

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 8, Issue 5, May 2019

Cost Estimation and Specification of a Sewage Treatment Plant at BIT campus

Shobhan Majumder¹, Poornesh², Reethupoorna M.B.², Razi Musthafa²

Assistant Professor, Dept. of Civil Engineering, B.I.T, Mangaluru, India¹

Research Scholar, Dept. of Civil Engineering, B.I.T, Mangaluru, India²

ABSTRACT: The focus of present study is to identify the cost estimation and specification of various treatment units in a Sewage Treatment Plant (STP) at Bearys Institute of Technology (BIT). The contours of the ground were found to be higher at South West direction (100.5 m) and lowest at North East direction (92.5 m), expected a gravity flow in this direction. The estimation of the proposed structure is particularly essential to distinguish all of the expense for the proposed units to be constructed. The treatment units were designed based on daily sewage generation. Total cost of construction for Equalization tank was estimated as Rs. 65597 with Flash mixer of Rs. 16397. However, total estimated cost of construction of STP was calculated as Rs. 839281.

KEYWORDS: Cost estimation, Specification, STP, Treatment units.

I. INTRODUCTION

The aim of wastewater treatment is to ensure human health and prevent ecological degradation by the safe disposal of local and modern wastewater generated during the utilization of water [1]. In India, there was no particular treatment given to wastewater and was discharged into drains and trenches, which in the long run wound up in waterways, streams, lakes, and seas, and eventually utilized by individuals [2]. Incorporating the cost estimation and cost control is accomplished by utilizing the social database the executive's framework in Microsoft Access. Therefore, such coordination empowers the exchange of cost estimation information naturally to the cost control process [3]. The major conclusion is that cost involved in structure development is as yet an unfriendly issue because of different known reasons and in this way, there is an earnest requirement for building up a propelled expense in structure development that should yield better outcome [4]. Supporting of these models that depend on verifiable information, fake neural systems and case-based thinking techniques achieve an acceptable level of error. By far most of strategies don't consider, since the factors that depend on the possibility of practical advancement [5].

II. SITE SURVEYING

Bearys Institute of Technology (BIT) is 20 km from the centre of the city and 5 km from Mangalore University Campus at Konaje. The campus is having 5-acre area, consists of two academic blocks, one workshop block and two hostels with a mess and one prayer hall. The plan and the contours of the Bearys Institute of Technology campus represented in Fig 1 and Fig 2, respectively. The blocks totally consist of seven water tanks of 5000 liters capacity each with 3 times loading per day, so total capacity of 105000 liters of water are pumped daily. In the present study two overhead tanks (OHTs) have been considered which are placed on boy's hostel and the STP was designed for the generated sewage from the same. Therefore, the total quantity of water required for the boy's hostel is 30000 liters per day. From the contour map of the campus it was observed that, South West part of the campus is of higher elevation and North East is of lower elevation where we can expect the gravity flow. So, placing the STP in North East is more convenient. The contour values were varying from 91.5 m to 92.5 m in the proposed sewage treatment plant area.

