DESIGN CALCULATION

PROJECT TITLE

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

UNIT

120KL CAPACITY GLBR
AT GOLETI GUTTA VILLAGE

PRINCIPAL CLIENT

RURAL WATER SUPPLY
AND
SANITATION DEPARTMENT,
TELANGANA

CONTRACTOR

L&T CONSTRUCTION
WATER & EFFLUENT TREATMENT SBG

DESIGN OF GLBR

BASIC DATA

Diameter = 8.0 m
Water depth = 2.6 m
Free board = 0.3 m

CAPACITY CHECK

Required capacity = 120 KL

Capacity of section

Clear diameter = 8.0 – 2 x plaster thickness
= 8.0 – 2 x 0.012
= 7.976 m

Water depth = 2.6 m

Volume = (pi * d x d ./ 4) x H
= (Pi* 7.976 x 7.976 / 4) * 2.6 = 129.90 m^3 (including dead storage)

Volume-Dead storage = 129.90 – 7.49 = 122.41 m^3

Volume of single column = pi * d x d. / 4 x H
= Pi x 0.30 x 0.30 / 4 x 2.6
= 0.18

Total nos of column = 4 nos

Less for pedestal = 4 x 1 x 1 x 0.1 = 0.4

Less volume of column = 0.18 m^3 x 4 nos = 0.72 m^3

Total deduction = 0.4 + 0.72 = 1.12

Net volume = 121.29 m^3 > 120 m^3 hence O.K.

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

SBC – 15 t/m^2

GROUND WATER TABLE: NO GWT

Design of Sump

Design Approach

Element

- Cylindrical wall
- Flat slab
- Column

CYLINDRICAL WALL

Cylindrical wall

Wall is designed as top hinge, bottom fixed condition Subject to triangular loading

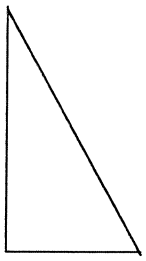
- Water pressure from inside
- Soil pressure from outside

Loading

1. Water load :
   a. Water depth = 2.6 m
   b. Free board = 0.3 m

   Total height = 2.9 m

   Water pressure is as below



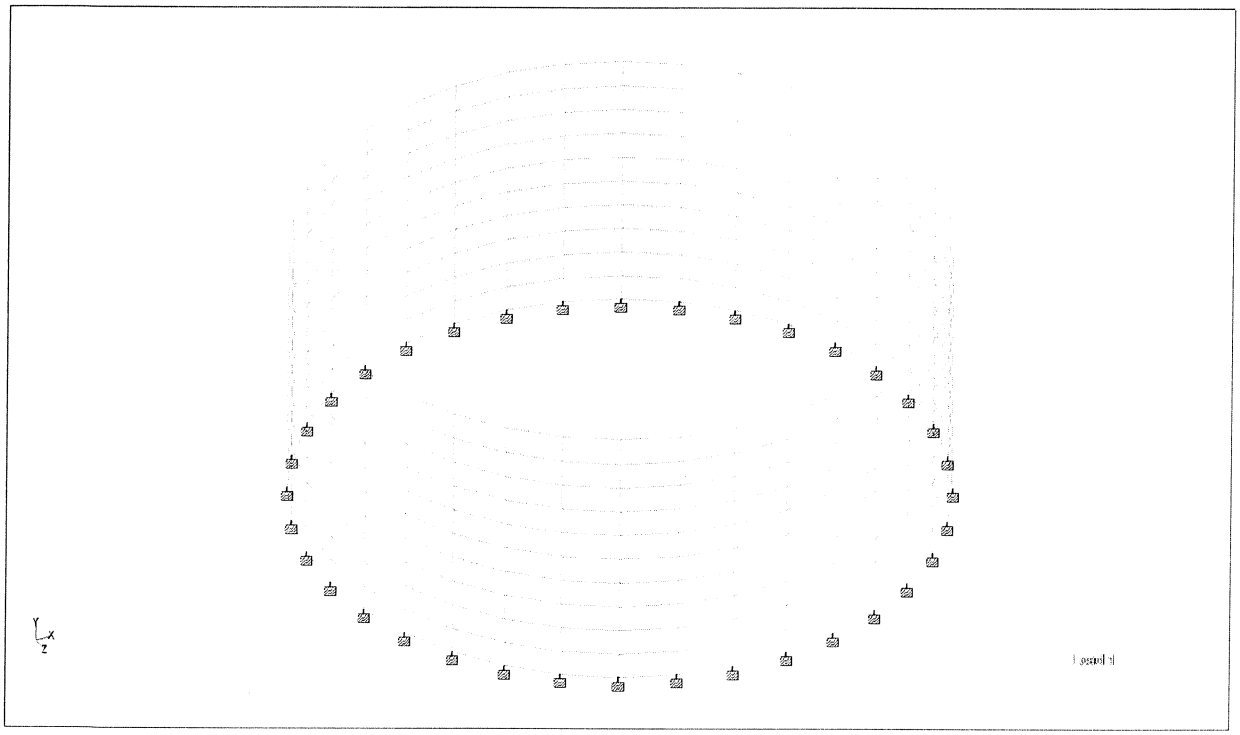
2. Soil load :

   a. Depth below ground level = 0.5 m say 0.57 m to match staad geometry
   b. Density of soil = 1.80 t/m3
   c. Angle of repose = 30 degree

