



**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 :

**DESIGN OF GLBR - 10KL CAPACITY
MADHARAMGUTTA AT TANDUR MANDAL**

	NAME	SIGN	DATE
DSGN			
CHKD			
APPD			

DOC./DRG. No.

SIZE

REV.

L E 1 5 0 8 8 3 - C - W S - R W - D C - 1 4 6 1

A4

A

RELEASED FOR

PRELIMINARY

INFORMATION

APPROVAL

CONSTRUCTION

Submitted sir,

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

Kindly pursue the Designs of the following 10KL GLBR at Madharamgutta(V), Tandur (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.

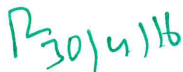
The additional points noted after checking the designs are:

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

Volume-Dead storage = 11.13-1.04 = 10.09

Net volume = 10.09 m³ > 10 m³ hence O.K.

ELEMENT:

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

SBC – 10 t/m²

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	RURAL WATER SUPPLY AND SANITATION DEPARTMENT, TELANGANA
	Different village		
STRUCTURE	DESIGN CALCULATION FOR	DATE	REV
	GLBR	2/2/2016	0
DESIGN CALCULATION			
DATA			
General Data	Surmpcap	10.000	m ³
Required Capacity of Sump 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/m ³
unit weight of water	uww	10.000	kN/m ³
unit weight of plaster	uwp	21.000	kN/m ³
	load Data		
live load at roof slab	lff	1.500	kN/m ²
Finish load	Fl	1.000	kN/m ²
	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
			As per tender Specification

Bottom slab thickness	Bsthk	0.200	m
plaster thickness	pt	0.012	m
Permissible stress (As per IS 456 & IS 3370)			
Concrete	fck	30	N/mm ²
Concrete grade -FCK	fckc	8.0	N/mm ²
per. stress in con. for direct comp	fckbc	10.0	N/mm ²
per. stress in con in com.due to bending	fckt	1.5	N/mm ²
per. stress in con. for direct tension	fcktb	2.0	N/mm ²
per. stress in con. In ten due to bending	em	2.74E+04	N/mm ²
modulus of elasticity for container	fy	415	N/mm ²
Reinforcement	fyc	130	N/mm ²
per. Ten. str. - steel tension due to bending	fyuc	130	N/mm ²
per. Ten. str. - steel tension due to direct ten	md	9.33	
Modular ratio	Dmin	15.0	m
Dimension for minimum steel	g	9.810	
Mass & Wt relation factor			
[A] CAPACITY OF CONTAINER			
Volume Calculation			
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 ³
dead storage	vdd	1.04	m ³
net volume	vn	10.09	m ³ >
[B] TOP SLAB DESIGN			
Concrete grade	Fck	30	N/mm ²
Steel	Fy	415	N/mm ²
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 ³
Loading		
Live load	LI	1.5 kN/m ²
Finishing load	FI	1 kN/m ²
CALCULATION		
Calculation of loading		
Self wt (Dead load)	DI	3.75 kN/m ²
Total Load	TI	6.25 kN/m ²
Effective depth	De	100 mm
Bending Moment	Bm	1.758 kN-m
Modular ratio		9.33
K		0.42
J = 1-k/3		0.9
Ast		157.1 mm ²
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 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 = coe x H x D / 2		
F= Hoop force		

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

Ration H²/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 ² 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
	m	mm		kN	in cm2	th-m*ast)	
	area of steel requid	dia of bar	bar spacing	area of steel prod			
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
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				=PI(0*(cyid+cytt)*cyh*cytt*uw =PI(1)*(cyid+cytt+(cybt-cybt/3)*cyh*(1-cyc))*(cybt-cybt)/2*uw =(cyid-pt)*PI(0)*pt*(trdd+cyh+mrrdd/2-cyxa)*uwp =cyspw+cytpw+cyppw							
straight part		cytpw		0.0		kN											
tapered part		cyppw		4.5		kN											
plaster		ticy		63.9		kN											
total weight																	
Maximum moment in wall																	
		sr. no		depth from top in meter		thickness at section		coefficient		moment in wall = Coe. X height*3 * unit wt of liquid		effective depth		Area of steel required		Minimum Area of steel in mm2	
				m		m				KN-m		m					
Minimum % steel as per IS 3370-2009		1		0.160		0.150		0.00013		0.005		0.095		0		180	
		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				0.240		%											
as compression only, provide min r/f				3.600		cm2											
area of steel required total on both face																	