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 8, Issue 5, May 2019

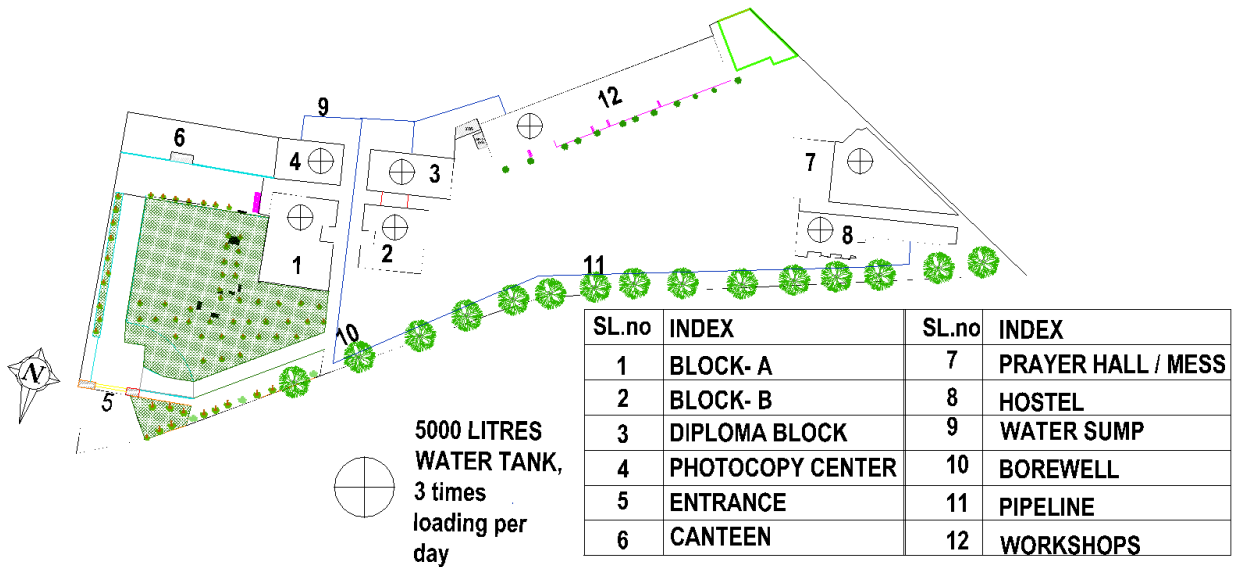


Fig. 1. Plan of Bearys Institute of Technology (BIT) showing various blocks and water tank with daily loading.



Fig. 2. Contour plot of proposed study area at Bearys Institute of Technology

III. CALCULATION OF WASTEWATER GENERATED

INPUT

No. of water tanks	2 nos
Each tank capacity	5000 liters
No. of times of filling	3 times
Population	160 P
Per capita demand	135 LPCD

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 8, Issue 5, May 2019

CALCULATION

Flow rate	Popln x LPCD	21600	L/d
Quantity of water supplied		21.6	m ³ /d
Quantity of wastewater generated		80%	
Quantity of wastewater generated	80% of water supply	17.28	m ³ /d
Assume peak factor		1.3	times
Total quantity of wastewater generated	WW generated x 1.3	22.46	m ³ /d

RESULT

Quantity of wastewater generated		22.46	m ³ /d
		22464	l/d
		0.022	MLD
		25	m ³ /d
Consider future expansion and peak demand		2	times
	Taken	50	m³/d

IV. DESIGN OF VARIOUS TREATMENT UNITS

Sewage treatment can be categorized as aerobic and anaerobic process. Aerobic is of primary treatment, secondary treatment, biological treatment, miscellaneous and tertiary treatment. Primary treatment consists of equalization tank and flash mixer. Secondary and biological treatment consists of sand filter and sludge drying bed. Miscellaneous consists of disinfection tank. The design of Equalization tank, flash mixer, clariflocculator, rapid gravity filter, disinfection tank and the sludge drying bed have been calculated based on the quantity of wastewater generated [5]. The layout plan and the cross section of the proposed STP are presented in Fig 3 and Fig 4, respectively. However, the summary of the designed STP units showed in Table 1.

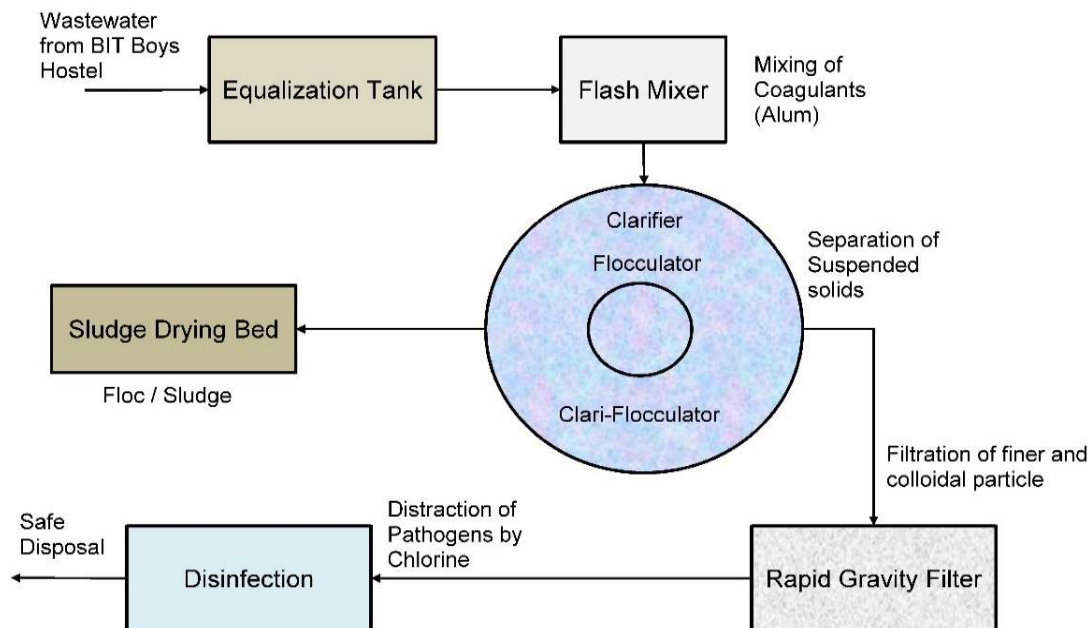


Fig. 3. Layout plan of STP unit at Bearys Institute of Technology.

