, unloading, stacking excluding GST levied by GOI & GOM in all respect etc. complete. Reflux valves as per I.S.5312 Part I (1984)				
	Without by pass arrangement -PN -1				
	Raw Sewage pump				
	250 mm.	2.00	Nos	30,294.00	60,588.00
	Filter Feed Pump				
	250 mm.	2.00	Nos	30,294.00	60,588.00
	MJP/ SSR/ 2021-22 / SECTION - I(XII) : PIPES APPURTENANCES , Page no. 131				
	Bio media Items				
39	Supplying of Specially designed container for holding Filter media including Lightweight Expanded Clay Aggregates size (8-30 mm) and Bio media including mixture of woodchips Vermicompost, cocopeat and bacterial culture with special worms per designed quantity including transportation & fixing in position as directed etc. complete.	2880.00	Nos	4,750.00	13,680,000.00
	Market rate				
40	Rapid sand Gravity filter sand At Source (Godhara, Gokak, Kanhan,	273.95	Cum	1,730.00	473,933.50
	MJP/ SSR/ 2021-22 / SECTION- A MATERIALS				

Sr. No.	Item Description	Qty	Unit	Rate	Amount (Rs.)
41	Trasnsportation Godhara to Pune distance by Road 660 Km.	273.95	Cum	11,031.37	3,022,043.90
	MJP/ SSR/ 2021-22 / SECTION - C : TRANSPORTATION Page no.				
42	Stone Aggregate 20 mm	273.95	Cum	900.00	246,555.00
	MJP/ SSR/ 2021-22 / SECTION- A MATERIALS				
43	Transportation as per STATEMENT VI Including loading, unloading and stacking				
	Manure or sludge (5.52 Cum) lead 25 Km	1058.00	Cum	747.48	790,833.90
	MJP/ SSR/ 2021-22 / SECTION - C : TRANSPORTATION Page no.				
NET TOTAL Rs.					46,263,956.50

MEASUREMENT SHEET - SCREEN CHAMBER, GRIT CHAMBER AND RAW SEWAGE SUMP

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	Short Wall	2	0.80	0.15	1.50	0.36	Cum
				Total for screen		2.75	Cum
	Grit						
	Long Wall (extra than screen chamber)	1	1.00	0.15	2.40	0.36	Cum
	Short Wall	2	1.30	0.15	2.40	0.94	Cum
				Total for grit		1.3	Cum
6	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	80	Cum	6.73	0.54	MT
7	Fabrication work in Frame and Grating for Access						
	Screen	1	5.30	0.80		4.24	Sqm
	Grit	1	6.30	1.45		9.14	Sqm
					Total	13.38	Sqm
8	Removing excess excavated material out of site						
	Screen chamber	1	5.30	0.80	1.30	5.52	Cum
	Grit Chamber	1	6.30	1.30	2.20	18.02	Cum
	soling, PCC, Raft volume					9.83	Cum
	Total Volume					33.37	Cum
	bulkage @ 40%					46.72	Cum
9	Refilling and compaction						
	Total Excavation					93.75	Cum
	Deduction for tank volume, soling, PCC, Raft					33.37	Cum
	Refilling and compaction volume					60.38	Cum

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	Raw Sewage Sump						
1	Excavation				5.10		
A	0.0 to 1.5 m	1	11.7	11.70	1.5	205.34	Cum
	soil					51.34	Cum
	Murum					51.34	Cum
	Soft rock					51.34	Cum
	hard rock					51.34	Cum
B	1.5 to 3.0 m	1	10.70	10.70	1.5	171.74	Cum
	soil					42.94	Cum
	Murum					42.94	Cum
	Soft rock					42.94	Cum
	hard rock					42.94	Cum
C	3.0 to 4.5 m	1	10.70	10.70	1.5	171.74	Cum

MEASUREMENT SHEET - SCREEN CHAMBER, GRIT CHAMBER AND RAW SEWAGE SUMP

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	soil					42.94	Cum
	Murum					42.94	Cum
	Soft rock					42.94	Cum
	hard rock					42.94	Cum
D	4.5 to 6.0 m	1	9.70	9.70	0.6	56.46	Cum
	soil					14.12	Cum
	Murum					14.12	Cum
	Soft rock					14.12	Cum
	hard rock					14.12	Cum
2	Soling						
	RSS	1	9.10	9.10	0.30	24.85	Cum
3	PCC M20						
	RSS	1	8.70	8.70	0.10	7.57	Cum
4	Raft M30						
	RSS	1	8.50	8.50	0.40	28.9	Cum
5	RCC Wall						
	Long Wall	2	8.10	0.30	4.50	21.87	Cum
	Short Wall	2	7.50	0.30	4.50	20.25	Cum
					Total	42.12	Cum
6	Beams						
	Beam 1	3	7.50	0.2	0.3	1.35	Cum
	Beam 2	3	7.50	0.2	0.3	1.35	Cum
					Total	2.7	Cum
7	Slab	1	8.10	8.10	0.2	13.13	Cum
	Deduction for manhole	-2	2.20	1.00	0.2	-0.88	Cum
					Total	12.25	Cum
8	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	100	Cum	85.97	8.6	MT
9	Fabrication work in Frame and Grating for Access						
	RSS	2	2.20	1.00		4.4	Sqm
10	Removing excess excavated material out of site						
	RSS	1	8.10	8.10	4.30	282.13	Cum
	soling, PCC, Raft volume					61.32	Cum
	Total Volume					343.45	Cum
	bulkage @ 40%					480.83	Cum
11	Refilling and compaction						

MEASUREMENT SHEET - SCREEN CHAMBER, GRIT CHAMBER AND RAW SEWAGE SUMP

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	Total Excavation					605.28	Cum
	Deduction for tank volume, soling, PCC, Raft					343.45	Cum
	Refilling and compaction volume					261.83	Cum
12	Dewatering						
	35 Days x 4 hours/day	days	35	hours / day	4	140	Hrs