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/m ³
Density of soil	denso	18	kN/m ³
Density of concrete	decon	25	kN/m ³
Angle of Repose	Phi	30	degree
Safe bearing capacity of soil	Sbc	100.0	kN/m ²
Concrete grade	Fck	30	N/mm ²
Steel grade	Fy	415	N/mm ²
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)	tth	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	DefToe	144	mm
Ast required =		60.61	mm ²
Check for minimum steel			
top		240	mm ²
bottom		0	mm ²
Design Steel			
Main steel - Top		240	mm ²
Main steel - bottom		61	mm ²
Distribution steel - top		240	mm ²
Distribution steel - bottom		0	mm ²

Design of heel : At point B & C

Design at point B			
Due to rectangle diagram (upward)	Mrecl	2.55	kN-m
	Mtril	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 ²
Check for minimum steel - straight portion			
top		240	mm ²
bottom		0	mm ²
Design Steel			
Main steel - Top		240	mm ²
Main steel - bottom		0	mm ²
Distribution steel - top		240	mm ²
Distribution steel -bottom		0	mm ²

Design at point C			
Due to rectangle diagram (upward)	Mrecl	0.00	kN-m
	Mtril	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 ²
Check for minimum steel - tapered portion			
Average thickness	thav	0.20	m
top		240	mm ²
bottom		0	mm ²
Design Steel			
Main steel - Top		240	mm ²
Main steel - bottom		0	mm ²
Distribution steel - top		240	mm ²
Distribution steel -bottom		0	mm ²