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 8, Issue 5, May 2019

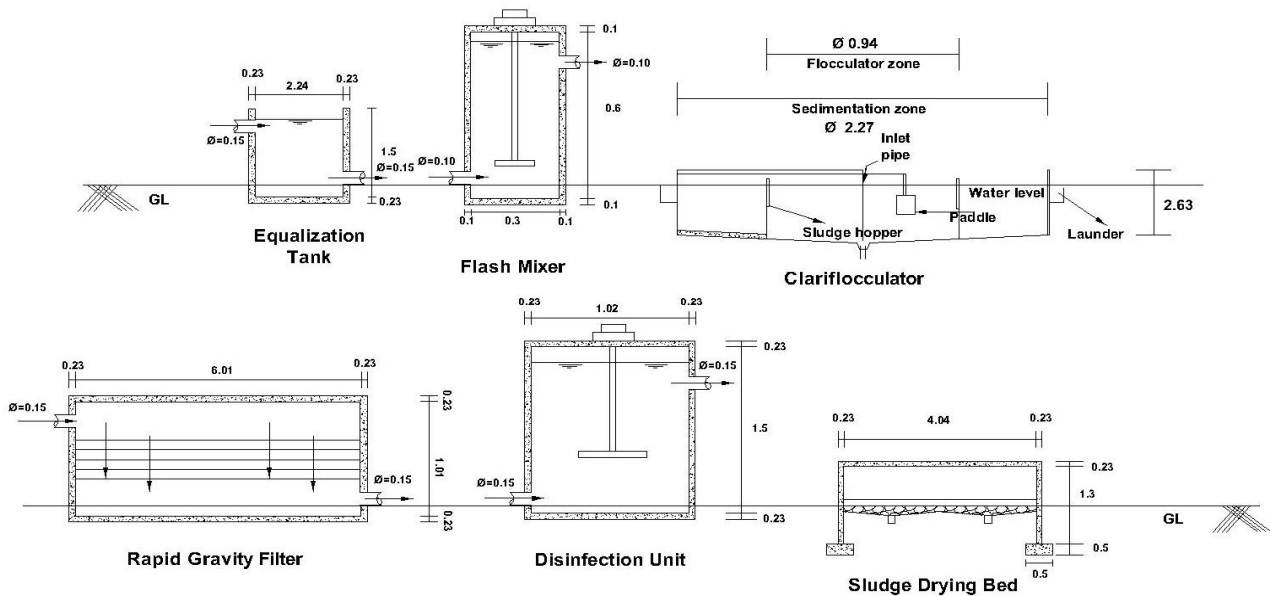


Fig. 4. Cross section of the designed STP treatment units

Table 1. Summary of the dimensions of the various treatment units in STP at BIT campus

Parameter	Unit	Eq tank	FM	CF	SDB	RGF	Dis
Flow rate (Q)	m ³ /d	50	50	50	50	50	50
Detention time (Dt)	sec	3600	90	Dtf = 2400	11 d		1800
Volume (Vol)	m ³	5	0.052	Dtc = 7200	14.17	28.06	1.04
Length (L)	m	2.24	0.30		4.04	6.01	1.02
Width (B)	m	1.49	0.30		2.70	4.62	0.68
Depth (H)	m	1.50	0.59	2.63	1.30	1.01	1.5
Pipe diameter (d)	m	0.15	0.10	0.15	0.15	0.15	0.15
Additional Info				df = 0.94 dc = 2.27	Vol(s) = 3.27	Rf = 0.075	Cl ₂ = 0.25 kg/d

V. RESULTS AND DISCUSSION

COST ESTIMATION OF EQUALIZATION TANK

Given			
Length	L	2.24	m
Breadth	B	1.49	m
Depth	D	1.5	m
Wall thickness	t	0.23	m
No of walls		2	nos
Effective length	Le	1.78	m
Effective breadth	Be	1.03	m
Floor thickness	Ft	0.15	m

