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

TELANGANA WATER GRID

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

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

	NAME	SIGN	DATE
DSGN			
CHKD			
APPD			

TITLE :

DESIGN OF GLBR - 10KL CAPACITY AT TRIYANI MANDAL GOUNDUGUDA

DOC./DRG. No.

LE150883-C-WS-RW-DC-1462

SIZE: A4

REV.: A

RELEASED FOR

- [ ] PRELIMINARY
- [ ] INFORMATION
- [x] APPROVAL
- [ ] CONSTRUCTION

Submitted sir,

Sub: RWS&S-TDWSP- Gounduguda 10KL GLBR in Triyani Mandal–Komarambheem Asifabad Segment-Adilabad District-Designs -Approval-Reg.

*****

Kindly puruse the Designs of the following 10KL GLBR at Gounduguda(V) ,Triyani (M), submitted by the Executive Engineer TDWSP Asifabad Division ,Adilabad district for approval.

1. 10 KL GLBR.

The Executive Engineer TDWSP Asifabad Division has submitted Structural Designs & Drawings of 10KL GLBR 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 415
- Dia of GLBR Inner to Inner : 3.00m
- Sidewall Height : 1.9mts
- Sidewall Thickness:200mm
- Top Slab thickness: 150 mm
- Raft Slab thickness: 200mm

As per the above parameters the structural design and drawings of the GLBR 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: 456-1000, SP:16, 34, IS:3370 and IS 1893-1002 (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)	DEE (Designs)	30/4/16 Superintending Engineer,
TDWSP,Nirmal Circle	TDWSP,Nirmal Circle	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 GLBR

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 GLBR

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 x d ./ 4) x H
= (Pi* 2.976 x 2.976 / 4) * 1.6 = 11.13 m^3 (including dead storage)

Volume-Dead storage = 11.13-1.04 =10.09

Net volume = 10.09 m^3 > 10 m^3 hence O.K.

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

SBC – 10 t/m^2

GROUND WATER TABLE: NO GWT

GLBR : 10 KL				FORMULA
PROJECT: PROVIDING DRINKING WATER TO HABITATIONS IN KOMARAMBHEEM ASIFABAD SEGMENT IN ADILABAD DISTRICT (30 MLD WTP)	GLBR AT	CLIENT		
	Different village	RURAL WATER SUPPLY AND SANITATION DEPARTMENT, TELANGANA		
STRUCTURE	DESIGN CALCULATION FOR GLBR	DATE	REV	
		2/2/2016	0	

DESIGN CALCULATION

DATA

General Data				
Required Capacity of Sump	Sumpcap	**10.000**	m3	As per tender Specification
Location				
Hydraulic Features				
Ground Level	GL	**0.00**	m	
Dead Storage	Ds	**0.15**	m	
Free Board	FB	**0.30**	m	
Basic Shape :		Circular with flat slab		
Material Data				
unit weight of concrete	uwc	**25.000**	kN/m3	
unit weight of water	uww	**10.000**	kN/m3	
unit weight of plaster	uwp	**21.000**	kN/m3	
load Data				
live load at roof slab	llf	**1.500**	kN/m2	
Finish load	Fl	**1.000**	kN/m2	
Geometry Data				
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	

Bottom slab thickness	Bsthk	**0.200**	m		
plaster thickness	pt	**0.012**	m		
Permissible stress (As per IS 456 & IS 3370)					
Concrete					
Concrete grade -FCK	fck	30	N/mm2		
per. stress in con. for direct comp	fckc	8.0	N/mm2		
per. stress in con in com.due to bending	fckbc	10.0	N/mm2		
per. stress in con. for direct tension	fckt	1.5	N/mm2		
per. stress in con. In ten due to bending	fcktb	2.0	N/mm2		
modulus of elasticity for container	em	2.74E+04	N/mm2		=5000*(fck)^0.5*100
Reinforcement	fy	415	N/mm2		
per. Ten. str.- steel tension due to bending	fyc	130	N/mm2		
per. Ten. str.- steel tension due to direct ten	fyuc	130	N/mm2		
Modular ratio	md	9.33			
Dimension for minimum steel	Dmin	15.0	m		
Mass & Wt relation factor	g	9.810			
[A] CAPACITY OF CONTAINER					
Volume Calculation					
Water Depth with Dead Storage	Wdd	1.600			
Inside Diameter		3.000			
Clear Inside Diamater without plaster	Diac	2.976			
total volume	**vt**	**11.13**	m3		
dead storage	vdd	1.04	m3		
net volume	vn	10.09	m3 >	10.000	OK
[B] TOP SLAB DESIGN					
Concrete grade	Fck	30	N/mm2		
Steel	Fy	415	N/mm2		
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/m3
Loading				
Live load	Ll		1.5	kN/m2
Finishing load	Fl		1	kN/m2
CALCULATION				
Calculation of loading				
Self wt (Dead load)	Dl		3.75	kN/m2
Total Load	Tl		6.25	kN/m2
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	mm2
Provide : 10 dia - 200 c/c				

