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Comparative Estimation Of Underground Water Tank And Elevated Storage Tank of Junnar

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Abstract — *A water tank are a container for storing water. The need for a water tank is as olden civilization, to supply storage of water for uses in many applications, drinking water, irrigation agricultural, fire suppression, agricultural farming, chemical manufacturing as well as many other uses. An Underground water storage tanks (or sub-surface tanks) are used for underground storage of potable drinking water, wastewater & rainwater collected. And it is a water storage structure constructed below the ground. The term also incorporates structures that are partly below ground.*

Keywords- *UG water tank; capacity of water tank; Intz tanks; ground level*

I. INTRODUCTION

In recent years, there has been much emphasis on water supply projects all over the world, which are very imperative for the social and industrial development of the country. Water tanks can be of different capacity depending upon the requirement of consumption. Based on the place the water tanks are classified into three ways:

1. Underground water tanks.
2. Tank resting on grounds.
3. Elevated or overhead water tanks.

II. TYPES OF WATER TANKS

In this section, the types of water tanks are discussed in detail. There are different types of water tank depending upon the shape, position with respect to ground level etc.

2.1 Underground water tank

An Underground storage tank (UST) is a storage tank that is placed below the ground level.

2.2 Overhead water tank

Over head water tank is container for storing water. Water tank are used to provide storage of water for use in many application , drinking water, irrigation agriculture, food preparation as well as many other uses.

III. SAMPLE CALCULATION OF WATER DEMAND OF JUNNAR

Water Supply Scheme

Tal –Dist. Pune

Statement No : 3 Water Demand					
Sr. No	**Particular**	**Present stage year 2011**	**Initial stage year 2021**	**Immediate Stage year 2031**	**Ultimate Stage Year 2041**
1.	Population	25522	32872	37518	41951
2.	Rate of water supply through House connection	135	135	135	135
3.	Domestic demand in ML.	3.45	4.44	5.06	5.66
4.	Total not demand in ML.	3.45	4.44	5.06	5.66
5.	Total gross demand (add 15% losses) in ML.	4.05	5.22	5.96	6.66
6.	Fire demand in ML.	0.51	0.57	0.61	0.65
7.	Total gross demand use in storage demand in ML.	4.56	5.79	6.57	7.31

Table no. 1

ML= Million liters
Note:- 1 ML = 1000000 liters
Fire demand= 100 x (square root of population / 1000) / 1000
Per capita supply of per person 135 liter

Estimation Of Under Ground Water Tank

Sr. No	Item	No.	L	B	D	Q	TQ
1.	Excavation G.L upto 2.3m 38.8 19.8 0.10 0.10 0.10 0.15 0.15 0.15 0.15 0.15 39.3 20.3	1	39.3	20.3	2.3	1834.92	1834.92 cu.m
2.	PCC In Foundation 15 cm thick flooring	2 2 1	39.3 18.5 4	0.90 19	0.30 0.15	31.21 11.4	 42.610 cu.m
3.	Brick masonry c/c length = (38.3+19.3) x 2	1	115.2	0.3	1.55	53.56	53.56 cu.m
4.	UCR masonry 1st step 2st step UCRM 1st step c/c =[[3.8+0.7]+[19.8+0.7]x2]=118.4 2nd step c/c = [[38+0.5]+[19.8+0.5]x2]=117.6m	 1 1 1 1	 118.4 117.6	 0.7 0.5 6.7 0.5	 0.2 0.25 6.20 0.25	 6.77 5.95	 6.77 cu.m 5.95 cu.m
5.	Slab 0.4+38+0.4 0.4+ 19.8+0.4 L=0.4+3.8+0.4 =38.8m B=0.4+19.8+0.4 =20.6m	1	38.8	20.6	0.1	79.92	
6.	Internal plaster 3.8 19.8 19.8 3.8 L=38+19.8+38+19.8=115.6m	1	115.6	-	1.55	179.18	179.18 cu.m
7.	10cm thick, brick on edge flooring	1	38	19.8	-	752.4	752.4 cu.m
8.	10cm thick RCC (1:2:4) 1.55 +0.12 1.67	1	1.67	-	1.55	2.58	2.58 cu.m
9.	12m thick water proof cement Plaster in cm (1:4) 1.55 +0.25 1.8 Inside wall Top slab	 2 2 1	 38 19.8 38	 - 	 1.55 19.8	 179.18 752.4	 931.58 cu.m
	deduct Man hole cover	1	0.60	0.50		0.30	913.2 cu.m
10.	Man hole cover (weigh upto 0.50 quintal)	1				1	1m

