



**GOVERNMENT OF TELANGANA  
TELANGANA DRINKING WATER SUPPLY PROJECT  
Rural Water Supply & Sanitation Department**

**TELANGANA WATER GRID**



**L&T Construction - Water, Smart World & Communication  
CHENNAI**

CLIENT: RURAL WATER SUPPLY AND SANITATION DEPARTMENT (WATER GRID), TELUNGANA. CONSULTANT : WAPCOS LIMITED

PROJECT : PROVIDING DRINKING WATER TO HABITATIONS IN KOMARAMBHEEM ASIFABAD SEGMENT IN ADILABAD DISTRICT

SUPPLIER / CONTRACTOR: L&T Construction, Water, Smart World and Communication

JOB Ref. No. : LE150883 TITLE :  

	NAME	SIGN	DATE
DSGN			
CHKD			
APPD			

**DESIGN OF SUMP - 10KL CAPACITY  
SOMIGUDA AT NARNOOR MANDAL**

DOC./DRG. No. 

L	E	1	5	0	8	8	3	-	C	-	W	S	-	R	W	-	D	C	-	1	4	4	9
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 SIZE A4 REV. A

RELEASED FOR  PRELIMINARY  INFORMATION  APPROVAL  CONSTRUCTION

**Submitted sir,**

**Sub:**RWS&S-TDWSP- Vadoni 10KL clear water sump in Narnoor Mandal–Komarambheem Asifabad Segment-Adilabad District-Designs -Approval-Reg.

\*\*\*\*\*

Kindly puruse the Designs of the following 10KL Clear Water sump at Somiguda(V), Narnoor(M), submitted by the Executive Engineer TDWSP Asifabad Division, Adilabad district for approval.

### 1. 10KL Clear Water Sump.

The Executive Engineer TDWSP Asifabad Division has submitted Structural Designs & Drawings of 10KL Clear Water sump based on the field conditions and as per the estimate provisions, the structural designs & drawings for the above structure is verified with RWS&S standard Type Designs and submitted for approval.

The following design parameters were considered:

- Capacity : 10KL
- Net SBC of Soil : 10.0 t/sqm
- Grade of concrete & Steel : M 30 & Fe 500
- Dia of sump Inner to Inner : 3 .00m
- Sidewall Height : 1.90mts
- Sidewall Thickness: ~~200mm~~ 250mm
- Top Slab thickness: 150 mm
- RaftSlab thickness: 200mm

As per the above parameters the structural design and drawings of the clear water sump is verified, as per similar Type designs available and approved by the RWS&S Department considering the SBC and type of soil, duly following IS codes, IS: 456-2000, SP:16, 34, IS:3370 and IS 1893-2002 (seismic codes).The sizes and steel proposed in the designs and drawings of all components are safe and sufficient.

The additional points noted after checking the designs are:

- Detailed Estimate of the Structure with these specifications has to be prepared and compared with the provision made in sanctioned estimate. Such that deviation if any is within authorized limits. If any deviations noticed, the Estimate should be submitted for obtaining approval from the Competent Authority.

Subject to approval a draft memo addressed to the EE, TDWSP Asifabad Division , for communicating approved Structure is put up for kind perusal and approval.

AEE (Designs)  
TDWSP, Nirmal Circle

DEE (Designs)  
TDWSP, Nirmal Circle

Superintending Engineer,  
TDWSP, Nirmal Circle

# **DESIGN CALCULATION**

## **PROJECT TITLE**

PROVIDING DRINKING WATER TO HABITATIONS  
IN KOMARAMBHEEM ASIFABAD SEGMENT  
IN ADILABAD DISTRICT (30 MLD WTP)

## **UNIT**

10 KL SUMP

DCI NO: - LE150883-C-WS-RW-DC-1442  
&  
LE150883-C-WS-RW-NU-1443

## **PRINCIPAL CLIENT**

RURAL WATER SUPPLY  
AND  
SANITATION DEPARTMENT,  
TELANGANA

## **CONTRACTOR**

L&T CONSTRUCTION  
WATER & EFFLUENT TREATMENT SBG

## DESIGN OF SUMP

### BASIC DATA

Diameter = 3 m  
Water depth = 1.6 m  
Free board = 0.30 m

### CAPACITY CHECK

Required capacity = 10 KL

Capacity of suction

Clear diameter = 3 – 2 x plaster thickness  
= 3 – 2 x 0.012  
= 2.976 m

Water depth = 1.6 m

Volume =  $(\pi * d * d / 4) * H$   
=  $(\pi * 2.976 * 2.976 / 4) * 1.6 = 11.13 \text{ m}^3$  (including dead storage)