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 8, Issue 5, May 2019

Footing projection			0.15	m
Length of PCC bed	Lp		2.54	m
Breadth of PCC bed	Bp		1.79	m
Ground level	Dg		1	m
Depth of PCC bed	Dp		0.2	m
Plastering thickness	tp		0.01	m
As per Code book area of 1 m ³ requires			500	Bricks
Proportion of concrete		1	2	4
		c	s	ca
As per Standard 50kg of a cement bag			0.0345	m ³
1 bag cement			50	kg
Pipe dia			0.015	m
Pipe length			5	m
Cost of pipe per m			100	Rs
1 CFT			68.15	kg
Floor bed:				
Quantity of Floor work	Le*Be*Ft		0.275	m ³
Brick work:				
Outer area	L*No of walls*D*t		1.5456	m ²
Inner area	Be*No of walls*D*t		0.711	m ²
Total quantity of brick work			2.256	m ²
We have, 1 m ³		500	bricks	
Therefore, no of bricks	brick work*nos		1128	nos
Plain cement concrete (PCC):				
Quantity of PCC	Lp*Bp*Dp		0.90932	m ³
Plastering of wall:				
Length of Inner wall	L*No of walls*D		6.72	m ²
Breadth of Inner wall	B*No of walls*D		4.47	m ²
Length of outer wall	Le*No of walls*D		5.34	m ²
Breadth of outer wall	Be*No of walls*D		3.09	m ²
Assumed Plastering thickness	tp		0.01	m
Total quantity of plastering of wall			0.20	m ³
Total quantity of concrete			1.38	m ³
Earthwork excavation				
Quantity of earthwork excavation	L*B*(Dg+Dp)		4.005	m ³
Quantity of Cement, Sand, Coarse aggregate				
No of bags of Cement	Total quantity/standard		40.01	bags
Quantity of cement	bags*kg		2000.26	kg
Quantity of sand	from 1:2:4		4000.51	kg
Quantity of coarse aggregate				
Vol of floor + PCC			1.184	m ³
Quantity	(vol/0.0345)*50kg*Proportion		6865.68	kg
Assumed litres of paint			20	litres
Abstract table				
Rate of a cement bag			410	rupees
Rate of a Wire cut brick			9	rupees
Rate of a Sand load			1.514	rupees/kg
Rate of Coarse aggregate			1.57	rupees/kg

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 8, Issue 5, May 2019

Rate of Paint			250	rupees/litre
Rate of a Labour				
Mason			700	rupees/day
Male helper			500	rupees/day
Female helper			400	rupees/day
No of Mason			2	Nos
No of Male helper			2	Nos
No of Female helper			2	Nos
Working days			4	days
Cost estimation				
Cost for cement			16402	rupees
Cost for sand			4001	rupees
Cost of coarse aggregate			10779.1	rupees
Cost of Brick			10151.8	rupees
Cost of Pipe			500	rupees
Cost of painting			5000	rupees
Cost of labours				
Mason			5600	rupees
Male helper			4000	rupees
Female helper			3200	rupees
Estimated cost			59633	rupees
Contractors profit	10%		5963.35	rupees
Total Estimated Cost		Rs.	65597	

COST ESTIMATION OF FLASH MIXER

Given				
Length	L		0.3	m
Breadth	B		0.3	m
Depth	D		0.6	m
Wall thickness	t		0.1	m
No of walls			2	nos
Effective length	Le		0.1	m
Effective breadth	Be		0.1	m
Floor thickness	Ft		0.15	m
Footing projection			0.15	m
Length of PCC bed	Lp		0.6	m
Breadth of PCC bed	Bp		0.6	m
Ground level	Dg		0	m
Depth of PCC bed	Dp		0.2	m
Plastering thickness	tp		0.01	m
As per Code book area of 1 m ³ requires			500	Bricks
Proportion of concrete		1	2	4
		c	s	ca
Roof top cover thickness	tr		0.15	m ³
As per Standard 50kg of a cement bag			0.0345	m ³
1 bag cement			50	kg
Pipe dia			0.015	m
Pipe length			5	m
Cost of pipe per m			100	Rs
Assumed litres of paint			10	litres

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 8, Issue 5, May 2019

Floor bed:			
Quantity of Floor work	$Le*Be*Ft$	0.002	m^3
Brick work:			
Outer area	$L*No\ of\ walls*D*t$	0.036	m^3
Inner area	$Be*No\ of\ walls*D*t$	0.012	m^3
Total quantity of brick work		0.048	m^3
We have, 1 m^3		500	bricks
Therefore, no of bricks	$brick\ work*nos$	24	nos
Plain cement concrete (PCC):			
Quantity of PCC	$Lp*Bp*Dp$	0.072	m^3
Plastering of wall:			
Length of Inner wall	$L*No\ of\ walls*D$	0.36	m^2
Breadth of Inner wall	$B*No\ of\ walls*D$	0.36	m^2
Length of outer wall	$Le*No\ of\ walls*D$	0.12	m^2
Breadth of outer wall	$Be*No\ of\ walls*D$	0.12	m^2
Total quantity of plastering of wall		0.0092	m^3
Roof top slab			
Quantity of concrete	$L*B*tr$	0.014	m^3
Assumed Plastering thickness	tp	0.01	m
Total quantity of concrete		0.096	m^3
Earthwork excavation			
Quantity of earthwork excavation	$L*B*(Dg+Dp)$	0.018	m^3
Quantity of Cement, Sand, Coarse aggregate			
No of bags of Cement	Total quantity/standard	2.79	bags
Quantity of cement	bags*kg	139.49	kg
Quantity of sand	from 1:2:4	278.9761	kg
Quantity of coarse aggregate			
Vol of floor + PCC		0.074	m^3
Quantity	$(vol/0.0345)*50kg*Proportion$	426.087	kg
Abstract table			
Rate of a cement bag		410	rupees
Rate of a Wire cut brick		9	rupees
Rate of a Sand load		1.514	rupees/kg
Rate of Coarse aggregate		1.57	rupees/kg
Rate of Paint		250	rupees/litre
Rate of a Labour			
Mason		700	rupees/day
Male helper		500	rupees/day
Female helper		400	rupees/day
No of Mason		2	Nos
No of Male helper		2	Nos
No of Female helper		2	Nos
Working days		3	days
Cost estimation			
Cost for cement		1144	rupees
Cost for sand		279	rupees
Cost of coarse aggregate		668.9565	rupees
Cost of Brick		214.4104	rupees
Cost of Pipe		500	rupees