MEASUREMENT SHEET - TIGER BIO FILTER

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	TIGER BIO FILTER						
1	Excavation				0.50		
A	0.0 to 1.5 m	1	12.66	5.66	0.5	35.83	Cum
	soil					8.96	Cum
	Murum					8.96	Cum
	Soft rock					8.96	Cum
	hard rock					8.96	Cum
2	Soling						
	TBF	1	12.46	5.46	0.30	20.41	Cum
3	PCC M20						
	TBF	1	12.06	5.06	0.10	6.11	Cum
4	Raft M30						
	TBF	1	11.86	4.86	0.10	5.77	Cum
5	Brick Wall						
	TBF						
	Long Wall	2	11.46	0.23	1.20	6.33	Cum
	Short Wall	2	4.00	0.23	1.20	2.21	Cum
	Crate Support Wall	5	11.00	0.23	0.50	6.33	Cum
						Total for T	14.87
							Cum
6	Plaster						
	Internal						
	Crate Support Wall						
	Long Wall	6	11.00		0.50	33	Sqm
	Wall top	5	11.00		0.23	12.65	Sqm
	Long Wall	2	11.00		1.20	26.4	Sqm
	Short Wall	2	4.00		1.20	9.6	Sqm
						Total	81.65
							Sqm
	External						
	Long Wall	2	11.46		1.20	27.51	Sqm
	Short Wall	2	4.46		1.20	10.71	Sqm
	Wall Top	1	30.92	0.3		9.28	Sqm
						Total	47.50
							Sqm
7	External-white-wash	1				47.50	Sqm
8	External-colour-wash	1				47.50	Sqm
9	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	60	Cum	5.77	0.35	MT
10	Removing excess excavated material out of site						
	soling, PCC, Raft volume					32.29	Cum
	Total Volume					32.29	Cum
	bulkage @ 40%					45.21	Cum

MEASUREMENT SHEET - TIGER BIO FILTER

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
11	Refilling and compaction						
	Total Excavation					35.83	Cum
	Deduction for tank volume, soling, PCC, Raft					32.29	Cum
	Refilling and compaction volume					3.54	Cum
12	MS Fabricated Shed						
	TBF-II Shed in Fabrication work Shed Size-12 m X 5 m x 3 m		12.00	5.00	3.00		
	for column 50*50*5 Unit Weight 6.97 kg/m	10	3.00	6.97	kg/m	209.10	KG
	for truss 50*50*3 Unit Weight 3.71 kg/m	5	5.00	3.71	kg/m	92.75	KG
	for principle rafter 50*50*3 Unit Weight	10	2.90	3.71	kg/m	107.59	KG
	for strut rafter 50*50*3 Unit Weight 3.71 kg/m	10	0.20	3.71	kg/m	7.42	KG
	for central strut rafter 50*50*3 Unit Weight	5	0.30	3.71	kg/m	5.57	KG
	for bottom frame below truss 50*50*3 Unit Weight 3.71 kg/m	1	34.00	3.71	kg/m	126.14	KG
	for perlin 30*30*3 Unit Weight 2.51 kg/m	5	13.00	2.51	kg/m	163.15	KG
	for Base Plate 150*150*10 mm	20	0.15	0.15	0.010	35.33	KG
					Total Wei	747.04	Kg
						0.75	MT
13	corrugated galvanised iron sheets	2	13.00	2.90		75.4	Sqm

MEASUREMENT SHEET - FILTER FEED TANK

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
8	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	100	Cum	64.79	6.48	MT
9	Fabrication work in Frame and Grating for Access						
	FFT	2	1.20	0.70		1.68	Sqm
10	Removing excess excavated material out of site						
	FFT	1	7.10	7.10	3.50	176.44	Cum
	soling, PCC, Raft volume					48.12	Cum
	Total Volume					224.56	Cum
	bulkage @ 40%					314.39	Cum
11	Refilling and compaction						
	Total Excavation					366.5	Cum
	Deduction for tank volume, soling, PCC, Raft					224.56	Cum
	Refilling and compaction volume					141.94	Cum
12	Dewatering						
	35 Days x 4 hours/day	days	35	hours/day	4	140	Hrs

MEASUREMENT SHEET - FILTER PLATFORM

Sr. No.	Item Description	Nos.	L (m)	B (m)	H (m)	Quantity	Unit
	FILTER PLATFORM						
1	Excavation				0.55		
A	0.0 to 1.5 m	1	10.4	6.20	0.55	35.47	Cum
	soil					8.87	Cum
	Murum					8.87	Cum
	Soft rock					8.87	Cum
	hard rock					8.87	Cum
2	Soling						
	Filter Platform	1	10.20	6.00	0.30	18.36	Cum
3	PCC M20						
	Filter Platform	1	9.80	5.60	0.10	5.49	Cum
4	Raft M30						
	Filter Platform	1	9.60	5.40	0.15	7.78	Cum
5	Steel - HCRM / CRS @ Kg/Cum	Kg/Cum	80	Cum	7.78	0.63	MT
6	Removing excess excavated material out of site						
	soling and PCC volume					23.85	Cum
	Total Volume					23.85	Cum
	bulkage @ 40%					33.39	Cum
7	Refilling and compaction						
	Total Excavation					35.47	Cum
	Deduction for tank volume, soling, PCC, Raft					23.85	Cum
	Refilling and compaction volume					11.62	Cum

MEASUREMENT SHEET - ELECTROMECHANICAL WORKS

Sr. No.	Item Description	Nos.	Unit
1	Screen (Manual) of size 1.8 m length x 0.5 m width of SS 304 MOC and Manual hand rake for cleaning screen of SS handle 1 m in length and cleaning area of 6 nos 5 mm SS rod of total length 200 mm straight and 50 mm of 90 degree bend.	1	No
2	Grit pump Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION - Pumps, Page no. 6, 7 of size 1.8 m length x 0.5 m width of SS304 MOC 1 HP (Up to 9000 LPH)	1	No
3	Raw Sewage Pumps Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION - Pumps, Page no. 6, 7 15 HP (Up to 132000 LPH)	2	Nos
4	TTU Feed pumps Supplying Non-clog Submersible Pump suitable for sewage/ Liquid waste application with standard MOC and given duty points as below MJP/ MECH/ ELECT/ SSR/ 2021-22 SECTION - Pumps, Page no. 6, 7 15 HP (Up to 132000 LPH)	2	Nos
5	Pressure Sand Filter of FRP / MSEP vessel with suitable thickness to withstand a water pressure including MPV or 5 Valve system and PVC / UPVC / MSEP interconnecting and underdrain piping including fittings, with standard filter media layer with minimum depth of filter sand 1.0 m supported by gravels. The piping arrangement should provide sufficient pressure for backwash operations and avoid loss of sand during backwash operation. Suitable openings to be provided to ease addition and removal the media. Dia 1.9 m x 2 m minimum height	4	Nos
6	Activated Carbon Filter of FRP / MSEP vessel with suitable thickness to withstand a water pressure including MPV or 5 Valve system and PVC / UPVC / MSEP interconnecting and underdrain piping including fittings, with standard filter media layer with minimum depth of Activated Carbon 1.0 m supported by gravels. The piping arrangement should provide sufficient pressure for backwash operations and avoid loss of Activated carbon during backwash operation. Suitable openings to be provided to ease addition and removal the media. Dia 1.9 m x 2 m minimum height	4	Nos
7	PurAll Tablet Chlorinator + cartridge	0	nos