Volume-Dead storage = 11.13-1.04 = 10.09

Net volume = 10.09 m<sup>3</sup> > 10 m<sup>3</sup> hence O.K.

ELEMENT:

Inside tank: (1) Cylindrical wall  
(2) Top Slab

SBC – 10 t/m<sup>2</sup>

GROUND WATER TABLE: NO GWT

SUMP : 10 KL				FORMULA
PROJECT: PROVIDING DRINKING WATER TO HABITATIONS IN KOMARAMBHEEM ASIFABAD SEGMENT IN ADILABAD DISTRICT (30 MILD WTP)	SUMP AT	CLIENT		
	Different village	RURAL WATER SUPPLY AND SANITATION DEPARTMENT, TELANGANA		
STRUCTURE	DESIGN CALCULATION FOR SUMP	DATE	REV	
		2/2/2016	0	
<b>DESIGN CALCULATION DATA</b>				
<b>General Data</b>	Required Capacity of Sump	Sumpcap	10.000	m <sup>3</sup>
	Location			
<b>Hydraulic Features</b>	Ground Level	GL	0.00	m
	Dead Storage	Ds	0.15	m
	Free Board	FB	0.30	m
	Basic Shape :	Circular with flat slab		
	unit weight of concrete	uwc	25.000	kN/m <sup>3</sup>
	unit weight of water	uww	10.000	kN/m <sup>3</sup>
	unit weight of plaster	uwp	21.000	kN/m <sup>3</sup>
	live load at roof slab	lrf	1.500	kN/m <sup>2</sup>
	Finish load	Fl	1.000	kN/m <sup>2</sup>
	Diameter	Dia	3.00	m
	Depth of tank above GL		0.90	
	Depth of tank below GL		1.00	
	Water depth : With Dead storage	Wd	1.60	m
	Top Slab thickness	Tsthk	0.150	m
				As per tender Specification

Bottom slab thickness	Bsthk	0.200	m
plaster thickness	pt	0.012	m
<b>Permissible stress ( As per IS 456 &amp; IS 3370)</b>			
Concrete			
Concrete grade -FCK	fck	30	N/mm <sup>2</sup>
per. stress in con. for direct comp	fokc	8.0	N/mm <sup>2</sup>
per. stress in con in com.due to bending	fokbc	10.0	N/mm <sup>2</sup>
per. stress in con. for direct tension	fokt	1.5	N/mm <sup>2</sup>
per. stress in con. In ten due to bending	foktb	2.0	N/mm <sup>2</sup>
modulus of elasticity for container	em	2.74E+04	N/mm <sup>2</sup>
Reinforcement	fy	<del>500</del> 415	N/mm <sup>2</sup>
per. Ten. str.- steel tension due to bending	fyc	130	N/mm <sup>2</sup>
per. Ten. str.- steel tension due to direct ten	fyuc	130	N/mm <sup>2</sup>
Modular ratio	md	9.33	
Dimension for minimum steel	Dmin	15.0	m
Mass & Wt relation factor	g	9.810	
=5000*(fck) <sup>0.5</sup> *100			
<b>[A] CAPACITY OF CONTAINER</b>			
<b>Volume Calculation</b>			
Water Depth with Dead Storage	Wdd	1.600	
Inside Diameter		3.000	
Clear Inside Diameter without plaster	Diac	2.976	
total volume	vt	11.13	m <sup>3</sup>
dead storage	vdd	1.04	m <sup>3</sup>
net volume	vn	10.09	m <sup>3</sup> >
10.000 OK			
<b>[B] TOP SLAB DESIGN</b>			
Concrete grade	Fck	30	N/mm <sup>2</sup>
Steel	Fy	415	N/mm <sup>2</sup>
Clear cover	Cv	45	mm
Slab Diameter	Lx	3.000	m
Slab type	St	1	Simply supported