[C] CYLINDRICAL WALL

inner diameter	cyid	3.000	m
top thickness	cytt	**0.150**	m
bottom thickness	cybt	**0.150**	m
Water depth	cyh	**1.600**	m
coefficient of constant height	cyc	**0.000**	
free board		0.300	m

height of wall fir design	cyhh	1.600	m
increment in thickness	cyith	0.000	m

Hoop Force ; Wall free at Top and hinge at bottom condition

F = coe x H x 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	coeiffient	hoop force in wall = Coe. X rad * height * unit wt of liquid	area of steel required = force / 1300 in cm2	actual tensile stress in concrete = force/(thk*width+m*ast)	Minimum Area of steel in mm2 on each face
		m	mm		kN	mm2		
	1	0.160	0.150	0.010	0.2	2	0.002	180
Minimun % steel as per IS 3370-2009	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
Maximum Dimension	4	0.640	0.150	0.347	8.3	64	0.053	180
3.000	5	0.800	0.150	0.465	11.2	86	0.071	180
Permissible dimension for 0.24 % steel	6	0.960	0.150	0.565	13.6	104	0.087	180
15.000	7	1.120	0.150	0.632	15.2	117	0.097	180
Minimum Steel	8	1.280	0.150	0.631	15.2	117	0.097	180
0.240	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

	sr. no	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					
straight part	cyspw	59.4	kN		=PI()*(cyid+cytt)*cyh*cytt*uwc
tapered part	cytpw	0.0	kN		=PI()*(cyid+cytt+(cybt-cytt)/3)*cyh*(1-cyc)*(cybt-cytt)/2*uwc
plaster	cyppw	4.5	kN		=(cyid-pt)*PI()*pt*(trdd+cyh+mrdd/2-cyxa)*uwp
total weight	tlcy	63.9	kN		=cyspw+cytpw+cyppw

Maximum moment in wall

	sr. no	depth from top in meter	thickness at section	coeiffient	moment in wall = Coe. X height^3 * unit wt of liquid	effective depth	Aera of steel required	Minimum Area of steel in mm2
		m	m		kN-m	m		
	1	0.160	0.150	0.00013	0.005	0.095	0	180
Minimun % steel as per IS 3370-2009	2	0.320	0.150	0.00046	0.019	0.095	2	180
	3	0.480	0.150	0.00105	0.043	0.095	4	180
Maximum Dimension	4	0.640	0.150	0.00221	0.091	0.095	8	180
#REF!	5	0.800	0.150	0.00364	0.149	0.095	13	180
Permissible dimension for 0.24 % steel	6	0.960	0.150	0.00500	0.205	0.095	18	180
15.000	7	1.120	0.150	0.00535	0.219	0.095	20	180
Minimum Steel	8	1.280	0.150	0.00287	0.118	0.095	11	180
#REF!	9	1.440	0.150	-0.00463	-0.190	0.095	-17	180
	10	1.600	0.150	-0.01979	-0.811	0.095	-73	180

	sr. no	area of steel requd	dia of bar	bar spacing	area of steel prod	distance
	1	180.000	**10**	**200**	393	0.160
	2	180.000	**10**	**200**	393	0.320
	3	180.000	**10**	**200**	393	0.480
	4	180.000	**10**	**200**	393	0.640
	5	180.000	**10**	**200**	393	0.800
	6	180.000	**10**	**200**	393	0.960
	7	180.000	**10**	**200**	393	1.120
	8	180.000	**10**	**200**	393	1.280
	9	180.000	**10**	**200**	393	1.440
	10	180.000	**10**	**200**	393	1.600

Vertical steel		
as compression only,I provide min r/f	0.240	%
area of steel required total on both face	3.600	cm2

FOUNDATION DESIGN

WALL FOOTING DESIGN				
PROJECT: ADILABAD W.S.S				P16-2
UNIT : 10 KL GLBR				
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 GI	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	

CASE 1 : TANK FULL CONDITION WITH NO SOIL OUTSIDE

Total load & Moment calculation
Taking moment @ toe

Component		Wt kN W	Lever Arm m Dist	Moment kN-m W * dist
Wall Straight portion	W1	7.13	0.33	2.32
Wall Tapered portion	W2	0.00	0.25	0.00
Walkway/slab	P	5.00	0.33	1.63
Footing				
Footing : toe	W3	1.25	0.13	0.16
Footing center	W4	0.75	0.33	0.24
Footing : heel (straight)	W5	2.25	0.63	1.41
Footing : heel (tapered)	W6	0.00	0.85	0.00
Water	W7	8.55	0.63	5.34
Total downward load		24.93		11.09