MEASUREMENT SHEET - ELECTROMECHANICAL WORKS

Sr. No.	Item Description	Nos.	Unit
7	NaOCl Chlorinator Pump Diaphragm Type / peristaltic type / Solenoid Max Flow Rate Upto 10LPH Power Source Electric Phase Single Material PP / PTFE(Teflon) Voltage 230 Volt Frequency 50Hz		
a	Mixing Tank of 100 Ltrs capacity	1	Nos
b	Dosing Pump	2	Nos
8	Control Panel		
	Design, Supply, Installing, Commissioning & Testing of Master PLC control monitoring and communication panel as per IEC 61131 at Pure Water Sump suitable for monitoring and control of pure water Pumps. Pressure Transmitters, Level Transmitter, PH Transmitter, Turbidity Transmitter ,for all pumps installed.		
	Master PLC Panel	1	No
	MJP/ MECH/ ELECT / SSR/ 2021-22/ SECTION 19 - SA [SCADA & AUTOMATION] Item no. 2.7 Page no. 72		
9	Supplying and erecting Fully Automatic Star Delta starter to operate squirrel cage induction motor working on 380- 440 Volt, 3 phase, 50 Hz with no volt coil, over load element, and ON - OFF push buttons, with necessary material and connected to supply, etc complete. Starter with original sheet steel encloser.		
	> 12.5 HP & Up to 20 HP	6	nos
	1 nos extra starter considered as spare.		
	MJP /MECH/ ELECT/ SSR/ 2021-22 SECTION 10 - LG [L.T. SWITCHGEAR AND PROTECTION] Item no. LG 3 Page no. 27		
10	Main power supply cable		
	3 core PVC insulated, PVC sheathed copper conductor flat submersible cable		
	Supplying and erecting, Flat flexible submersible cable with, Copper Conductor, PVC insulated, and PVC sheathed.		
	3 core 16 sq mm	40	m
11	Power cables		
	Aluminium conductor 4 Core, XLPE / PVC insulated & armoured cable		
	Supplying and erecting, XLPE / PVC insulated, armoured cable 1100 V grade with ISI mark Four core, solid / stranded aluminium conductor with 6 mm thick 25 mm width M.S. spacer with G.I. Earth wire 6 sq mm, complete erected on wall / on pole with 25 X 3 mm M.S. clamps or in provided trench in an approved manner.		
	4 Core 6 sq mm	240	m
	MJP MECH/ ELECT/ SSR/ 2021-22 SECTION 12 - CB [L.T. CABLE] Item no. CB 6 Page no. 35		
12	Control Cables		
	Copper conductor PVC insulated, Unarmoured control cable		

MEASUREMENT SHEET - ELECTROMECHANICAL WORKS

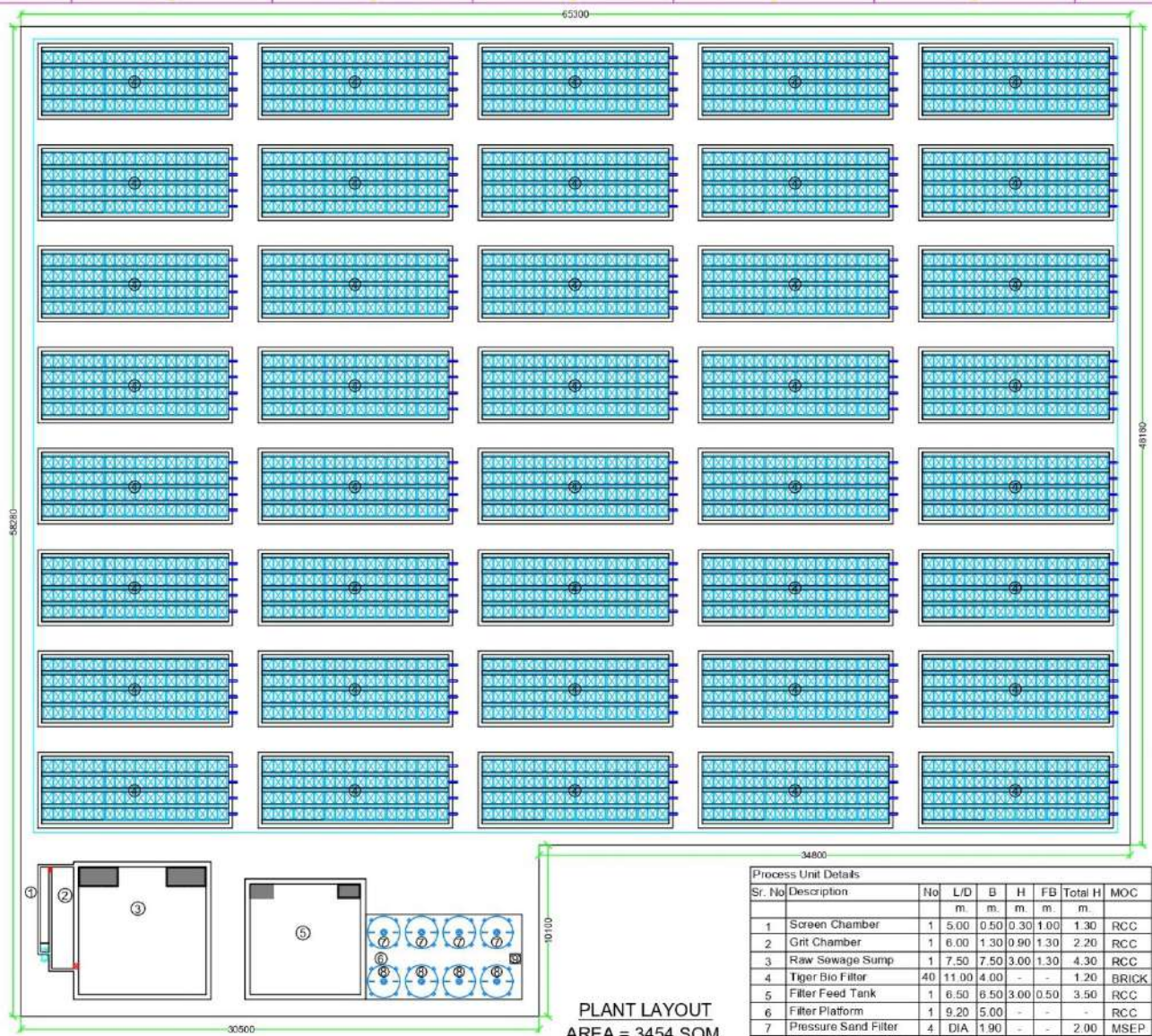
Sr. No.	Item Description	Nos.	Unit
	Supplying and erecting Un-armoured control cable with ISI mark stranded / solid copper conductor 1.1 kV grade complete erected on wall / panel or in provided trench in an approved manner.		
	4 core 2.5 sq mm	240	m
	MJP MECH/ ELECT/ SSR/ 2021-22/ SECTION 12 - CB [L.T. CABLE] Item no. CB 8-2 Page no. 36		