Pressure at bottom = Y * H * (1-sin th)/ (1 + sin th) + Surcharge load
= 18 * 0.57 * (1 – sin 30)/ (1+ sin 30) + 10 x 0.333
= 6.75 kN/m^2

Analysis is done in STADD, Input data & Output result are given

Provide, ~~175~~ 200 mm thick wall
Analysis of wall is done using software STAAD.Pro



STAAD MODEL

```
STAAD SPACE
START JOB INFORMATION
JOB NAME 1.20 lac GSR
JOB PART 8.0 m dia WATER HEIGHT 2.6 + 0.3 fb
END JOB INFORMATION
INPUT WIDTH 79
UNIT METER KN
JOINT COORDIANTE CYL REV
1 4.0 0 0 36 4.0 0 350
REPEAT 1 0 0.28 0
REPEAT 8 0 0.29 0
REPEAT 1 0 0.30 0
ELEMENT INCIDENCES
1 1 2 38 37 TO 35 1 1
36 36 1 37 72
REPEAT ALL 9 36 36
DEFINE MATERIAL START
ISOTROPIC MATERIAL1
E 2.73e+007
POISSON 0.17
DENSITY 25
ALPHA 1.2e-011
DAMP 0.05
END DEFINE MATERIAL
ELEMENT PROPERTY
1   TO 36  THICKNESS 0.175
37  TO 72  THICKNESS 0.175
73  TO 108 THICKNESS 0.175
109 TO 144 THICKNESS 0.175
145 TO 180 THICKNESS 0.175
181 TO 216 THICKNESS 0.175
217 TO 252 THICKNESS 0.175
253 TO 288 THICKNESS 0.175
289 TO 324 THICKNESS 0.175
325 TO 360 THICKNESS 0.175
CONSTANTS
MATERIAL MATERIAL1 ALL
SUPPORTS
1 TO 36 FIXED
LOAD 1 WATER
ELEMENT LOAD
1   TO 36  TRAP Y 29.0 26.2
37  TO 72  TRAP Y 26.2 23.3
73  TO 108 TRAP Y 23.3 20.4
109 TO 144 TRAP Y 20.4 17.5
145 TO 180 TRAP Y 17.5 14.6
181 TO 216 TRAP Y 14.6 11.7
217 TO 252 TRAP Y 11.7 8.80
253 TO 288 TRAP Y 8.80 5.90
289 TO 324 TRAP Y 5.90 3.00
325 TO 360 TRAP Y 3.00 0.00
LOAD 2 LOADTYPE None  TITLE SEIMIC - 9.04% , CONSIDER 12 %
ELEMENT LOAD
1   TO 36  TRAP Y 3.48 3.15
37  TO 72  TRAP Y 3.15 2.80
73  TO 108 TRAP Y 2.80 2.45
109 TO 144 TRAP Y 2.45 2.10
145 TO 180 TRAP Y 2.10 1.75
181 TO 216 TRAP Y 1.75 1.40
217 TO 252 TRAP Y 1.40 1.05
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253 TO 288 TRAP Y 1.05 0.71
289 TO 324 TRAP Y 0.71 0.36
325 TO 360 TRAP Y 0.36 0.00
LOAD 3 SOIL - 0.5M DEPTH
ELEMENT LOAD
1   TO 36  TRAP Y -6.75 -5.01
37  TO 72  TRAP Y -5.01 -3.33
LOAD COMB 4 COMBINE LOAD : WATER + SEISMIC
1 1.0 2 1.0
PERFORM ANALYSIS
PRINT ELEMENT FORCE LIST 1 37 73 109 145 181 217 253 289 325
FINISH
```

EXCEL SHEET FOR WALL DESIGN WATER PRESSURE

Reinforcement Calculation of Cylindrical wall			
Circular wall			
Load case : Water + Seismic			
BASIC DATA			
Diameter - in to in	Diain	**8**	m
Maximum wall thickness	wthk	**0.175**	m
Clear cover to main steel	Cv	**45**	mm
Maximum dia of bar	mdbar	**12**	mm
Concrete grade	Fck	**30**	N/mm2
Allowable crack width	Acw	**0.2**	mm
GENERAL DATA			
As per IS 3370-2009	Dmin	15	m
steel grade	Fy	**500**	N/mm2
Modulus of Elasiticity of Concrete	Ec	27386	N/mm2
Modulus of Elasiticity of reinforcement	Es	200000	N/mm2
Maximum out to out Dia	Maxdia	8.35	m
Permissible stress in direct tension	fyuc	130	N/mm2
Permissible stress in tension due to bending	fyucb	130	N/mm2
Minimum % steel as per IS 3370-2009	ptmin	**0.24**	%
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
Modular ratio	m	9.33	
	k	0.418	
	j	0.861	
As maximum diameter is less than 15 m , minimum steel = 0.24 %			