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

APPROVED

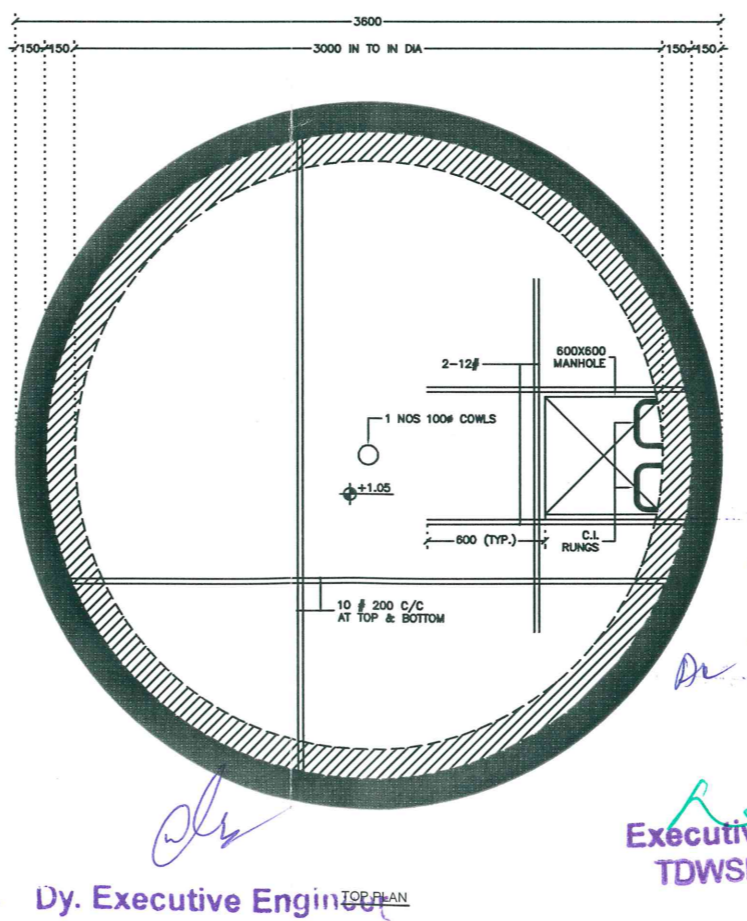
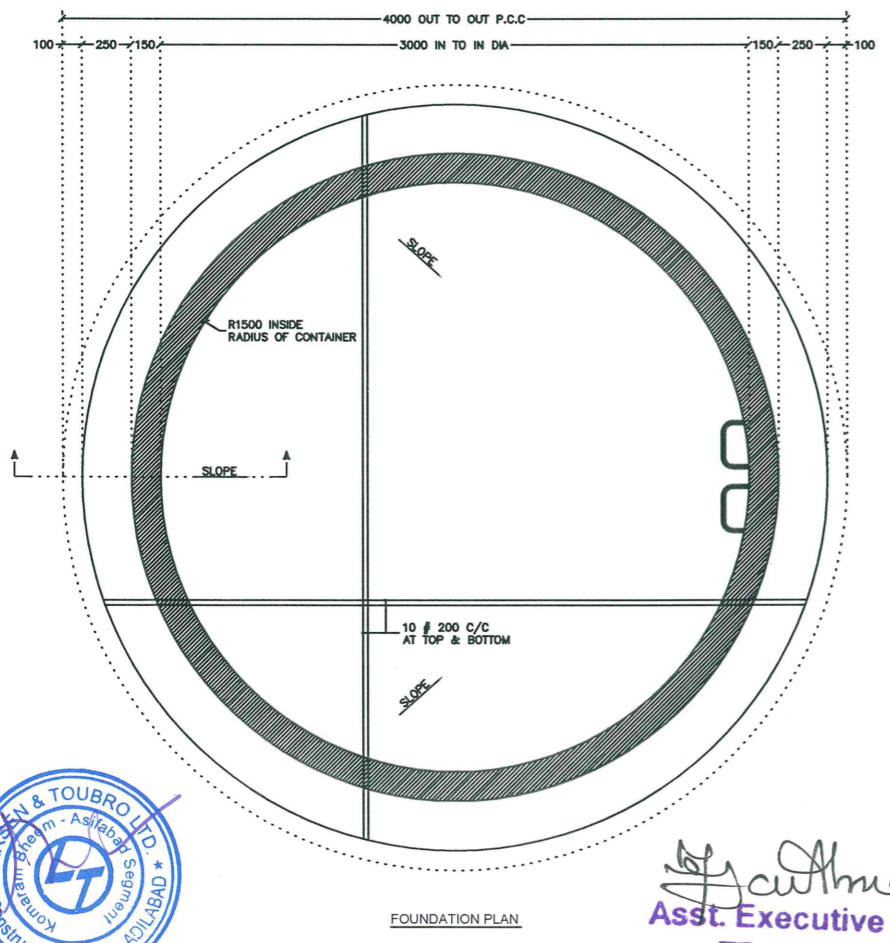