MEASUREMENT SHEET - PLUMBING

Sr. No.	Item Description	Nos.	L (m)	B (m)	Quantity	Unit
	Providing and supplying in standard lengths ISI mark rigid unplasticised PVC pipes suitable for potable water with solvent cement joints including cost of couplers, as per IS specification no. 4985 / 1988 excluding GST levied by GOI and GOM in all respect, including transportation, freight charges, inspection charges, loading, unloading, conveyance to the departmental stores and stacking the same in closed shed duly protected from sun rays and rains including cost of jointing material i.e. solvent cement, etc. complete (selffit type to be jointed with cement solvent).					
	1) 10% of cost of pipes shall be considered for cost of PVC specials for estimate purpose only. 2) One coupler and required cement solvent shall be provided with each full length pipe cost of which is included in rates below.					
	MJP/ SSR/ 2021-22 / SECTION – I(II) P.V.C. PIPES,					
1	Raw Sewage pump to TBF Distribution					
a	Main header	Dia	225			
	225 mm.	1	100		100	m
	PVC Specials- 10%					
b	Distribution					
	160 mm.	1	150		150	m
	PVC Specials- 10%					
2	TBF collection to FFT (gravity)					
a	Main header					
	160 mm.	1	275		275	m
	PVC Specials- 10%					
b	collection tributary					
	75 mm.	1	75		75	m
	PVC Specials- 10%					
3	TTU Plumbing	Dia	225			
	225 mm.	1	45		45	m
	PVC Specials- 10%					
4	TBF distribution			No. of beds		
	75 mm.	1	5	40	200	m
	PVC Specials- 10%					
5	Labour	Nos	Days			
	Plumber	6	10		60	days
	Helper	12	10		120	days
6	Sluice valves					

MEASUREMENT SHEET - PLUMBING

Sr. No.	Item Description	Nos.	L (m)	B (m)	Quantity	Unit
	Providing double flange sluice valve conforming for IS- 14846 including worn gear arrangements as per test pressure, stainless steel spindle, caps, including inspection charges, transportation upto departmental store, unloading, stacking excluding GST levied by GOI & GOM in all respect etc. complete.					
	MJP/ SSR/ 2021-22 / SECTION - I(XII) : PIPES APPURTENANCES , Page no. 132					
	Raw Sewage pump					
	250 mm.	2			2	Nos
	Filter Feed Pump					
	250 mm.	2			2	Nos
7	Reflux valves (non-return valves)					
	Providing and supplying ISI mark CI D/F reflux valves (non-return valves) of following dia including railway freight, inspection charges, unloading from railway wagon, loading into truck, transportation upto departmental stores, unloading, stacking excluding GST levied by GOI & GOM in all respect etc. complete. Reflux valves as per I.S.5312 Part I (1984)					
	MJP/ SSR/ 2021-22 / SECTION - I(XII) : PIPES APPURTENANCES , Page no. 131					
	Raw Sewage pump					
	250 mm.	2			2	Nos
	Filter Feed Pump					
	250 mm.	2			2	Nos



**PLANT LAYOUT
AREA = 3454 SQM.**

Process Unit Details								
Sr. No	Description	No	L/D	B	H	FB	Total H	MOC
			m.	m.	m.	m.	m.	
1	Screen Chamber	1	5.00	0.50	0.30	1.00	1.30	RCC
2	Grit Chamber	1	6.00	1.30	0.90	1.30	2.20	RCC
3	Raw Sewage Sump	1	7.50	7.50	3.00	1.30	4.30	RCC
4	Tiger Bio Filter	40	11.00	4.00	-	-	1.20	BRICK
5	Filter Feed Tank	1	6.50	6.50	3.00	0.50	3.50	RCC
6	Filter Platform	1	9.20	5.00	-	-	-	RCC
7	Pressure Sand Filter	4	DIA	1.90	-	-	2.00	MSEP
8	Activated Carbon Filter	4	DIA	1.90	-	-	2.00	MSEP
9	Chlorination Unit	1	-	-	-	-	-	-

PROJECT NAME :
2000 KLD SEWAGE TREATMENT PLANT
BASED ON TIGER BIO FILTER
TECHNOLOGY.

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 - The structural component and BOQ prepared considering Finished Ground Level (+00.00) and Existing Ground Level (+00.00). Temporary Bench Mark 1 (xxx.000) Kept on the Top level of Road on North East side of the site.
 - BIS Grade Cement to be used for all concrete and plastering applications.
 - All water treatment structure to be checked for water leakages.
 - This drawing should be read in conjunction with relevant detailed Design and Structural drawings. All dimensions shall be verified on site prior to commencement of work.
 - This Drawing is the property of TBF Environmental Solutions Pvt. Ltd. It is not to be copied or produced or handed over to third party or used for any other purpose other than which it is intended. This drawing together with any copies made by the recipient shall be returned on demand to us.

REVISION		
DATE	REMARKS	SIGNATURE

CLIENT : SWSM, MAHARASHTRA

DRAWING NAME :
PLANT LAYOUT

PROJECT CODE : TBF-	DRAWING NO : D-01/PL/01	DATE : JUNE-2021
DRAWN BY : L.D.B.	CHECKED BY : S.B.	SCALE : NTS.