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 8, Issue 5, May 2019

Cost of painting		2500	rupees
Cost of labours			
Mason		4200	rupees
Male helper		3000	rupees
Female helper		2400	rupees
Estimated cost		14906	rupees
Contractors profit	10%	1490.614	rupees
Total Estimated Cost		Rs. 16397	

COST ESTIMATION OF CLARIFLOCCULATOR

Given

Outer diameter	d1	2.27	m
Inner diameter	d2	0.94	m
Depth	D	2.63	m
Wall thickness	t	0.23	m
Outer Dia with thickness	d1t	2.5	m
Inner Dia with thickness	d2t	1.17	m
Floor thickness	Ft	0.15	m
Footing projection		0.15	m
Outer Dia of PCC bed	d1p	2.42	m
Inner Dia of PCC bed	d2p	1.09	m
Ground level	Dg	1.63	m
Depth of PCC bed	Dp	0.2	m
Plastering thickness	tp	0.01	m
As per Code book, area of 1 m ³ requires		500	Bricks
Proportion of concrete	1 c	2 s	4 ca
As per Standard 50kg of a cement bag		0.0345	m ³
1 bag cement		50	kg
Pipe dia		0.015	m
Pipe length		5	m
Cost of pipe per m		100	Rs
1 CFT		68.15	kg
Floor bed:			
Quantity of Floor work			
Outer diameter area	$2*3.14*d1/2$	7.128	m
Inner diameter area	$2*3.14*d2/2$	2.952	m
Quantity of outer dia floor		4.312	m ³
Quantity of inner dia floor		1.785	m ³
Brick work:			
Total quantity of brick work		6.093	m ³
We have, 1 m ³	500	bricks	
No of bricks		3046.65	Nos
Plain cement concrete (PCC):			
Quantity of Inner bed PCC	$((3.14/d2)/4)*Ft$	0.125	m ³
Quantity of Outer bed PCC	$(3.14/d1)/4)*Ft$	0.052	m ³
Deduction:			
Inner area	$(3.14*((d1+t)^2))/4$	1.075	m ³
Overall deduction			
Inner		4.045	m ³

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 8, Issue 5, May 2019

Outer		1.075	m ³
Total Quantity		2.970	m ³
Assumed Plastering thickness	tp	0.01	m
Total quantity of plastering of wall		0.157	m ³
Total quantity of concrete		6.427	m ³
Earthwork excavation			
Quantity of earthwork excavation		6.736	m ³
Quantity of Cement, Sand, Coarse aggregate			
No of bags of Cement	Total quantity/standard	186.29	bags
Quantity of cement	bags*kg	9314.58	kg
Quantity of sand	from 1:2:4	18629.17	kg
Quantity of coarse aggregate			
Vol of floor + PCC		9.067	m ³
Quantity	(vol/0.0345)*50kg*Proportion	52565.04	kg
Assumed litres of paint		40	litres
Abstract table			
Rate of a cement bag		410	rupees
Rate of a Wire cut brick		9	rupees
Rate of a Sand load		1.514	rupees/kg
Rate of Coarse aggregate		1.57	rupees/kg
Rate of Paint		250	rupees/litre
Rate of a Labour			
Mason		700	rupees/day
Male helper		500	rupees/day
Female helper		400	rupees/day
No of Mason		2	Nos
No of Male helper		2	Nos
No of Female helper		2	Nos
Working days		7	days
Cost estimation			
Cost for cement		76380	rupees
Cost for sand		18629	rupees
Cost of coarse aggregate		82527.11	rupees
Cost of Brick		27419.85	rupees
Cost of Pipe		500	rupees
Cost of painting		10000	rupees
Cost of labours			
Mason		9800	rupees
Male helper		7000	rupees
Female helper		5600	rupees
Estimated cost		237856	rupees
Contractors profit	10%	23785.57	rupees
Total Estimated Cost		Rs. 261641	