Total restoring moment @ toe	TRM	11.1	kN-m
Total over turning moment		1.0	kN-m
F.S.against over turning		11.1	
Check for over turning	Hense o.k		
Total moment due to vertical load	Tmv	11.1	kN-m
Total moment due to horizontal load	Tmh	1.0	kN-m
Total vertical load	TPv	24.9	kn
Net Moment	Tmn	10.1	kN-m
M/p	E	0.40	m
Ecc	Ecc	0.020	m
b/6	Aec	0.14	m
Net moment From ECC	Mdg	0.503	

Property of footing

Width of footing		1.00	m
Depth of footing		0.85	m
Footing Area	Fare	0.85	m2
Modulus of section	Fz	0.12	m3

Pressure distribution

Pressure due to direct load =P/A	prea	29.32	kN/m2
Pressure due to moment =M/Z	Preb	4.17	kN/m2

Pressure

Maximum pressure - P/A + M/Z	Pmax	33.50	kN/m2
Minimum pressure - P/A + M/Z	Pmin	25.15	kN/m2

Check for SBC

Maximum pressure < SBC		OK		
Minimum presure > 0		OK		
Pressure difference		8.346		
Pressure difference / m		9.819		
Pressure at outer Wall face - A		preow	31.04	kN/m2
Pressure at inner Wall face B		preiw	29.57	kN/m2
Pressure at point C		preiw1	25.15	kN/m2

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	Deftoe	144	mm
Ast required =		60.61	mm2
Check for minimum steel			
top		240	mm2
bottom		0	mm2
Design Steel			
Main steel - Top		240	mm2
Main steel - bottom		61	mm2
Distribution steel - top		240	mm2
Distribution steel - bottom		0	mm2
Design of heel : At point B & C			
Design at point 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	mm2
Check for minimum steel - straight portion			
top		240	mm2
bottom		0	mm2
Design Steel			
Main steel - Top		240	mm2
Main steel - bottom		0	mm2
Distribution steel - top		240	mm2
Distribution steel -bottom		0	mm2
Design at point C			
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	mm2
Check for minimum steel - tapered portion			
Avrage thickness	thav	0.20	m
top		240	mm2
bottom		0	mm2
Design Steel			
Main steel - Top		240	mm2
Main steel - bottom		0	mm2
Distribution steel - top		240	mm2
Distribution steel -bottom		0	mm2

SUMMARY

Pressure Check

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

Reinforcement

	AstR						Astp	
Toe		dia	spc	+	dia	spc		
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
Heel Straight portion								
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
Heel tapered portion								
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

Asst. Executive Engineer
TDWSP Asifabad

Dy. Executive Engineer
TDWSP Asifabad

Executive Engineer
TDWSP Asifabad

LARSEN & TOUBRO LTD. Kommareddy Pratap Reddy Nagar Sheem - Asifabad Construction-TDWSP-ADILABAD

APPROVED

SE, NIRMAL

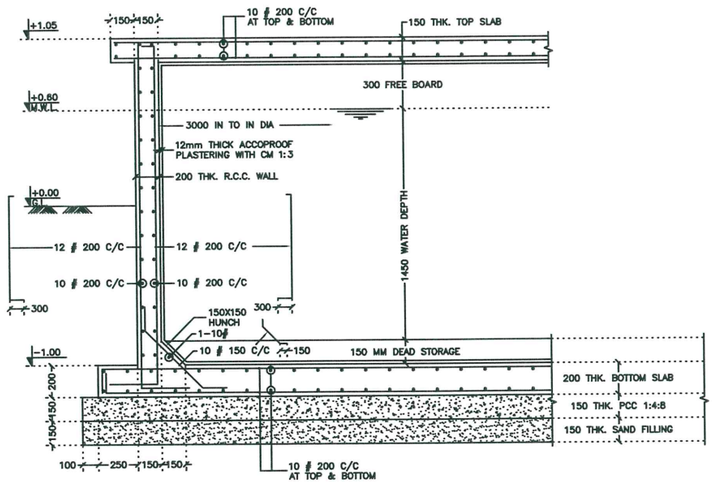
NAME OF VILLAGE				
KOLAMGUDA	MADHARAMGUTTA	GONDUGUDDA	GOVARGUDA	BABAPUR

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

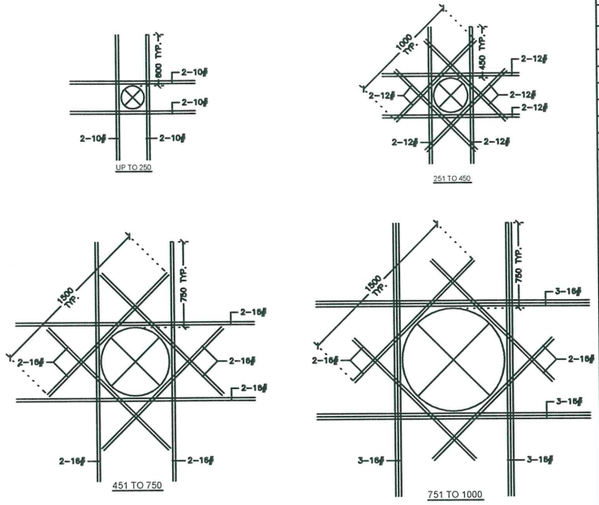
NOTES :