Table no. 2

ABSTRACT

Sr. No.	Item	Qty	Per	Rate		Amount	
				Material	Labour	Material	Labour
1.	Excavation G.L upto 2.3m	1834.9	cu.m	175	175	321107.5	321107.5
2.	Providing and laying in situ, cement concrete in M-10 of trap/ granite/ quartzite/ gneiss metal for foundation and bedding including bailing out water, formwork, compacting and curing complete, with fully automatic micro processor based PLC with SCADA enabled reversible Drum Type mixer, with natural sand.	42.61	cu.m	3700	885	157657	37709.85
3.	Providing second class Burnt Brick masonry with conventional/ I.S. type bricks in cement mortar 1:6 in foundations and plinth of inner walls/ in plinth external walls including bailing out water, striking joints on unexposed faces, raking out joints on exposed faces and watering Complete.	53.56	cu.m	4930	940	264050	50346.4
4.	Providing uncoursed rubble masonry of trap / granite / quartzite / gneiss stones in cement mortar 1:6 in foundation and plinth of inner walls / in plinth of external walls including bailing out water, striking joints on un exposed faces and watering complete.	6.77 5.95	cu.m cu.m	2850	1350	19294.5	9139.5
5.	Providing and laying in situ cement concrete M-20 of trap / granite /quartzite/ gneiss metal for R.C.C. work in foundations like raft, strip foundations, grillage and footings of R.C.C. columns and steel stanchions etc. including bailing out water, formwork, cover blocks compaction and curing roughening the surface	79.92	cu.m	4895	1060	3912084	84715.24
6.	Providing internal cement plaster 6 mm thick in a single coat in cement mortar 1:4 without neeru finish to concrete surface in all positions including scaffolding and curing complete.	179.18	cu.m	110	85	19709.8	15230.3
7.	Providing and laying Rough Shahabad Stone Flooring 25mm to 30mm thick and of required width in plain/ diamond pattern on a bed of 1:6 C.M. including cement float, striking joints, pointing in cement mortar 1:3 curing and cleaning etc. complete	752.4	cu.m	497	148	373942.8	111355.2
8.	10 cm thick RCC pardi (1:2:4)	2.58	cu.m	650	650	1677	1677
9.	Providing and laying damp proof course50mm thick in (1:2:4) cement concrete layer and bitumen / using cement with waterproofing compound curing, formwork etc. complete.	931.28	cu.m	2.75	5300	2561.02	49357.84
10.	Manhole	1	No.	450	450	450	450
	Total cost					1551658.02	681088.79

Table no. 3

Total cost of material=1551658.02/- And Total cost of labour = 681088.79/-

total cost = cost of material+ cost of labour = 1551658.02 + 681088.79 = 2232746.81/

Total cubical contents = 38 x19.8 x 1.55

= 1166.22 cu.m

Total liter of water stored =1166.22 x 1000

= 1166220 lit.

Cost of liter = $\frac{\text{total cost}}{\text{Total liter of water stored}}$

= $\frac{2232746.81}{}$

1166220
= 1.91 Rs/liters

Estimation Of Overhead Water Tanks

Sr.No	Item	No.	L	B	D	Q	TQ
1.	Excavation	4	1.30	1.30	1.50	10.14	10.14cu.m
2.	PCC (1:4:8) in Foundation	4	1.30	1.30	1.50	3.38	3.38cu.m
3.	PCC (1:1.5:3) without reinforcement • Slab 3.14 x 16=50.24 8 Tank wall Beams Columns	 1 1 1 4 4	 201.06 201.06 50.24 1.6 1.10	 6.25 6.25 6.25 0.30 1.10	 0.10 0.15 0.15 0.30 0.15	 125.66 188.49 47.1 5.76 0.73	367.74 cu.m
4.	Centering work for column footing	16	1.10	-	0.15	2.64	2.64 sq.m
5.	Centering work for column	8	0.3	-	10	24	24 sq.m
6.	Centering work for beam and braces	24	4.30	-	0.3	30.96	30.96 sq.m
7.	Centering work for beam and braces Top and Bottom	 2	 201.06	 -	 -	 402.12	 402.12 sq.m
8.	Centering work for circular RCC wall	2	-	12.56	6.25	157.07	157.07 sq.m
9.	mild steel reinforcement including cutting bending and placing effective span= 16-0.06 =15.94m no of bar required in each direction 15.94+1 0.12 =133.83= 134 no's chord length at center of radius. $=2\sqrt{(1.92^2-0.96^2)}+2x9x0.009$ 15cm slab effective slab= 16-0.10 = 15.9m no's of bars required each= 158 no's chord length at center or radius 10 cm slab 15 cm slab total for slab a= side of square d= diameter of circle $a^2=\frac{\prod x\ d^2}{4}$ $a^2=\frac{\prod x\ 16^2}{4}$ $a^2=201.06$ a= 14.17 1) 10cm slab a= 0.90x16=14.4m Effective span = 144.006 =14.34m No. of bar = 14.34+1 0.12 =120.5= 121mm Total length of bars = 2x144x(14.28+2x9x0.0012) = 4174.84m Wall reinforcement Vertical bars Effective diameter= 16+0.10 = 16.1m	2x134 2x158		0.50 0.89			