COST ESTIMATION OF SLUDGE DRYING BED

Given			
Length	L	4.04	m
Breadth	B	2.7	m

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 8, Issue 5, May 2019

Depth	D		1.3	m
Wall thickness	t		0.23	m
No of walls			2	nos
Effective length	Le		3.58	m
Effective breadth	Be		2.24	m
Floor thickness	Ft		0.15	m
Footing projection			0.15	m
Length of PCC bed	Lp		4.34	m
Breadth of PCC bed	Bp		3	m
Ground level	Dg		0	m
Depth of PCC bed	Dp		0.2	m
Plastering thickness	tp		0.01	m
As per Code book, area of 1 m ³ requires			500	Bricks
Proportion of concrete		1	2	4
		c	s	ca
As per Standard 50kg of a cement bag			0.0345	m ³
1 bag cement			50	kg
Pipe dia			0.015	m
Pipe length			15	m
Cost of pipe per m			100	Rs
Floor bed:				
Quantity of Floor work	Le*Be*Ft		1.203	m ³
Brick work:				
Outer area	L*No of walls*D*t		2.41592	m ³
Inner area	Be*No of walls*D*t		1.340	m ³
Total quantity of brick work			3.755	m ³
We have, 1 m ³		500	bricks	
Therefore, no of bricks	brick work*nos		1878	nos
Plain cement concrete (PCC):				
Quantity of PCC	Lp*Bp*Dp		2.604	m ³
Plastering of wall:				
Length of Inner wall	L*No of walls*D		10.504	m ²
Breadth of Inner wall	B*No of walls*D		7.02	m ²
Length of outer wall	Le*No of walls*D		9.308	m ²
Breadth of outer wall	Be*No of walls*D		5.824	m ²
Assumed Plastering thickness	tp		0.01	m
Total quantity of plastering of wall			0.326	m ³
Total quantity of concrete			4.133	m ³
Earthwork excavation				
Quantity of earthwork excavation	L*B*(Dg+Dp)		2.182	m ³
Quantity of Cement, Sand, Coarse aggregate				
No of bags of Cement	Total quantity/standard		119.80	bags
Quantity of cement	bags*kg		5989.98	kg
Quantity of sand	from 1:2:4		11980	kg
Quantity of coarse aggregate				
Vol of floor + PCC			3.807	m ³
Quantity	(vol/0.0345)*50kg*Proportion		22068.9	kg
Assumed litres of paint			30	litres
Abstract table				

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 8, Issue 5, May 2019

Rate of a cement bag		410	rupees
Rate of a Wire cut brick		9	rupees
Rate of a Sand load		1.514	rupees/kg
Rate of Coarse aggregate		1.57	rupees/kg
Rate of Paint		250	rupees/litre
Rate of a Labour			
Mason		700	rupees/day
Male helper		500	rupees/day
Female helper		400	rupees/day
No of Mason		2	Nos
No of Male helper		2	Nos
No of Female helper		2	Nos
Working days		5	days
Cost estimation			
Cost for cement		49118	rupees
Cost for sand		11980	rupees
Cost of coarse aggregate		34648.1	rupees
Cost of Brick		16897.9	rupees
Cost of Pipe		1500	rupees
Cost of painting		7500	rupees
Cost of labours			
Mason		7000	rupees
Male helper		5000	rupees
Female helper		4000	rupees
Estimated cost		137644	rupees
Contractors profit	10%	13764.4	rupees
Total Estimated Cost		Rs. 151408	

COST ESTIMATION OF RAPID GRAVITY FILTER

Given			
Length	L	6.01	m
Breadth	B	4.62	m
Depth	D	1.01	m
Wall thickness	t	0.23	m
No of walls		2	
Effective length	Le	5.55	m
Effective breadth	Be	4.16	m
Floor thickness	Ft	0.15	m
Footing projection		0.15	m
Length of PCC bed	Lp	6.31	m
Breadth of PCC bed	Bp	4.92	m
Ground level	Dg	1	m
Depth of PCC bed	Dp	0.2	m
Plastering thickness	tp	0.01	m
As per Code book, area of 1 m ³ requires		500	Bricks
Proportion of concrete	1 c	2 s	4 ca
As per Standard 50kg of a cement bag		0.0345	m ³