1. ALL DIMENSION ARE IN MM AND LEVELS ARE IN METER.
2. ALL CONCRETE MIX M:30 WITH MAXIMUM FREE WATER CEMENT RATIO OF 0.45 AND MAXIMUM CEMENT CONTENT OF 400kg/m3 FOR WATER RETAINING STRUCTURE
3. ALL CONCRETE SHALL BE MACHINE MIXED AND MACHINE VIBRATED
4. # – INDICATE HYSD–TMT BAR FE–415 GRADE 1 COMFORMING TO I.S 1786–LATEST REVISION
5. CLEAR COVER TO MAIN STEEL 50mm IN BOTTOM SLAB & 25mm IN BEAM, TOP SLAB & WALL
6. FOUNDATION SHALL REST ON IN–SITU SOIL AND IT SHALL NOT BE ON FILLING MATERIAL i.e. MADE UP SOIL OR HIGHLY COMPRESSIBLE SOIL
7. BACK FILLING SHALL BE DONE IN WELL COMPACTED AND WELL WATER LAYER NOT EXCEEDING 150mm IN DEPTH
8. SBC CONSIDERED IN DESIGN IS 10 T/M2 & NO GROUND WATER TABLE.
9. INLET & OVERFLOW PIPE SHALL BE DECIDED AS PER SITE CONDITION
10. LOCATION & LEVELS OF INLET,OUTLET & OVERFLOW PIPE SHALL BE VERIFY WITH ENGINEER INCHARGE BEFORE EXECUTION

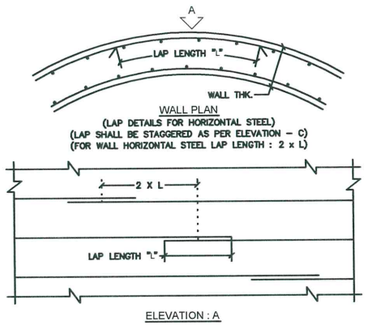
LAP LENGTH SECHDULE	
DIA OF BAR	LAP LENGTH "L" IN mm
8	320
10	400
12	480
16	640
20	800
25	1000



SECTION : A - A

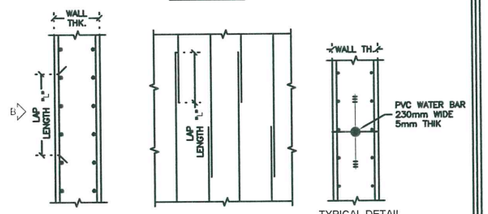


TYPICAL DETAIL FOR EXTRA STEEL BAR AT CUT-OUT



WALL PLAN
(LAP DETAILS FOR HORIZONTAL STEEL)
(LAP SHALL BE STAGGERED AS PER ELEVATION – C)
(FOR WALL HORIZONTAL STEEL LAP LENGTH : 2 x L)