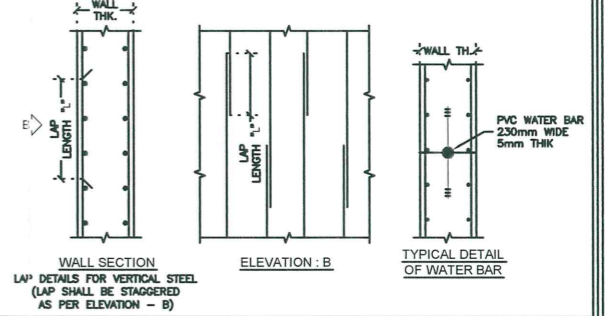
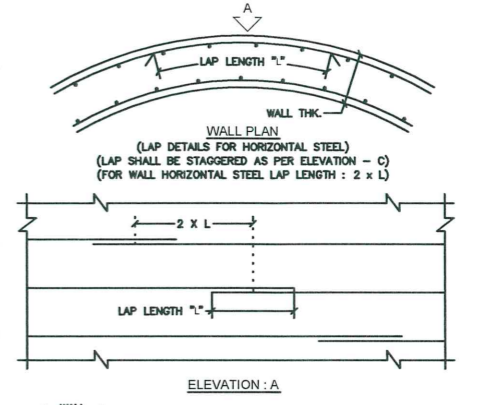
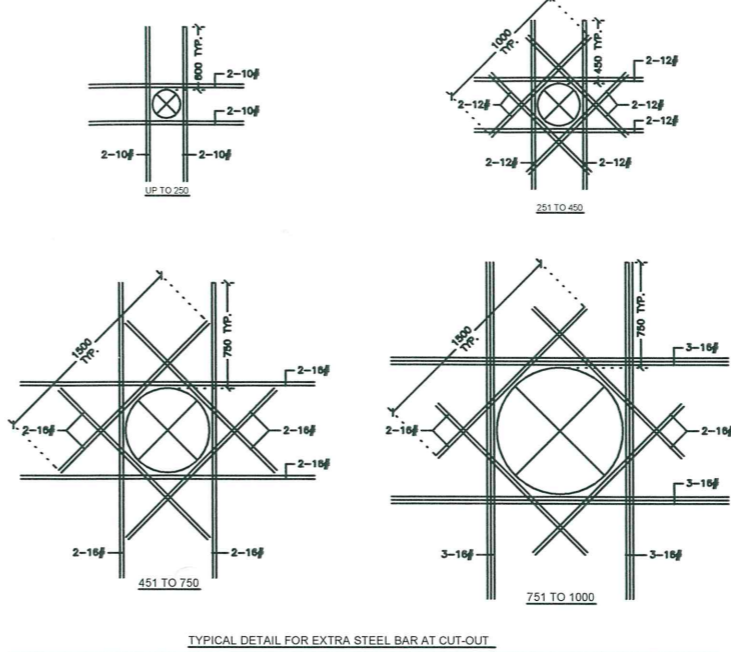
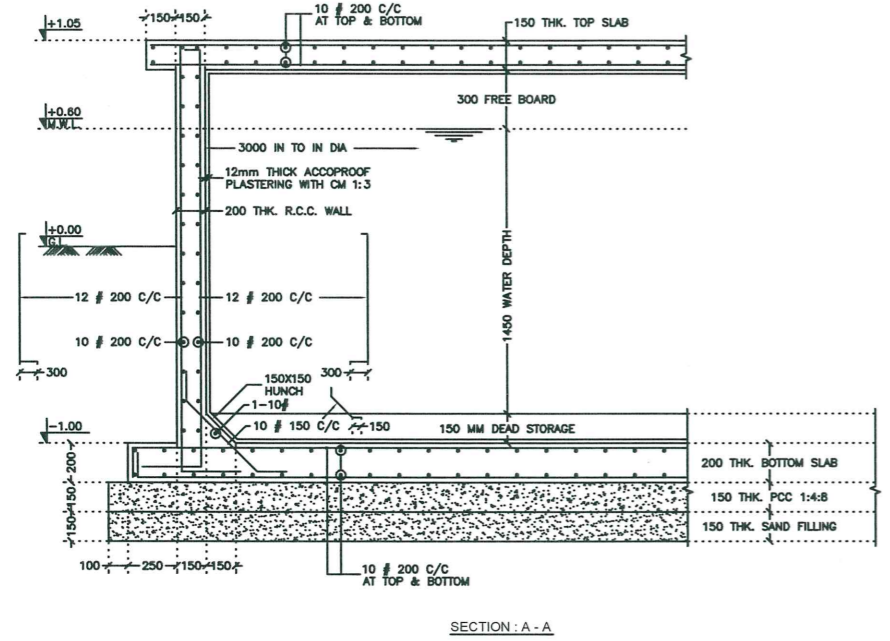
SE, NIRMAL