Width	B	1000 mm
Depth	D	150 mm
Maximum Bar dia	Db	10 mm
Density of concrete	Wd	25 kN/m <sup>3</sup>
Loading		
Live load	LI	1.5 kN/m <sup>2</sup>
Finishing load	FI	1 kN/m <sup>2</sup>
<b>CALCULATION</b>		
Calculation of loading		
Self wt ( Dead load)	DI	3.75 kN/m <sup>2</sup>
Total Load	TI	6.25 kN/m <sup>2</sup>
Effective depth	De	100 mm
Bending Moment	Bm	1.758 kN-m
Modular ratio		9.33
K	k	0.42
j = 1-k/3	j	0.9
Ast		157.1 mm <sup>2</sup>
Provide : 10 dia - 200 c/c		
<b>[C] CYLINDRICAL WALL</b>		
inner diameter	cyid	3.000 m
top thickness	cytt	<b>0.150</b> m
bottom thickness	cybt	<b>0.150</b> m
Water depth	cyh	<b>1.600</b> m
coefficient of constant height	cyc	<b>0.000</b> m
free board		0.300 m
height of wall fir design	cyhh	1.600 m
increment in thickness	cyth	0.000 m
Hoop Force ; Wall free at Top and hinge at bottom condition		
F = $c_{oe} \times H \times D / 2$		
F= Hoop force		

H = Height of water above that section  
 D = Diameter of wall at that section

Ration  $H^2/DT$  5.689  
 Enter Value for Auto serach 8.000

h

hoop force

sr. no	depth from top in meter	thickness at section	coefficient	hoop force in wall = Coe. X rad * height * unit wt of liquid	area of steel required = force / 1300	actual tensile stress in concrete = force/(thk*wid	Minimum Area of steel in mm2 on each face
1	0.160	0.150	0.010	0.2	2	0.002	180
2	0.320	0.150	0.106	2.6	20	0.016	180
3	0.480	0.150	0.227	5.4	42	0.035	180
4	0.640	0.150	0.347	8.3	64	0.053	180
5	0.800	0.150	0.465	11.2	86	0.071	180
6	0.960	0.150	0.565	13.6	104	0.087	180
7	1.120	0.150	0.632	15.2	117	0.097	180
8	1.280	0.150	0.631	15.2	117	0.097	180
9	1.440	0.150	0.533	12.8	98	0.082	180
10	1.600	0.150	0.317	7.6	58	0.049	180
	area of steel requd	dia of bar	bar spacing	area of steel prod			
1	180.000	10	200	785			
2	180.000	10	200	785			
3	180.000	10	200	785			
4	180.000	10	200	785			
5	180.000	10	200	785			
6	180.000	10	200	785			
7	180.000	10	200	785			
8	180.000	10	200	785			
9	180.000	10	200	785			
10	180.000	10	200	785			

weight of wall		cyspw		59.4		kN	
straight part		cyspw		59.4		kN	
tapered part		cytpw		0.0		kN	
plaster		cyppw		4.5		kN	
total weight		tcy		63.9		kN	
Maximum moment in wall							
	sr. no	depth from top in meter	thickness at section	coefficient	moment in wall = Coe. X height <sup>3</sup> * unit wt of liquid	effective depth	Area of steel required
		m	m		kN-m	m	in mm <sup>2</sup>
Minimum % steel as per IS 3370-2009	1	0.160	0.150	0.00013	0.005	0.095	0
Maximum Dimension #REF!	2	0.320	0.150	0.00046	0.019	0.095	2
Permissible dimension for 0.24 % steel 15.000	3	0.480	0.150	0.00105	0.043	0.095	4
Minimum Steel #REF!	4	0.640	0.150	0.00221	0.091	0.095	8
	5	0.800	0.150	0.00364	0.149	0.095	13
	6	0.960	0.150	0.00500	0.205	0.095	18
	7	1.120	0.150	0.00535	0.219	0.095	20
	8	1.280	0.150	0.00287	0.118	0.095	11
	9	1.440	0.150	-0.00463	-0.190	0.095	-17
	10	1.600	0.150	-0.01979	-0.811	0.095	-73
	sr. no	area of steel reqd	dia of bar	bar spacing	area of steel prod	distance	Minimum Area of steel
							in mm <sup>2</sup>
	1	180.000	10	200	393	0.160	180
	2	180.000	10	200	393	0.320	180
	3	180.000	10	200	393	0.480	180
	4	180.000	10	200	393	0.640	180
	5	180.000	10	200	393	0.800	180
	6	180.000	10	200	393	0.960	180
	7	180.000	10	200	393	1.120	180
	8	180.000	10	200	393	1.280	180
	9	180.000	10	200	393	1.440	180
	10	180.000	10	200	393	1.600	180
Vertical steel as compression only, I provide min r/f area of steel required total on both face		0.240	%				
		3.600	cm <sup>2</sup>				