TBF
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Web : www.tbfenvironmental.in

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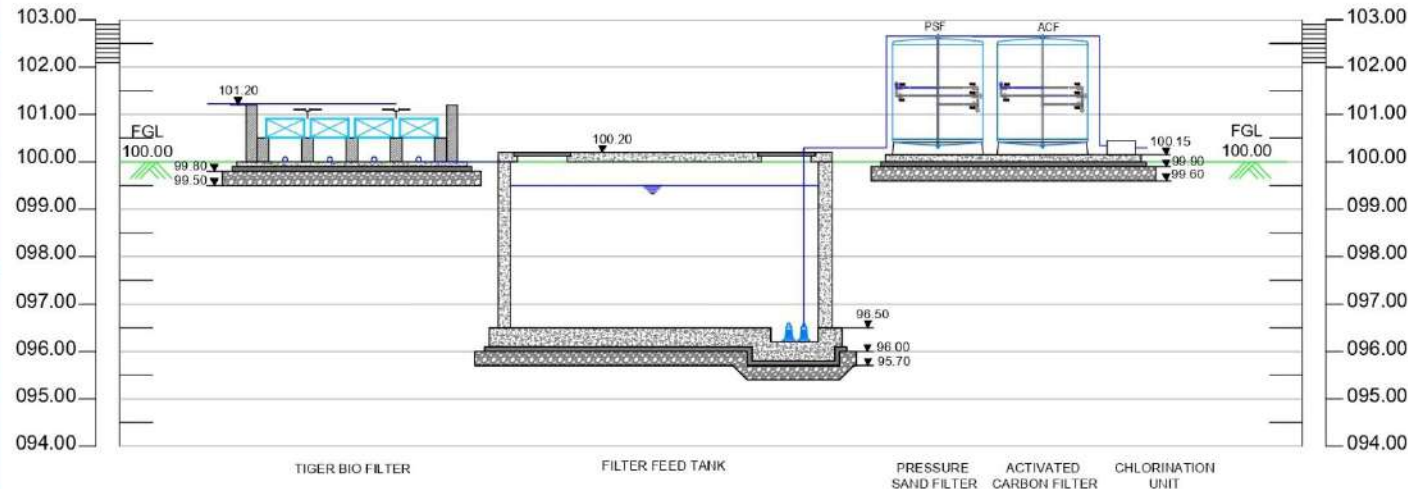
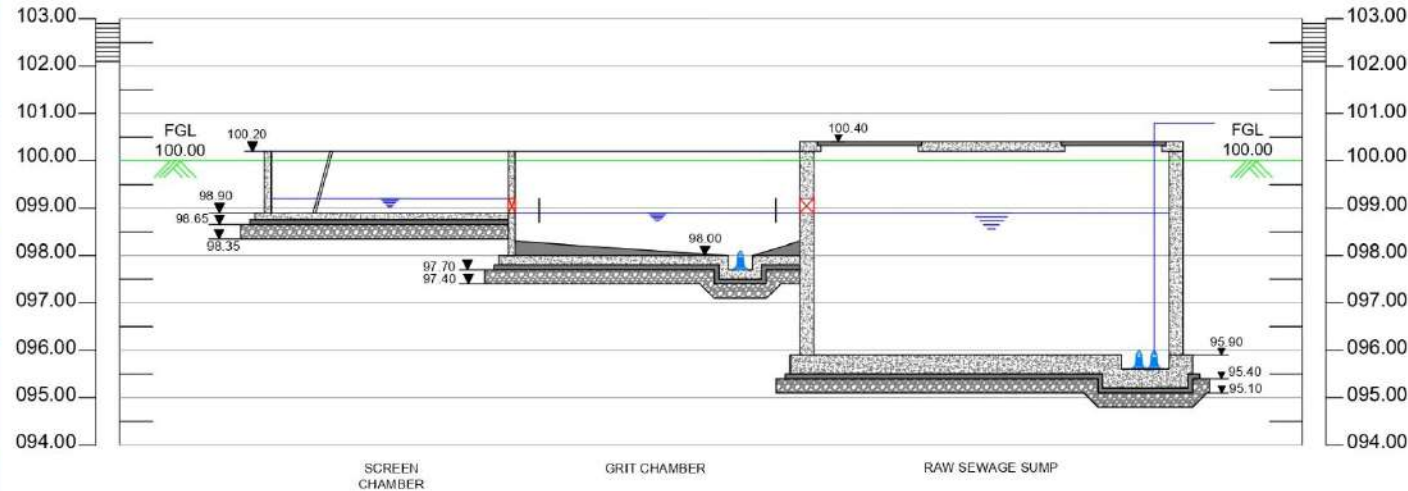
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HYDRAULIC FLOW DIAGRAM

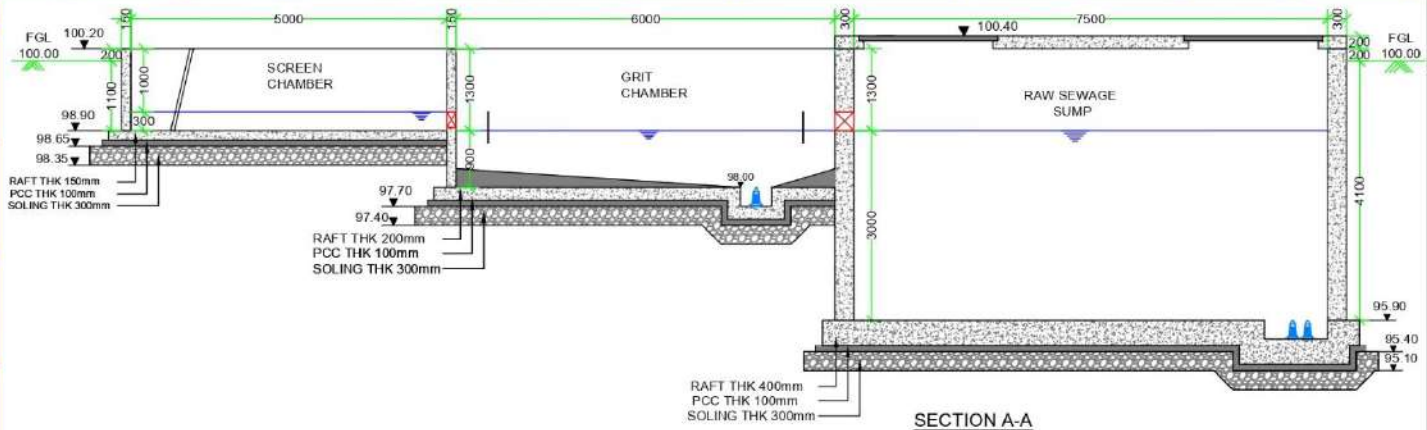
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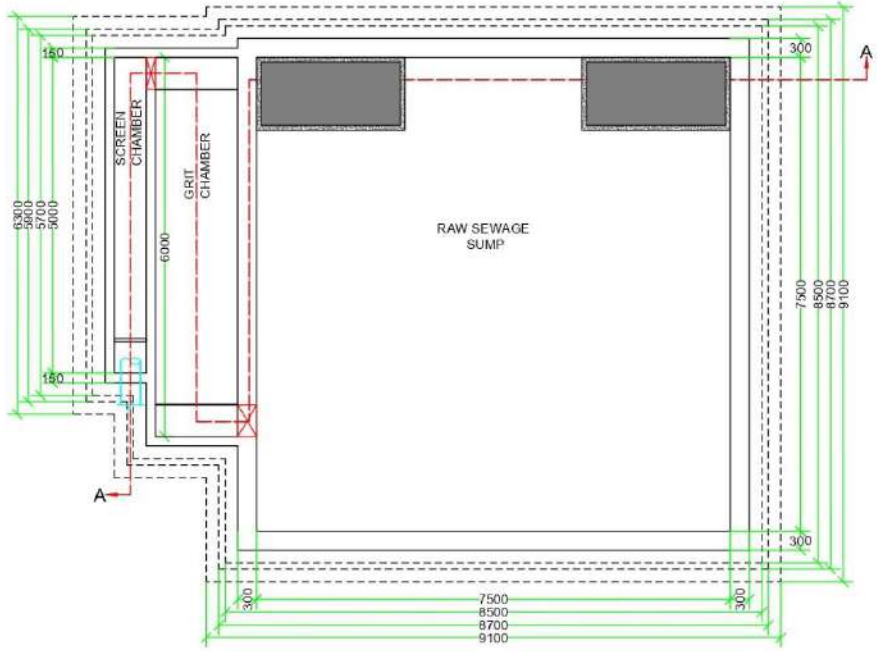
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HYDRAULIC FLOW DIAGRAM