NAME OF VILLAGE				
KOILANGUDA	MADHARAMGUTTA	GONDUGUDA	GOVARGUDA	BABAPUR

- 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 CONFORMING TO IS 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. LA: 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

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

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



APPROVED
 (Signature)
 SE, NIRMAL

Executive Engineer
 TDWSP Asfabad

(Signature)
 Asst. Executive Engineer
 TDWSP Asfabad

(Signature)
 Dy. Executive Engineer
 TDWSP Asfabad



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.

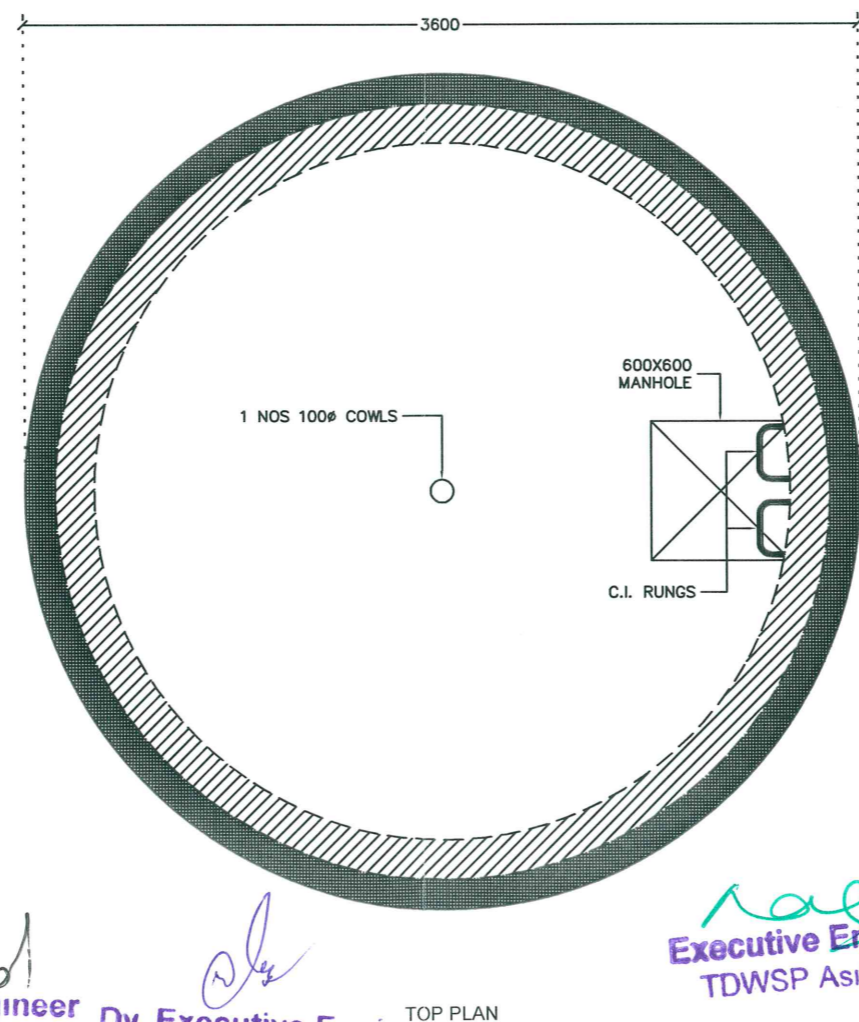
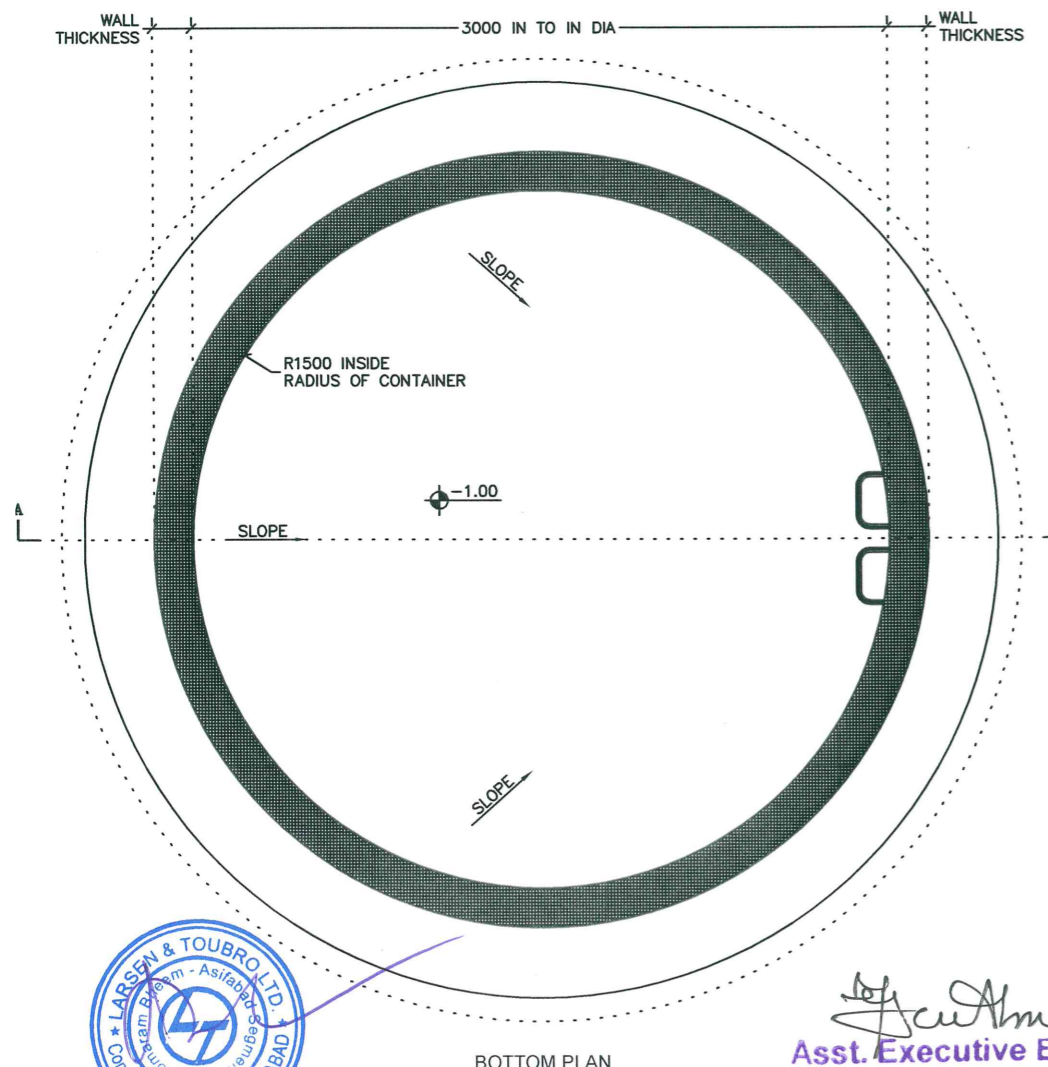
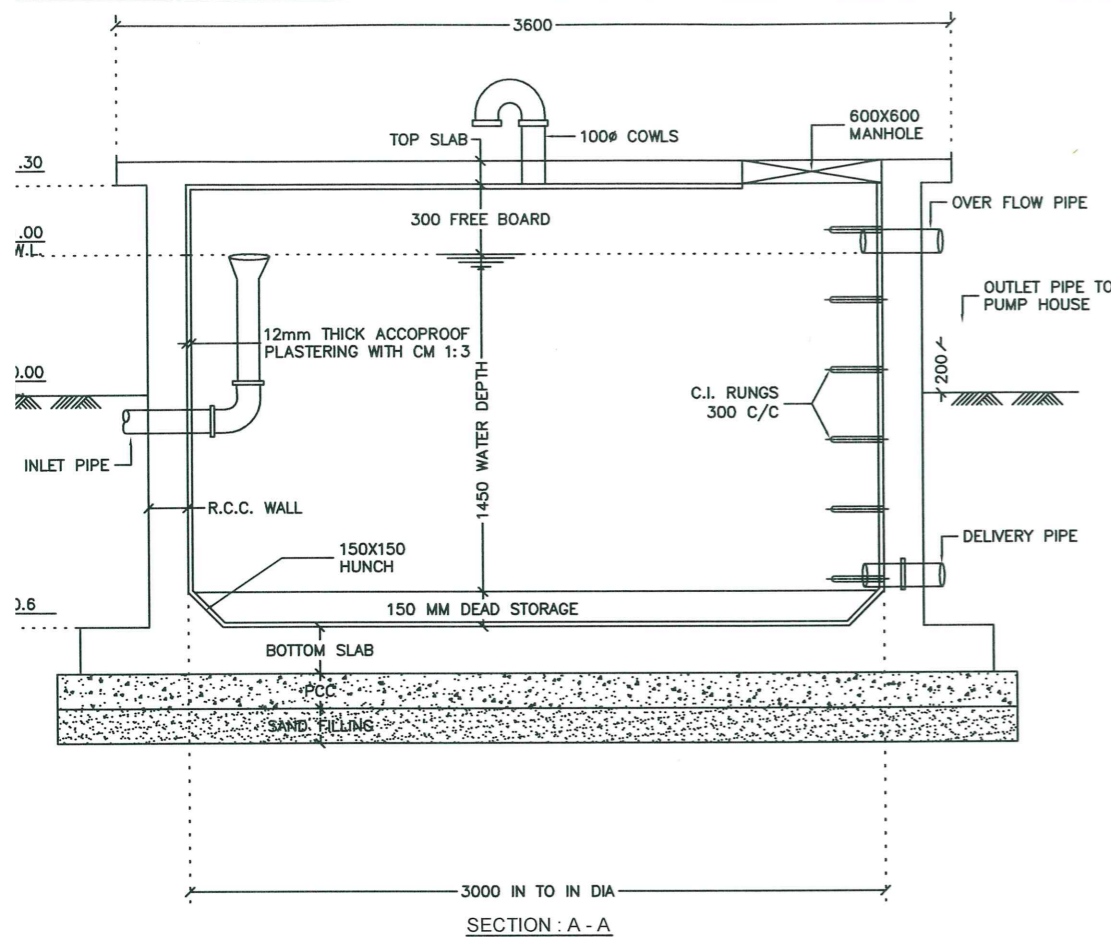
CLIENT: RURAL WATER SUPPLY AND SANITATION DEPARTMENT, TELANGANA
 CONSULTANT:
 PROJECT: PROVIDING DRINKING WATER TO HABITATIONS IN KOMARAMBHEEM ASIFABAD SEGMENT IN ADILABAD DISTRICT