## FOUNDATION DESIGN

### WALL FOOTING DESIGN

PROJECT: ADILABAD W.S.S

P16-2

UNIT : 10 KL Sump

WALL TYPE 1

W1

#### BASIC DATA

Density of water	denwt	10	kN/m3	
Density of soil	denso	18	kN/m3	
Density of concrete	decon	25	kN/m3	
Angle of Repose	Phi	30	degree	
Safe bearing capacity of soil	Sbc	100.0	kN/m2	
Concrete grade	Fck	30	N/mm2	
Steel grade	Fy	415	N/mm2	
Depth below Gl	Dbg	1.00	m	
Water depth	wtd	1.60	m	
free board	fb	0.30	m	
Wall above Ground		0.90	m	
Clear cover	Cv	50	mm	
Maximum size of bar dia	Db	12	mm	
Water depth with free board	Wd	1.90	m	
minimum % steel	pt	0.24	%	
Moment				
Due to Water	Mtw	1.00	kN-m	( From Analysis Result)
Wt from top dome/slab/column/wall	Slabwt	5.00	kN-m	

#### Wall geometry

Straight portion	lb	1.900	m
Tapered portion	lc	0.000	m
	tb	0.150	m
	td	0.150	m
Footing geometry			
Toe projection	ht	0.250	m
Heel straight projection	hh1	0.450	m
Heel tapered projection	hh2	0.000	m
Thickness at toe (free end)	tta	0.200	m
Thickness at toe (fwall face)	ttb	0.200	m
Thickness at heel (wall end)	tha	0.200	m
Thickness at heel (freel face)	thb	0.200	m
Total Height of Wall	Tlw	1.900	m
Total length of wall footing	wf	0.850	m



**Design of Toe - At Point A**

Moment at face of outer wall			
Due to rectangle diagram	Mreco	0.97	kN-m
	Mtrio	0.05	kN-m
Total moment due to upward pressure		1.02	kN-m
Net moment at A from Toe side	Toem	1.02	kN-m
Thickness at toe		200	mm
Effective depth	Def toe	144	mm
Ast required =		60.61	mm <sup>2</sup>
Check for minimum steel			
top		240	mm <sup>2</sup>
bottom		0	mm <sup>2</sup>
Design Steel			
Main steel - Top		240	mm <sup>2</sup>
Main steel - bottom		61	mm <sup>2</sup>
Distribution steel - top		240	mm <sup>2</sup>
Distribution steel - bottom		0	mm <sup>2</sup>

**Design of heel : At point B & C**

<b>Design at point B</b>			
Due to rectangle diagram (upward)	Mreci	2.55	kN-m
	Mtrii	0.15	kN-m
Total Upward moment		2.70	kN-m
Due to water (down ward)		1.92	kN-m
Net downward moment at B from heel side	heelm	0.77	kN-m
Thickness Provided		200	mm
	defheel	144	mm
Ast required =		46	mm <sup>2</sup>
Check for minimum steel - straight portion			
top		240	mm <sup>2</sup>
bottom		0	mm <sup>2</sup>
Design Steel			
Main steel - Top		240	mm <sup>2</sup>
Main steel - bottom		0	mm <sup>2</sup>
Distribution steel - top		240	mm <sup>2</sup>
Distribution steel -bottom		0	mm <sup>2</sup>