SECTION A-A



PLAN

SCREEN CHAMBER, GRIT CHAMBER & RAW SEWAGE SUMP

PROJECT NAME :
2000 KLD SEWAGE TREATMENT PLANT
BASED ON TIGER BIO FILTER
TECHNOLOGY.

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REVISION		
DATE	REMARKS	SIGNATURE

CLIENT : SWSM, MAHARASHTRA

DRAWING NAME:
SCREEN CHAMBER, GRIT CHAMBER
& RAW SEWAGE SUMP

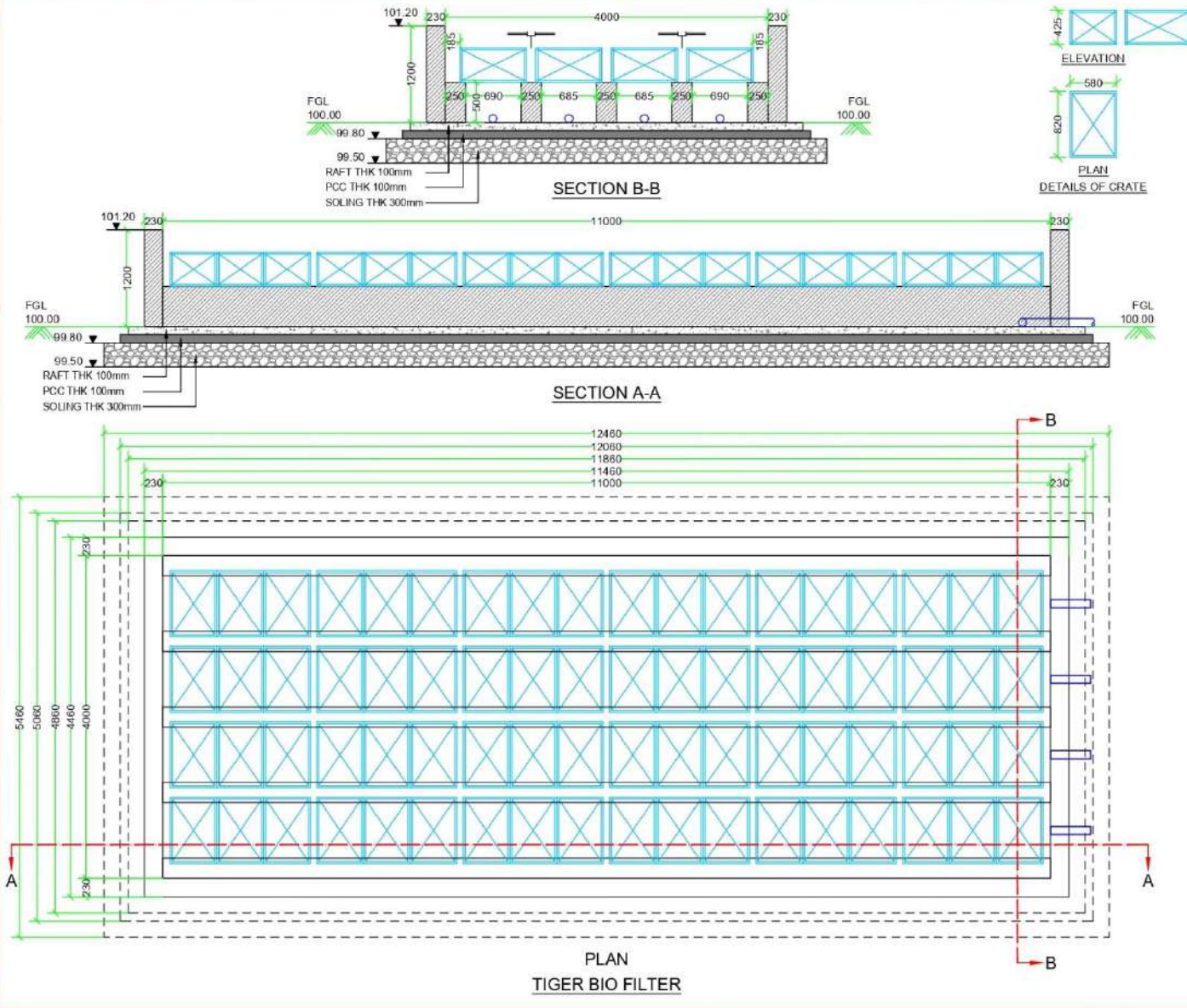
PROJECT CODE : TBF-	DRAWING NO : D.03/SC,GC&RS S01	DATE : JUNE-2021
DRAWN BY : L.D.B.	CHECKED BY : S.B.	SCALE : NTS.