	Effective span =∏x16.1 =50.57m No. of bars = 50.57+1 0.15 =344.8 =345mm Length of bar = 6.25-0.05+2x9x0.009 =6.362m Horizontal bar Effective span = 6.25 -0.05=6.2m No of rings=6.2 + 1 0.15 Length of ring=∏ x 16.1 = 50.57m						
	Vertical bars Horizontal bar	345 43	6.362 50.57 4369.4		0.50	2184.7	2184.7
	Beam reinforcement Beams below tank Effective span=4-0.05=3.95 Length of straight bar =395 + 2x9x0.016 =4.238m Length of bent up bar =4.238+2x0.50x0.40=4.638m 0.30 0.15 0.40 -0.05 0.40 Length of anchor bar =3.95+2x9x0.012 =4.116m Length of one ring =2x 0.40x 2x0.25 =0.80+0.50+24x0.006 =1.444m say = 1.45m No of rings = 3.95 +1 0.15 =28 say						
	Straight bar	64	4.238				
	Bent up bars	16	4.638 345.44		1.58	545.79	
	Anchor bars	32	4.116 131.71		0.89	117.22	
	Rings	448	1.15 515.2		0.22	113.34	
	Column reinforcement Length of footing bar = 1.10-2x 0.05+2x9x0.012 =1.216m Length of column bar 0.30+0.90+3+2x9x0.012=7.416 0.15 0.40 0.45						776.35

	1.00 -0.10 0.90sss Length of one ring =4x0.22+24x0.006 =1.024 m say 1.05m No's of footing base in each direction =1.10-0.14 +1 0.12 = 9 no's No's of column bar's per column = 4 no's No's of rings per column = 6+0.90+ 1 0.15 = 47 Colums Fotting bars Column bars Rings Total for column Total for beam Total for wall Total for slab	 144 32 376	 1.216 7.416 415.416 1.05 20.12		 6.25 6.25 6.25	 2577.6 129.5	 2707.1 776.35 233.30 2184.7 5901.45
10	18mm thick single coat mala plaster in cm (1:4) ∏x16.6x6.25=325.94 Bottom of slab ∏ x 16.6^2=216.42 4 Beam columns	 8x2 8	 4 1.20		 0.3+ 0.3 10	 325.94 216.42 38.4 9600	 10180.76sq.m
11	12mm thick single coat waterproof cement plaster in cm (1:4) Sides of wall Bottom of slab	 2		 ∏x16	 6.25	 314.15 201.06	 515.20sq.m
12.	Three coats of white washing Outer surface Bottom of slab Beam Columns					 325.94 216.42 38.4 9600	 10180.76sq.m
13.	Paving of 40mm thick I.P.S in proportion (1:2:4)					216.42	216.42sq.m
14.	Miscellaneous such as inlet pipe, outlet pipe, wash out, pipe, manhole, ladder, level indicator etc.	Lump				Lump	Lump

Table no. 3

ABSTRACT

Sr.No.	Item	Qty	Per	Rate		Amount	
1.	Excavation	10.14	cu.m	175	175	1774.5	1774.5
2.	PCC (1:4:8) in foundation	30.38	cu.m	3700	885	112406	26886.3
3.	PCC (1:1.5:3)without reinforcement	367.74	cu.m	3700	885	1360638	325449.9
4.	Centering work for column footing	2.64	Sq,m	112	52	295.68	137.28
5.	Centering work for column	24	Sq,m	3850	1790	92400	42960
6.	Centering work for beams & braces	30.96	Sq,m	3850	1790	119196	55418.4
7.	Centering work for circular slab. (1.5 time rectangular centering rate)	402.12	Sq,m	3850	1790	1547777	719615.8
8.	Centering work for circular RCC wall (1.5 time regular centering rates)	157.07	Sq,m	3850	1790	607029.5	282229.3
9.	Mild steel reinforcement including cutting, bending & placing etc. complete.	2184.7	quintal	3850	1790	8411095	3910613
10.	18mm thick single coat mala plaster in cm (1:4)	10180.76	Sq,m	295	165	3003324.2	1679825.4
11.	12mm thick water proof cement plaster in cm (1:4)	515.21	Sq,m	295	165	151986.95	85009.65
12.	Three coat of white washing	10180.76	-	92	76	936629.92	773787.76
13.	Paving of 40mm thick I.P.S in proportion(1:2:4)	216.42	Sq,m	40	30	8656.8	6492.6
14.	Miscellaneous such as inlet pipe, outlet pipe, over flow pipe, washout pipe, manhole cover, laden water level, indicator etc.	Lump	Sq,m	Lump.	Lump.	Lump.	Lump.
	Total cost					16353209.55	7910199.89

Total cost of material + labour
Total cost = 16353209.55 + 7910199.89
= 9545409.44

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