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

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

JOB No: LE150883
 TITLE: 10KL CAPACITY GLBR MADHARAMGUTTA AT TANDUR MANDAL (STRUCTURAL DETAILS)
 SCALE: 1:25
 PROJECTION:

RELEASED FOR: PRELIMINARY TENDER INFORMATION APPROVAL CONSTRUCTION



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
 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 : -

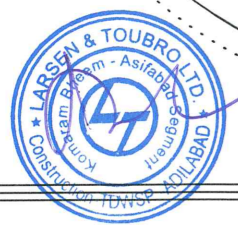
PROJECT : PROVIDING DRINKING WATER TO HABITATIONS IN KOMARAMBHEEM ASIFABAD SEGMENT IN ADILABAD DISTRICT

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

JOB No. : LE150883	TITLE : 10KL CAPACITY GLBR MADHARAMGUTTA AT TANDUR MANDAL (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 HMP</td> <td></td> <td>02-02-16</td> </tr> <tr> <td>DRWN PMD</td> <td></td> <td>02-02-16</td> </tr> <tr> <td>CHKD RMM</td> <td></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		PROJECTION
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DRAWING No. LE150883-C-WS-RW-GA-1461
 COMP. DATA : P16-02_79-01-02 SHEET 2 OF 2

RELEASED FOR PRELIMINARY TENDER INFORMATION APPROVAL CONSTRUCTION



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 TDWSP Asifabad

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 Dy. Executive Engineer
 TDWSP Asifabad

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 Executive Engineer
 TDWSP Asifabad

TOP PLAN

GEOTECHNICAL INVESTIGATION REPORT

TELANGANA DRINKING WATER SUPPLY PROJECT

KOMARAM BHEEM - ASIFABAD- SEGMENT 22

ASIFABAD , ADILABAD DISTRICT

10 KL GLBR MADGHARAMGUTTA AT TANDUR (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

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MCH Panellist No. 2490 /TP/2000-2

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TELANGANA DRINKING WATER SUPPLY PROJECT

10 KL GLBR AT MADHARAMGUTTA, TANDUR (M) IN ADILABAD DT.

1. INTRODUCTION

M/s. L & T Construction, Water & Effluent Treatment is proposing to construct 10 KL GLBR at MADHARAMGUTTA, TANDUR (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 MADHARAMGUTTA 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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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 Geotechnologies, 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


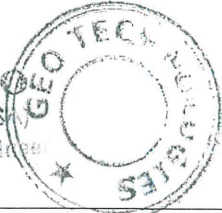
. In Hard rock, no SPT can be conducted. However, in SDR strata, SPT can be conducted with N values tending to be 'refusal'. This is the criterion for distinguishing between Soft rock /Weathered rock and Hard rock.

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).

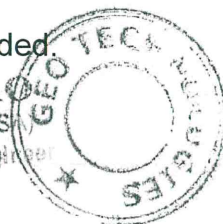
7.0 DISCUSSION ON FOUNDATION OPTIONS

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 MADHARAMGUTTA, TANDUR (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

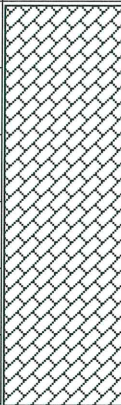
GLBR AT MADHARAMGUTTA, TANDUR (M) IN ADILABAD DT.

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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APPENDIX

CALCULATION OF SBC

GLBR AT MADHARAMGUTTA , TANDUR(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 N² B Rr + 6 (100 + N²) 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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