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 8, Issue 5, May 2019

1 bag cement		50	kg
Pipe dia		0.015	m
Pipe length		10	m
Cost of pipe per m		100	Rs
Floor bed:			
Quantity of Floor work	$Le*Be*Ft$	3.463	m^3
Brick work:			
Outer area	$L*No\ of\ walls*D*t$	2.79225	m^3
Inner area	$Be*No\ of\ walls*D*t$	1.933	m^3
Total quantity of brick work		4.725	m^3
We have, $1\ m^3$	500 bricks		
Therefore, no of bricks	brick work*nos	2362	nos
Plain cement concrete (PCC):			
Quantity of PCC	$Lp*Bp*Dp$	6.20904	m^3
Plastering of wall:			
Length of Inner wall	$L*No\ of\ walls*D$	12.1402	m^2
Breadth of Inner wall	$B*No\ of\ walls*D$	9.3324	m^2
Length of outer wall	$Le*No\ of\ walls*D$	11.211	m^2
Breadth of outer wall	$Be*No\ of\ walls*D$	8.4032	m^2
Assumed Plastering thickness	tp	0.01	m
Total quantity of plastering of wall		0.411	m^3
Total quantity of concrete		10.083	m^3
Earthwork excavation			
Quantity of earthwork excavation	$L*B*(Dg+Dp)$	33.319	m^3
Quantity of Cement, Sand, Coarse aggregate			
No of bags of Cement	Total quantity/standard	292.25	bags
Quantity of cement	bags*kg	14612.69	kg
Quantity of sand	from 1:2:4	29225.4	kg
Quantity of coarse aggregate			
Vol of floor + PCC		9.672	m^3
Quantity	$(vol/0.0345)*50kg*Proportion$	56071	kg
Assumed litres of paint		20	litres
Abstract table			
Rate of a cement bag		410	rupees
Rate of a Wire cut brick		9	rupees
Rate of a Sand load		1.514	rupees/kg
Rate of Coarse aggregate		1.57	rupees/kg
Rate of Paint		250	rupees/litre
Rate of a Labour			
Mason		700	rupees/day
Male helper		500	rupees/day
Female helper		400	rupees/day
No of Mason		2	Nos
No of Male helper		2	Nos
No of Female helper		2	Nos
Working days		6	days
Cost estimation			
Cost for cement		119824	rupees
Cost for sand		29225	rupees

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 8, Issue 5, May 2019

Cost of coarse aggregate		88031.4	rupees
Cost of Brick		21260.8	rupees
Cost of Pipe		1000	rupees
Cost of painting		5000	rupees
Cost of labours			
Mason		8400	rupees
Male helper		6000	rupees
Female helper		4800	rupees
Estimated cost		283542	rupees
Contractors profit	10%	28354.2	rupees
Total Estimated Cost		Rs. 311896	

COST ESTIMATION OF DISINFECTION TANK

Given			
Length	L	1.02	m
Breadth	B	0.68	m
Depth	D	1.5	m
Wall thickness	t	0.23	m
No of walls		2	nos
Effective length	Le	0.56	m
Effective breadth	Be	0.22	m
Floor thickness	Ft	0.15	m
Footing projection		0.15	m
Length of PCC bed	Lp	1.32	m
Breadth of PCC bed	Bp	0.98	m
Ground level	Dg	1	m
Depth of PCC bed	Dp	0.2	m
Plastering thickness	tp	0.01	m
As per Code book, area of 1 m ³ requires		500	Bricks
Roof slab thickness	tr	0.15	m
Proportion of concrete		1 2	4
		c s	ca
As per Standard 50kg of a cement bag		0.0345	m ³
1 bag cement		50	kg
Pipe dia		0.015	m
Pipe length		10	m
Cost of pipe per m		100	Rs
Floor bed:			
Quantity of Floor work	Le*Be*Ft	0.018	m ³
Brick work:			
Outer area	L*No of walls*D*t	0.7038	m ³
Inner area	Be*No of walls*D*t	0.152	m ³
Total quantity of brick work		0.855	m ³
We have, 1 m ³		500	bricks
Therefore, no of bricks	brick work*nos	428	nos
Plain cement concrete (PCC):			
Quantity of PCC	Lp*Bp*Dp	0.25872	m ³
Plastering of wall:			
Length of Inner wall	L*No of walls*D	3.06	m ²