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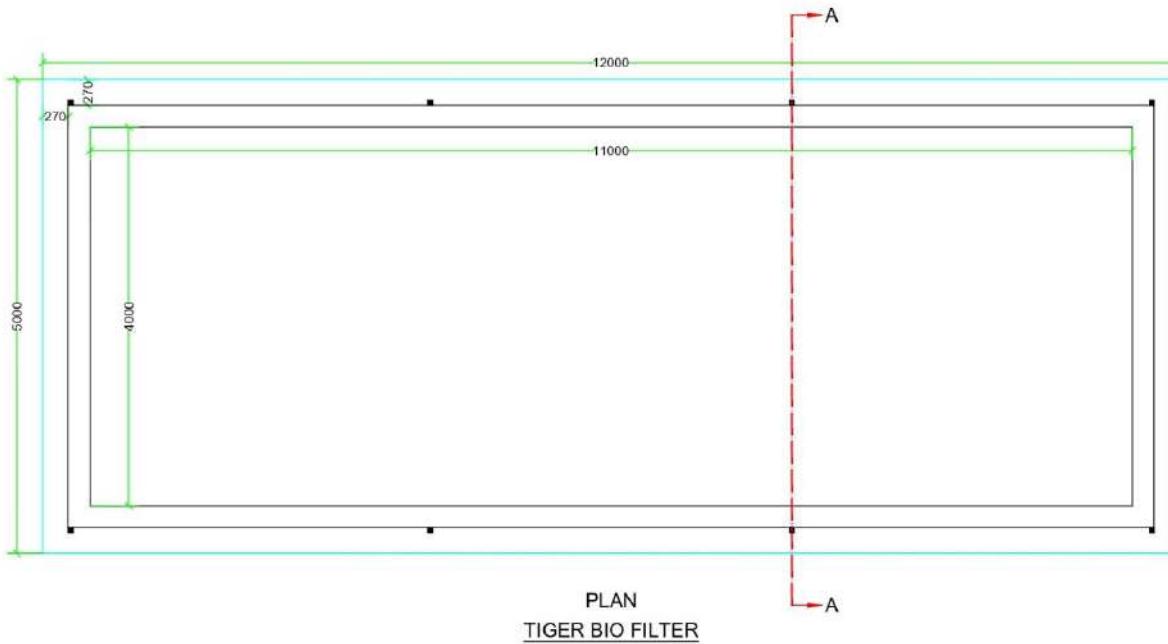
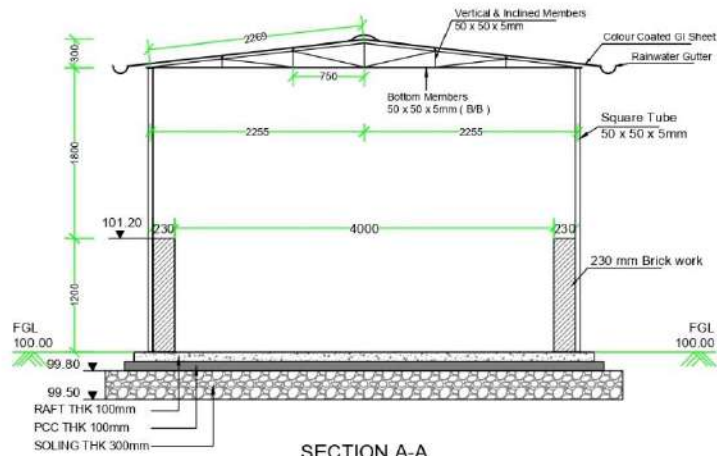


REVISION		
DATE	REMARKS	SIGNATURE

CLIENT : SWSM, MAHARASHTRA
 DRAWING NAME :
 TIGER BIO FILTER

PROJECT CODE : TBF-	DRAWING NO : D-04/TBF/01	DATE : JUNE-2021
DRAWN BY : L.D.B.	CHECKED BY : S.B.	SCALE : NTS.


 TBF ENVIRONMENTAL SOLUTIONS PVT. LTD.
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 Tel : +91 - 20 - 25280201
 Fax : +91 - 20 - 25280200
 Email : info@tbfenvironmental.in
 Web : www.tbfenvironmental.in



PROJECT NAME :

2000 KLD SEWAGE TREATMENT PLANT
BASED ON TIGER BIO FILTER
TECHNOLOGY.

NOTES

- All dimensions are in 'mm' unless mentioned otherwise.
- All dimensions are checked and co-related with the design and structural drawings and any discrepancy or omission shall be brought to the notice.
- All linear dimensions are including plastering in structural drawings unless otherwise mentioned.
- The structural component and BOQ prepared considering Finished Ground Level (+00.00) and Existing Ground Level (+00.00). Temporary Bench Mark 1 (xxx.000) Kept on the Top level of Road on North East side of the site.
- BIS Grade Cement to be used for all concrete and plastering applications.
- All water treatment structure to be checked for water leakages.
- This drawing should be read in conjunction with relevant detailed Design and Structural drawings. All dimensions shall be verified on site prior to commencement of work.
- This Drawing is the property of **TBF Environmental Solutions Pvt. Ltd.** It is not to be copied or produced or handed over to third party or used for any other purpose other than which it is intended. This drawing together with any copies made by the recipient shall be returned on demand to us.

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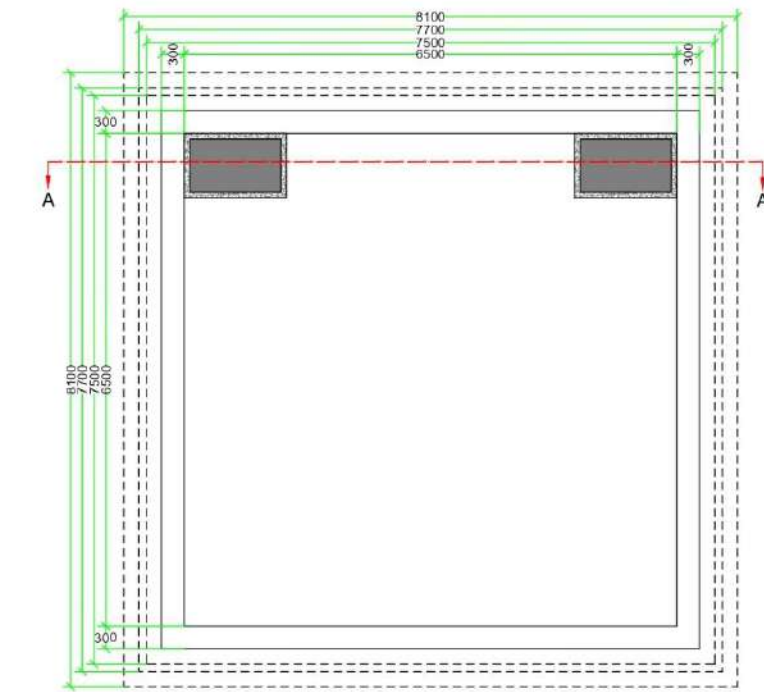
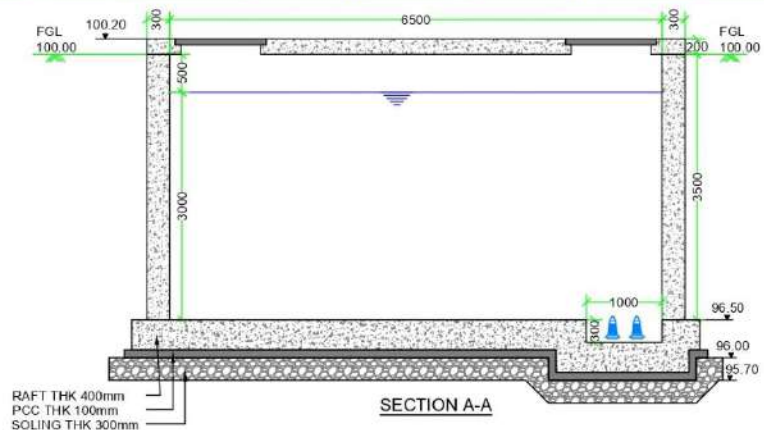
CLIENT : SWSM, MAHARASHTRA