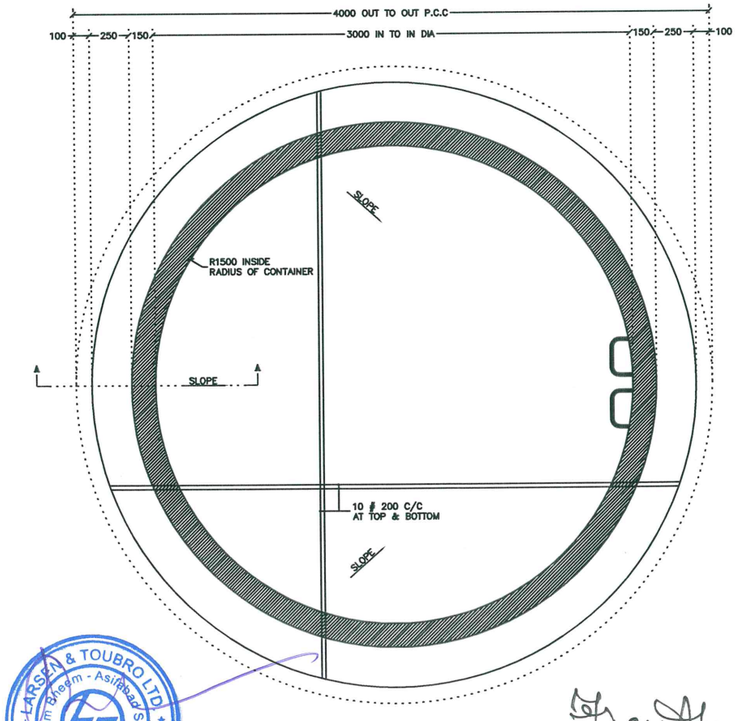
ELEVATION : A



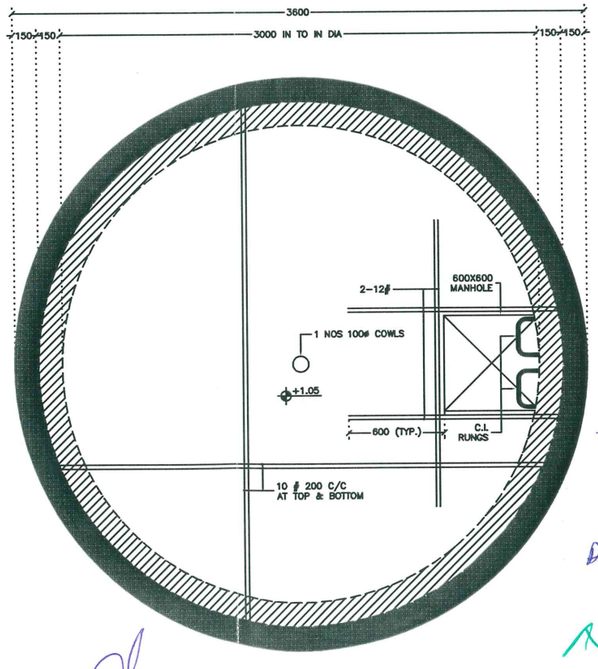
WALL SECTION
LAP DETAILS FOR VERTICAL STEEL (LAP SHALL BE STAGGERED AS PER ELEVATION – B)

ELEVATION : B

TYPICAL DETAIL OF WATER BAR



FOUNDATION PLAN



TOP PLAN

REV. No	DESCRIPTION	DATE	DESIGNED	DRAWN	CHECKED	APPROVED
A	FOR APPROVAL	02/02/16	HMP	NSP	RMM	–

REVISIONS

L&T Construction
Water, Smart World & Communication.

CLIENT : RURAL WATER SUPPLY AND SANITATION DEPARTMENT, TELANGANA.

CONSULTANT : -

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

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

JOB No. : LE150883

	NAME	SIGN	DATE
DSGN	HMP		02–02–16
DRWN	NSP		02–02–16
CHKD	RMM		02–02–16
APPD	–		02–02–16

TITLE : 10KL CAPACITY GLBR GOUNDUGUDA AT TRIYANI MANDAL (STRUCTURAL DETAILS)

SCALE 1:25

PROJECTION

DRAWING No. LE150883–C–WS–RW–RC–1462 SIZE A2 REV. A

COMP. DATA : P16–02_79–02–01 SHEET 1 OF 1

RELEASED FOR ☐ PRELIMINARY ☐ TENDER ☐ INFORMATION ☑ APPROVAL ☐ CONSTRUCTION

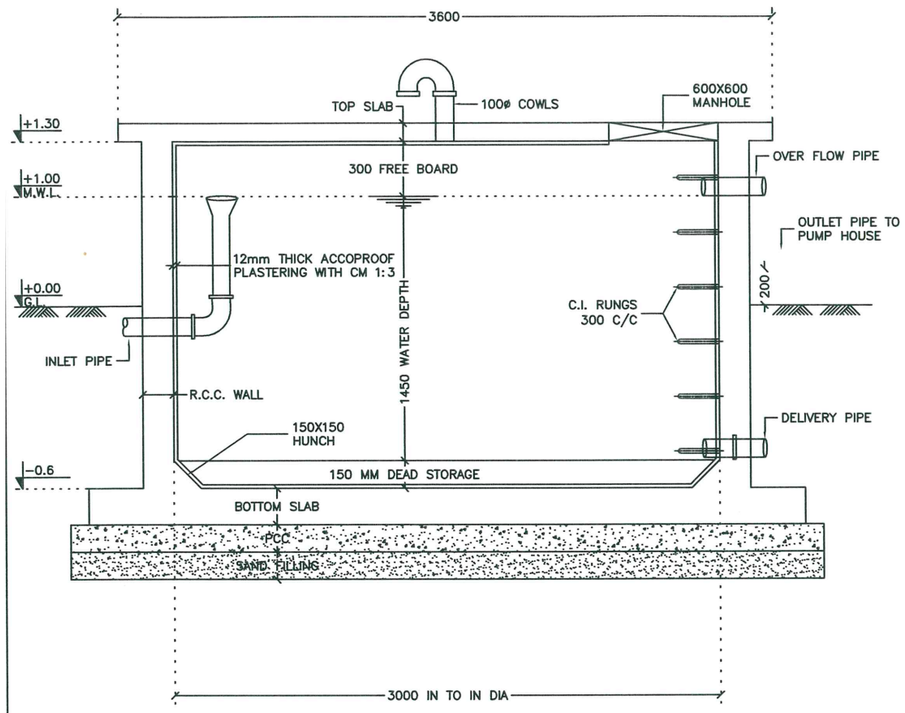
LARSEN & TOUBRO LTD Komaram Bheem - Asifabad Segment Construction Works ADILABAD