<b>Design at point C</b>			
Due to rectangle diagram (upward)	Mreci	0.00	kN-m
	Mtrii	0.00	kN-m
Total Upward moment		0.00	kN-m
Due to water (down ward)		0.00	kN-m
Net downward moment at B from heel side	heelm	0.00	kN-m
Thickness Provided		200	mm
	defheel	144	mm
Ast required =		0	mm <sup>2</sup>
Check for minimum steel - tapered portion			
Average thickness	thav	0.20	m
top		240	mm <sup>2</sup>
bottom		0	mm <sup>2</sup>
Design Steel			
Main steel - Top		240	mm <sup>2</sup>
Main steel - bottom		0	mm <sup>2</sup>
Distribution steel - top		240	mm <sup>2</sup>
Distribution steel -bottom		0	mm <sup>2</sup>

**SUMMARY**

**Pressure Check**

1>	P/A + M/Z	33.5	<	100	OK
2>	P/A - M/Z	25.2	>	0	OK

**Reinforcement**

	AstR	dia	spc	+	dia	spc	Astp	
<b>Toe</b>								
Top - main	240	10	200	0	0	393	OK	
Bottom main	61	10	200	0	0	393	OK	
Top - Dist	240	10	200	0	0	393	OK	
Bottom - Dist	0	10	200	0	0	393	OK	
<b>Heel Straight portion</b>								
Top - main	240	10	200	0	0	393	OK	
Bottom main	0	10	200	0	0	393	OK	
Top - Dist	240	10	200	0	0	393	OK	
Bottom - Dist	0	10	200	0	0	393	OK	
<b>Heel tapered portion</b>								
Top - main	240	10	200	0	0	393	OK	
Top - Dist	240	10	200	0	0	393	OK	
Bottom - Dist	0	10	200	0	0	393	OK	