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 8, Issue 5, May 2019

Breadth of Inner wall	B*No of walls*D	2.04	m ²
Length of outer wall	Le*No of walls*D	1.68	m ²
Breadth of outer wall	Be*No of walls*D	0.66	m ²
Roof top slab			
Quantity of concrete	L*B*tr	0.104	m ³
Assumed Plastering thickness	tp	0.01	m
Total quantity of plastering of wall		0.074	m ³
Total quantity of concrete		0.455	m ³
Earthwork excavation			
Quantity of earthwork excavation	L*B*(Dg+Dp)	0.832	m ³
Quantity of Cement, Sand, Coarse aggregate			
No of bags of Cement	Total quantity/standard	13.20	bags
Quantity of cement	bags*kg	659.84	kg
Quantity of sand	from 1:2:4	1319.67	kg
Quantity of coarse aggregate			
Vol of floor + PCC		0.277	m ³
Quantity	(vol/0.0345)*50kg*Proportion	1606.96	kg
Assumed litres of paint		10	litres
Abstract table			
Rate of a cement bag		410	rupees
Rate of a Wire cut brick		9	rupees
Rate of a Sand load		1.514	rupees/kg
Rate of Coarse aggregate		1.57	rupees/kg
Rate of Paint		250	rupees/litre
Rate of a Labour			
Mason		700	rupees/day
Male helper		500	rupees/day
Female helper		400	rupees/day
No of Mason		2	Nos
No of Male helper		2	Nos
No of Female helper		2	Nos
Working days		4	days
Cost estimation			
Cost for cement		5411	rupees
Cost for sand		1320	rupees
Cost of coarse aggregate		2522.92	rupees
Cost of Brick		3848.61	rupees
Cost of Pipe		1000	rupees
Cost of painting		2500	rupees
Cost of labours			
Mason		5600	rupees
Male helper		4000	rupees
Female helper		3200	rupees
Estimated cost		29402	rupees
Contractors profit	10%	2940.19	rupees
Total Estimated Cost		Rs. 32342	

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 8, Issue 5, May 2019

Table 2. Summary of cost estimation of various treatment units of STP at BIT

Parameters	Eq tank	FM	CF	SDB	RGF	Dis
Cost for cement	16402	1144	76380	49118	119824	5411
Cost for sand	4001	279	18629	11980	29225	1320
Cost of coarse aggregate	10779	669	82527	34648	88031	2523
Cost of Brick	10152	214	27420	16898	21261	3849
Cost of Pipe	500	500	500	1500	1000	1000
Cost of painting	5000	2500	10000	7500	5000	2500
Mason	5600	4200	9800	7000	8400	5600
Male helper	4000	3000	7000	5000	6000	4000
Female helper	3200	2400	5600	4000	4800	3200
Estimated cost	59633	14906	237856	137644	283542	29402
Contractors profit	5963	1491	23786	13764	28354	2940
Total Estimated Cost	65597	16397	261641	151408	311896	32342
				Sum Total (Rs)		839281

VI. CONCLUSIONS

Wastewater discharged into the environment may cause harmful effects if not treated properly. For the treatment of wastewater, proper sewage treatment plant has to be designed. However, estimation of the proposed design is very much important to identify the total cost for the proposed unit to avail the fund. The area available for STP unit at Bearys institute of technology campus is having the contour value of 91.5 m to 92.5 m. Area available for the sewage treatment is 399.81 m² with 300 m² expandable. The cost estimation for cement was found to be Rs. 1,19,824 for Rapid gravity filter and Rs. 76,380 for clariflocculator unit. However, cost of sand was calculated Rs. 29,225 for Rapid gravity filter with coarse aggregate Rs. 88,031. Total Cost of construction for Equalization tank was estimated as Rs. 65,597 with Flash mixer of Rs. 16,397, Sludge drying bed Rs. 151,408, Rapid gravity filter of Rs. 3,11,896, Disinfection tank of Rs. 32,342 and clariflocculator of Rs. 261,641. Total estimated cost of construction of STP was calculated as Rs. 8,39,281.

ACKNOWLEDGEMENT

Author(s) are thankful to Karnataka State Council for Science and Technology (KSCST), IISc, Bengaluru for providing financial support in conducting the project.

REFERENCES

- [1] Weber S, Khan S, Hollender J. "Human risk assessment of organic contaminants in reclaimed wastewater used for irrigation", *Desalination*. Vol. 187, pp 53-64, 2006.
- [2] Tarr J A, McCurley J, McMichael F C, Yosie T. "Water and wastes: a retrospective assessment of wastewater technology in the United States", *Technology and Culture*, Vol. 25, pp. 1800-1923, 1986.
- [3] Azhar S, Ahmed S M, Caballero A A, "Development of an Integrated Cost Estimation and Cost Control System for Construction Projects" pp. 1-7, 2003.
- [4] Bundschuh M, Gessner M O, Fink G, Ternes T A, Sogding C, Schulz R. "Ecotoxicological evaluation of wastewater ozonation based on detritus - detritivore interactions", *Chemosphere*, Vol. 82, pp. 355-36, 2011.
- [5] Lesniak A and Zima K "Cost Calculation of Construction Projects Including Sustainability Factors Using the Case Based Reasoning (CBR) Method", *sustainability*, Vol. 10, pp. 1-14, 2018.
- [6] Majumder S, Poornesh, Reethupoorna M B, Mustafa R. "Design of a sewage treatment plant at Bearys institute of technology, Mangalore", *IOSR Journal of Environmental Science, Toxicology and Food Technology*, Vol. 13, pp. 25-36, 2019.