Asst. Executive Engineer TDWSP Asifabad

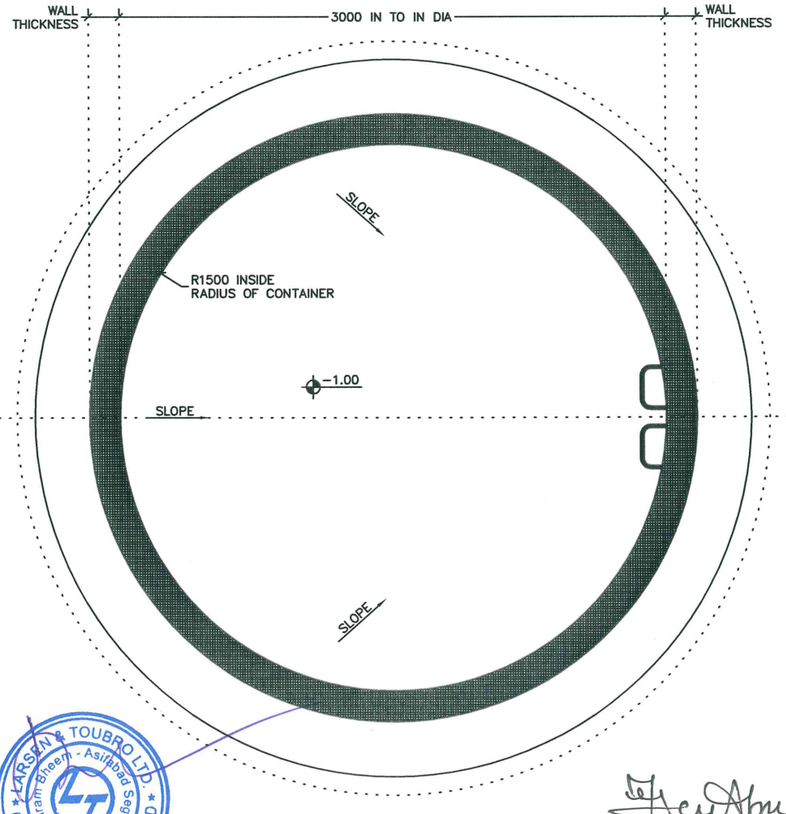
Dy. Executive Engineer TDWSP Asifabad

APPROVED 30/4/16 SE, NIRMAL

Executive Engineer TDWSP Asifabad



SECTION : A - A



BOTTOM PLAN

TOP PLAN

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

NAME OF VILLAGE				
KOLAMGUDA	MADHARAMGUTTA	GONDUGUDDA	GOVARGUDA	BABAPUR

NOTES :

<1> ALL DIMENSION ARE IN MM AND LEVELS ARE IN METER.

<2> LOCATION & LEVELS OF INLET,OUTLET & OVERFLOW PIPE SHALL BE VARIFIED WITH ENGINEER INCHARGE BEFORE EXECUTION

APPROVED 30/4/16
SE, NIRMAL

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

REVISIONS

L&T Construction
Water, Smart World & Communication.

CLIENT : RURAL WATER SUPPLY AND SANITATION DEPARTMENT, TELANGANA.

CONSULTANT : -

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

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

JOB No. : LE150883

	NAME	SIGN	DATE
DSGN	HMP		02-02-16
DRWN	PMD		02-02-16
CHKD	RMM		02-02-16
APPD	–		02-02-16

TITLE :
10KL CAPACITY GLBR
GOUNDUGUDA AT TRIYANI MANDAL
(GENERAL ARRANGEMENT DRAWING)

SCALE 1:30

PROJECTION

DRAWING No. LE150883-C-WS-RW-GA-1462
COMP. DATA : P16-02_79-01-02
SHEET 2 OF 2

SIZE A3 | REV. A

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LARSEN & TOUBRO LTD. Komaram Bheem - Asifabad Segment Construction TDWSP ADILABAD