*Farheed*

**Asst. Executive Engineer.**  
**TDWSP Asifabad**

*rae*

**Dy. Executive Engineer**  
**TDWSP Asifabad**

**Executive Engineer**  
**TDWSP Asifabad**

*[Handwritten signature]*

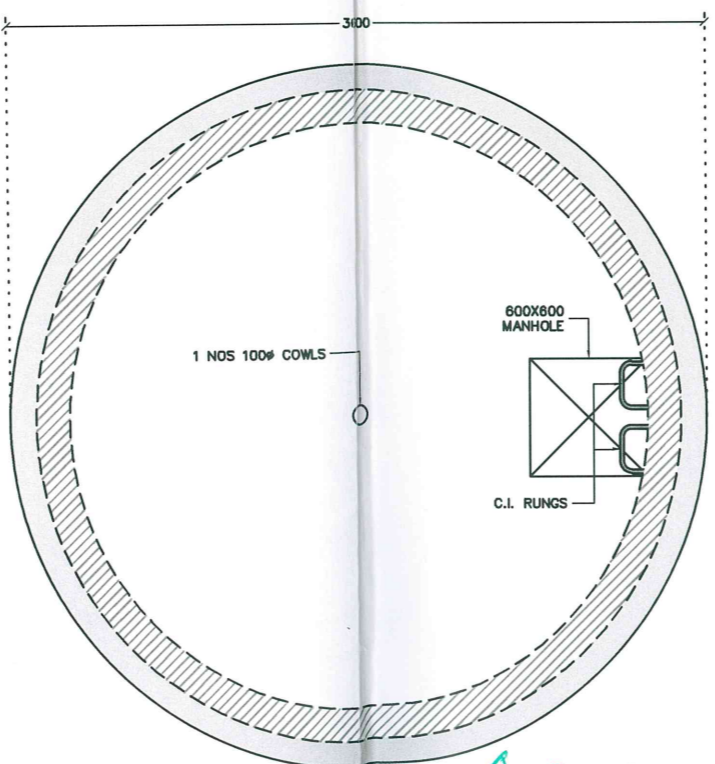
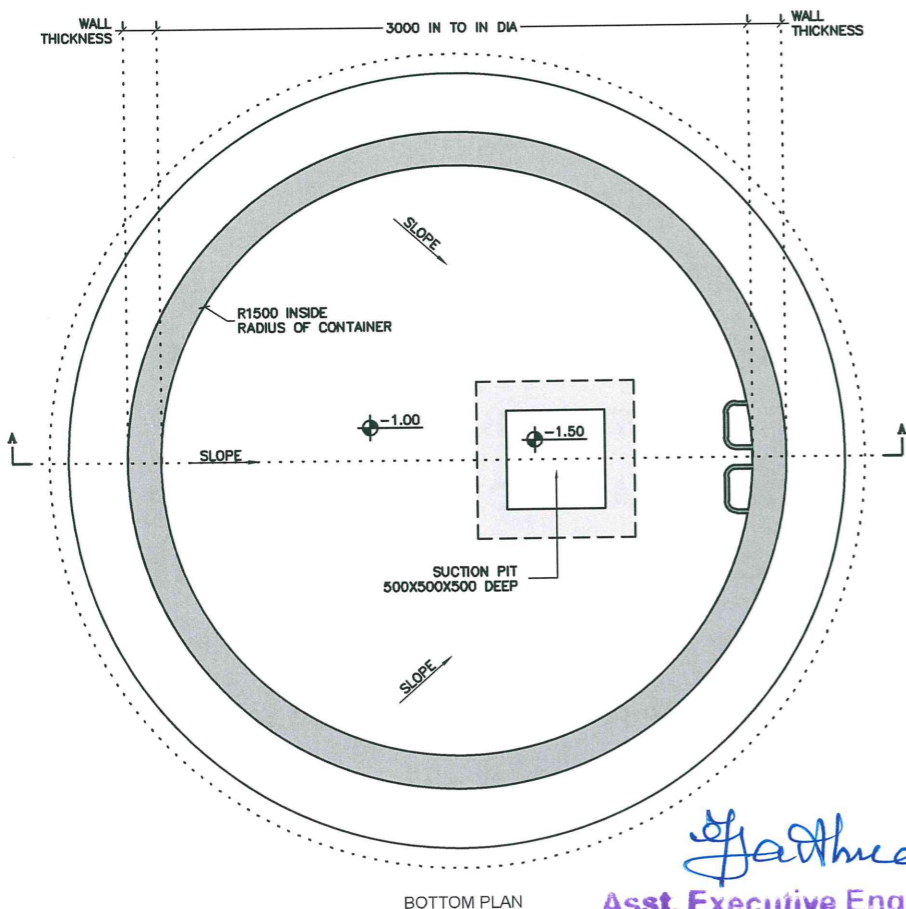
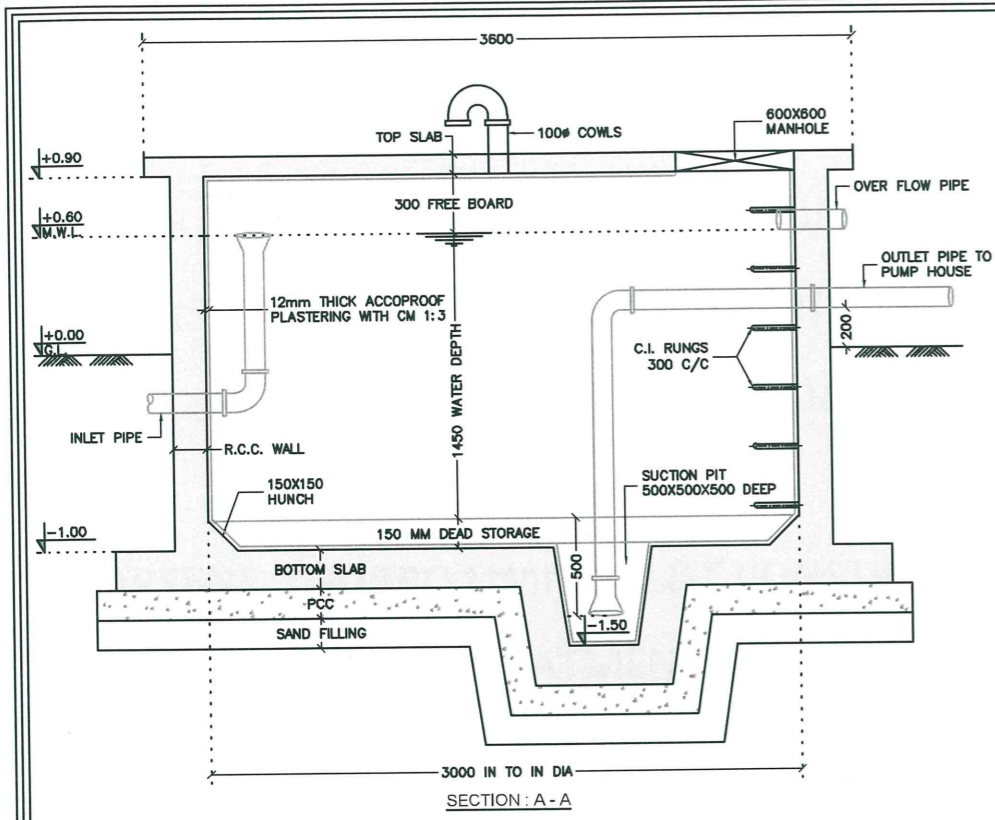
**APPROVED**