DRAWING NAME:

TIGER BIO FILTER

PROJECT CODE : TBF-	DRAWING NO : D-04/TBF/02	DATE : JUNE-2021
DRAWN BY : L.D.B.	CHECKED BY : S.B.	SCALE : NTS.


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PLAN
FILTER FEED TANK

PROJECT NAME :
2000 KLD SEWAGE TREATMENT PLANT
BASED ON TIGER BIO FILTER
TECHNOLOGY.

- NOTES**
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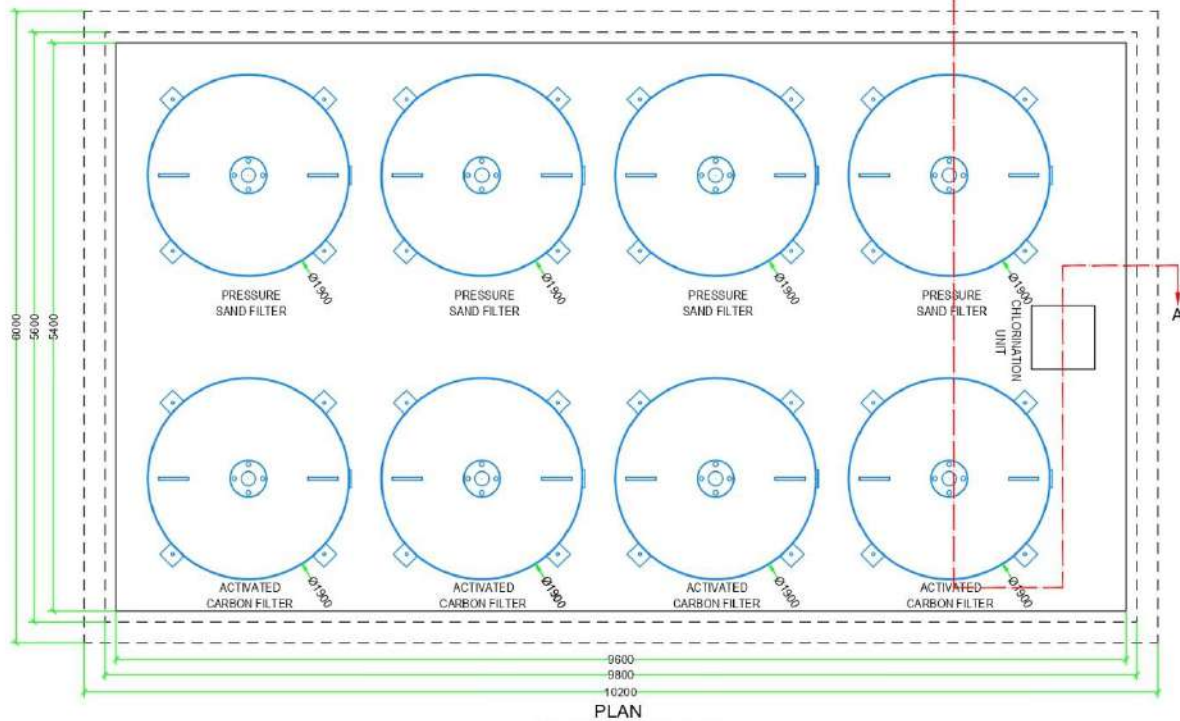
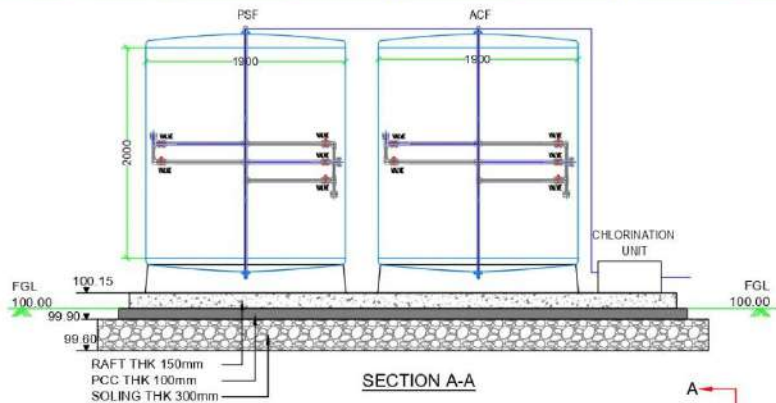
REVISION		
DATE	REMARKS	SIGNATURE

CLIENT : SWSM, MAHARASHTRA

DRAWING NAME:
FILTER FEED TANK

PROJECT CODE : TBF-	DRAWING NO : D-05/FF TAD1	DATE : JUNE-2021
DRAWN BY : L.D.B.	CHECKED BY : S.B.	SCALE : NTS.


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PLAN
PRESSURE SAND FILTER,
ACTIVATED CARBON FILTER & CHLORINATION UNIT

PROJECT NAME :
2000 KLD SEWAGE TREATMENT PLANT
BASED ON TIGER BIO FILTER
TECHNOLOGY.

NOTES

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REVISION		
DATE	REMARKS	SIGNATURE

CLIENT : SWSM, MAHARASHTRA

DRAWING NAME:
PRESSURE SAND FILTER,
ACTIVATED CARBON FILTER
& CHLORINATION UNIT

PROJECT CODE : TBF-	DRAWING NO : D-06PSF,ACF&CU01	DATE : JUNE-2021
DRAWN BY : L.D.B.	CHECKED BY : S.B.	SCALE : NTS.


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