Asst. Executive Engineer
TDWSP Asifabad

Dy. Executive Engineer
TDWSP Asifabad

Executive Engineer
TDWSP Asifabad

GEOTECHNICAL INVESTIGATION REPORT

TELANGANA DRINKING WATER SUPPLY PROJECT

KOMARAM BHEEM - ASIFABAD- SEGMENT 22

ASIFABAD , ADILABAD DISTRICT

10 KL GLBR GOUNDUGUDA AT TRIYANI (M)

CONTRACTOR **:**

M/s. LARSEN& TOUBRO LIMITED,L&T CONSTRUCTION,

WATER & EFFLUENT TREATMENT SBG, CHENNAI

Drilling By:

M/s. ANJI DRILLING & GROUTING WORKS

Report Prepared by

DR. D. BABU RAO,

M.E.(IIT,Roorkee), Ph.D.(USA), MIGS

MCH Panellist No. 2490 /TP/2000-2

GEOTECHNOLOGIES

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TELANGANA DRINKING WATER SUPPLY PROJECT

10 KL GLBR AT GOUNDUGUDA, TRIYANI (M) IN ADILABAD DT.

1. INTRODUCTION

M/s. L &T Construction, Water & Effluent Treatment is proposing to construct 10 KL GLBR at GOUNDUGUDA, TRIYANI (M) .The work is taken up under Segment 22 , Komaram Bheem Project , TDWSP, in Adilabad Dt.

The present Report presents the results of (1) Bore hole.

M/S Anji Drilling & Grouting works; Anantapur has carried out the drilling of bore holes, collection of soil and rock samples and conduct of Standard Penetration Tests at different levels in the respective bore holes at the proposed site.

Analysis of borehole data , Laboratory tests and geotechnical investigation report have been made by Prof. D Babu Rao, ME (IIT,R) , Ph.D. (USA), MIGS, Empanelled Consulting Geo technical Engineer &,Director, Geo technologies, Former Professor of Civil Engineering, Osmania University.

2. SCOPE OF WORK

The following is the scope of work of M/s. Anji Drilling and Grouting Works:

- Drilling Borehole at (1) location for 10 KL GLBR at GOUNDUGUDA in Adilabad Dt.
- Conducting SPT at regular intervals, where feasible
- Collection of undisturbed / disturbed samples from the Bore holes
- Preparation of Technical Report recommending suitable foundations and safe bearing capacity

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M.E., Ph.D.(USA)
Consulting Geotechnical Engineer

Following is the scope of work of Prof. D Babu Rao ,

Testing of soil samples in the Laboratory

Preparation of Technical Report

3. SUB SOIL INVESTIGATION

The sub soil investigation was carried out to determine:

Nature of sub stratum and engineering properties of sub strata which may affect the mode of construction of the proposed work.

FIELD INVESTIGATION PROCEDURE:

The following technique is adopted for sub soil investigations.

a) **BORINGS:**Rotary Drilling was done using TC / Diamond bits. The size of the casing used was 125 to 75 mm, yielding samples of NX size.

TC bits were employed for the overburden, and Impregnated Diamond Core bits were used for rock formation.

Drilling was performed on 10-15 Jan ,2016.

The following relevant data was recorded during Rotary drilling operations.

- Nature of strata
- Details of samples
- Core Recovery (CR)
- Rock Quality Designation (RQD)

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b) STANDARD PENETRATION TEST (SPT):

SPT split spoon sampler of standard dimensions was driven into the soil from the borehole bottom using 63.5 kg hammer with a fall of 75 cm height. The SPT weight was lifted to the specified height and allowed to fall freely on the anvil with the use of cat-head winch with one to one and half turn of the drum. Blow counts for the penetration of every 15 cm were recorded and the 'N' value is reported as the blow counts for 30 cm penetration of the sampler excluding the first 15 cm penetration as seating drive.

When the number of blows exceeded 50 to penetrate the first or second 15 cm length of the sampler, the SPT 'N' is regarded as more than 100 as described in IS 2131 - 1981. The test is terminated in such case and a record of the penetration of the sampler under 50 blows is made. SPT refusal is recorded when there is no penetration of the sampler at any stage and also when a rebound of the sounding system is recorded. These tests were conducted at close intervals of 1.0m so that a continuous SPT 'N' profile is available.

Disturbed soil collected in the SPT sampler was preserved in polythene covers and transported to the laboratory. Additional polythene cover was used to prevent the loss of moisture during the transit period.

c) DEPTH OF BORING: The depth of the Bore hole was as follows:

BH No	Drilled depth
1	5 m

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d) LOG OF BORE HOLE:

All the results obtained from the field operations are presented in Log of Bore hole in Fig. 1 .

4. LABORATORY TESTING:

The laboratory tests are conducted in the laboratory of Geotechnolgies, Hyderabad, an ISO- 9000 approved Laboratory.

Sandstone (sedimentary) rock was seen from GL to 05 m depth, No cores were procured in the BH.

5. SUB SOIL PROFILE

Based on Field and Laboratory tests, the following idealized sub soil profile is evolved.