*20/4/16*

**NORMAL**

*all*





SCHEDULE OF PIPE	
INLET PIPE SIZE	-
OUTLET PIPE SIZE	-
OVER FLOW PIPE SIZE	-

NAME OF VILLAGE				
KOLAMGUDA	MADHARAMGUTTA	GOUNDUGUDA	GOVARGUDA	BABAPUR
DODDIGUEM	OTTIGHAT	NAYAKAPPUGUDA	GOTTIGOUNDUGUDA	PAVUGUDA
OOTPALLI	EHEEM GUDA	KONDI GG	SOMIGUDA	ALIGUDA 3
NAYAKAPPU GUDA	PATHAGUDA	KANNEPALLY	RAJULAGUDA	KHILADIGAON

NOTES :  
 <1> ALL DIMENSION ARE IN MM AND LEVELS ARE IN METER.  
 <2> LOCATION OF SUCTION PIT SHALL BE DECIDED AS PER SITE CONDITION BEFORE EXECUTION  
 <3> LOCATION & LEVELS OF INLET, OUTLET & OVERFLOW PIPE SHALL BE VARIFIED WITH ENGINEER INCHARGE BEFORE EXECUTION

APPROVED  
 13/04/16  
 SE, NIRMAL



REV. No	DESCRIPTION	DATE	DESIGNED	DRAWN	CHECKED	APPROVED
A	FOR APPROVAL	02/02/16	-	PMD	RMM	-

**L&T Construction**  
 Water, Smart World & Communication.

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SUPPLIER / CONTRACTOR : **L&T Construction**  
 Water & Effluent Treatment SBG

JOB No. : LE150883	TITLE : 10KL CAPACITY SUMP AT DIFFERENT VILLAGE (GENERAL ARRANGEMENT DRAWING)	SCALE : 1:30																			
<table border="1"> <thead> <tr> <th>NAME</th> <th>SIGN</th> <th>DATE</th> </tr> </thead> <tbody> <tr> <td>DSGN</td> <td>HMP</td> <td>02-02-16</td> </tr> <tr> <td>DRWN</td> <td>PMD</td> <td>02-02-16</td> </tr> <tr> <td>CHKD</td> <td>RMM</td> <td>02-02-16</td> </tr> <tr> <td>APPD</td> <td>-</td> <td>02-02-16</td> </tr> </tbody> </table>	NAME	SIGN	DATE	DSGN	HMP	02-02-16	DRWN	PMD	02-02-16	CHKD	RMM	02-02-16	APPD	-	02-02-16		<table border="1"> <thead> <tr> <th>SIZE</th> <th>REV.</th> </tr> </thead> <tbody> <tr> <td>A3</td> <td>A</td> </tr> </tbody> </table>	SIZE	REV.	A3	A
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DRAWING No. LE150883-C-WS-RW-GA-1441  
 COMP. DATA : P16-02\_79-01-02 SHEET 2 OF 2

RELEASED FOR  PRELIMINARY  TENDER  INFORMATION  APPROVAL  CONSTRUCTION

Asst. Executive Engineer: Dy. Executive Engineer: Executive Eng.  
 TDWSP Asifabad TDWSP Asifabad TDWSP Asifabad