Depth	Strata	N value
0 – 5 m	Sandstone	>100

. In Hard rock, no SPT can be conducted. However, in SDR strata, SPT can be conducted with N values tending to be 'refusal'. This is the criterion for distinguishing between Soft rock /Weathered rock and Hard rock.

6.0 SHALLOW FOUNDATIONS

In general, the following pertains to foundations resting in soils.

. A properly designed foundation has to satisfy the following two limit states.

1) Limit state of collapse (i.e. Shear strength)

2) Limit state of serviceability (i.e. Settlement)

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SHEAR CRITERIA:

The first criterion is depends on shear strength. The calculations are based on "TERZAGHI" bearing capacity equation as recommended by IS: 6403 (with factor of Safety) which takes care of L/B ratio (shape), foundation depth etc., along with other parameters.

SETTLEMENT CRITERIA:

The intensity of loading that will cause a permissible settlement or specified settlement of the structure is termed as allowable bearing pressure. The settlement in this type of layer will be elastic settlement.

These foundation settlements are evaluated using elastic theory. The pressure distribution below the footing is assumed as 2 V: 1 H for estimating the settlement. Since rock formation is available at shallow depth. The settlement will be within the permissible limit. Hence open foundation is suitable.

ALLOWABLE BEARING CAPACITY:

Allowable Bearing capacity (ABC) is the net intensity of the loading which the foundation will carry without undergoing settlement in excess of the permissible value for the structure under consideration but not exceeding the net safe bearing capacity (SBC).

7.0 DISCUSSION ON FOUNDATION OPTIONS

From sub soil profile and laboratory test data, it can be seen that Sand stone

(Sedimentary) rock exists 0 to 5 m depth.

Hence shallow foundation is feasible and same is recommended.

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8.0 RECOMMENDATIONS

Based on Field Investigations and laboratory testing, the following Recommendations are made for construction of GLBR at GOUNDUGUDA, TRIYANI (M), Adilabad Dt. ,

a) Open foundations resting in sandstone at 2 m below GL ,are recommended. The structure is likely to result in saturation and inundation of the sub soil during long – time operation,

b) SBC is recommended as follows :

Location		BH 1
S. No.	Depth (m)	Recommended SBC t/ sq m
1	1.0	10
2	2.0	11
3	3.0	12

c) The actual size of foundations will be based on loads from the superstructure.

For ANJI DRILLING AND GROUTING WORKS

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Former Professor of Civil Engineering

Consulting Geotechnical Engineer

MCH Panelist No. 2490/TP/2000-2

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TELANGANA DRINKING WATER SUPPLY PROJECT

FIG 1 : Record of Boring, *Bore Hole No : 1*

GLBR AT GOUNDUGUDA, TRIYANI (M) IN ADILABAD DT.

Type of Boring: Core drilling **Dia of Boring: NX**

Date : 10-15 Jan 2016 **Drilled depth = 05 m**

Depth, m	Profile	Soil	Sample Depth m	N value	CR, %	RQD%
0		Sand stone	0	>100		
1.0			1.5	>100		
2.0						
3.0			3.0	>100		
4.0			4.5	>100		
5.0						
6.0						
7.0						
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						
14.0						
15.0						
16.0						

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GEO TECH SERVICES

APPENDIX

CALCULATION OF SBC

GLBR AT GOUNDUGUDA , TRIYANI(M) IN ADILABAD DT.

TYPICAL CALCULATIONS FOR OPEN FOUNDATIONS RESTING IN

SAND STONE AT 2 M DEPTH

a) Shear Criterion :

Assumed value of N = 50

Assumed width of foundation =4 m

Assumed depth of foundation = 1,5 m inside rock

Correction factors Rq = Rr = 0.5

With a F.S. of 3.0 ,

Allowable $q = 1 / 18 \ [2 N^2 B Rr + 6 (100 + N^2) D Rq]$ =1205 kN / sq m

b) Settlement Criterion :

For permissible settlement of 40 mm,

Allowable Bearing Pressure = 12.25 N (B + 0.3) / B

= 658 kN / sq m

Adopt 250 kN / sq m .

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c) ***As per IS : 8009 (Fig. 2) Code of Practice for calculation of settlements of foundations:***

For N = 50, B = 4,

Settlement = 0.0045 m per unit pressure of 1 kg / sq cm

For a pressure of 25 t/ sq m,

Settlement = 0.0025 x 4.5 x1000 = 11.25 mm OK

d) ***As per IS : 12070 (Code of Practice for Design & Construction of Shallow Foundations on Rocks) :***

Weathered and disintegrated rock is treated under Classification No. V of Table 3 of the Code

For this *very poor* rock , net allowable bearing pressure is recommended as

10 t / sq m , for settlement less than 12 mm.

Keeping the above considerations in view, Recommended Safe Bearing Capacity is 10 t per sq m

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