Paste data from STADD

Plate	L/C	SQX kN/m2	SQY kN/m2	MX kNm/m	MY kNm/m	MXY kNm/m	SX kN/m2	SY kN/m2	SXY kN/m2
1	4	0	78.4	-0.5	-2.9	0	33	0	0
37	4	0	37.5	0.0	0.0	0	159	0	0
73	4	0	10.8	0.2	1.1	0	288	0	0
109	4	0	-2.8	0.2	1.3	0	366	0	0
145	4	0	-7.7	0.2	1.0	0	384	0	0
181	4	0	-7.7	0.1	0.7	0	354	0	0
217	4	0	-5.8	0.1	0.3	0	293	0	0
253	4	0	-3.5	0.0	0.1	0	217	0	0
289	4	0	-1.7	0.0	0.0	0	135	0	0
325	4	0	-0.4	0.0	0.0	0	50	0	0

OUTPUT

Calculation for hoop steel

Sr.no	Plate no	Sx - Str. Stress Kn/m2	Thk	Axial Force kn	Steel reqd Design mm2	Steel reqd Minimum mm2	Dia. mm	spc mm	Astp mm2
							Provided steel mm2		
1	1	33	**175**	5.9	45	420	**10**	**200**	785
2	37	159	**175**	27.7	213	420	**10**	**200**	785
3	73	288	**175**	50.4	388	420	**10**	**200**	785
4	109	366	**175**	64.1	493	420	**10**	**200**	785
5	145	384	**175**	67.2	517	420	**10**	**200**	785
6	181	354	**175**	61.9	476	420	**10**	**200**	785
7	217	293	**175**	51.3	394	420	**10**	**200**	785
8	253	217	**175**	37.9	292	420	**10**	**200**	785
9	289	135	**175**	23.6	181	420	**10**	**200**	785
10	325	50	**175**	8.8	68	420	**10**	**200**	785

Check for hoop steel and stress

	steel			Concrete stress		
	Steel reqd mm2	Steel Prov mm2	check	perm. stress N/mm2	Actual stress N/mm2	check
1	420	785	O.K	1.5	0.03	O.K
2	420	785	O.K	1.5	0.15	O.K
3	420	785	O.K	1.5	0.28	O.K
4	493	785	O.K	1.5	0.35	O.K
5	517	785	O.K	1.5	0.37	O.K
6	476	785	O.K	1.5	0.34	O.K
7	420	785	O.K	1.5	0.28	O.K
8	420	785	O.K	1.5	0.21	O.K
9	420	785	O.K	1.5	0.13	O.K
10	420	785	O.K	1.5	0.05	O.K

Calculation Vertical steel

Sr.no	Plate no	My Stress	Thk	Effective Depth	Steel reqd	Steel			
						Water face		Other face	
						Design	Min	Design	Min
		Kn-m	mm	mm	mm2	mm2	mm2	mm2	mm2
1	1	2.9	175	124	-208	208	210	0	210
2	37	0.0	175	124	-3	3	210	0	210
3	73	1.1	175	124	82	0	210	82	210
4	109	1.3	175	124	95	0	210	95	210
5	145	1.0	175	124	75	0	210	75	210
6	181	0.7	175	124	48	0	210	48	210
7	217	0.3	175	124	24	0	210	24	210
8	253	0.1	175	124	9	0	210	9	210
9	289	0.0	175	124	2	0	210	2	210
10	325	0.0	175	124	0	0	210	0	210

Check for Vertical steel

Sr.no	Plate no	Steel provd.	Steel	Steel	

		Water side				required	Provided	check
		Dia	mm	Dia	mm	mm2	mm2	
1	1	**10**	**200**			210	393	O.K
2	37	**10**	**200**			210	393	O.K
3	73	**10**	**200**			210	393	O.K
4	109	**10**	**200**			210	393	O.K
5	145	**10**	**200**			210	393	O.K
6	181	**10**	**200**			210	393	O.K
7	217	**10**	**200**			210	393	O.K
8	253	**10**	**200**			210	393	O.K
9	289	**10**	**200**			210	393	O.K
10	325	**10**	**200**			210	393	O.K

Check for Vertical steel

Sr.no	Plate no	Steel provd.				Steel	Steel	check
		Outer side				required	Provided	
		Dia	mm	Dia	mm	mm2	mm2	
1	1	**10**	**200**			210	393	O.K
2	37	**10**	**200**			210	393	O.K
3	73	**10**	**200**			210	393	O.K
4	109	**10**	**200**			210	393	O.K
5	145	**10**	**200**			210	393	O.K
6	181	**10**	**200**			210	393	O.K
7	217	**10**	**200**			210	393	O.K
8	253	**10**	**200**			210	393	O.K
9	289	**10**	**200**			210	393	O.K
10	325	**10**	**200**			210	393	O.K

Uncrack Check

Calculation for Coefficient of Uncrack condition					
RCC wall					
	notation		Unit		
DATA				Steel provided	
Bending moment	Bm	**4.8**	kN-m	dia	spc
Reinforcement	Fy	**500**	N/mm2		
Concrete grade	fck	**30**	N/mm2	**10**	**200**
Area of steel provised	Ast	393	mm2	0	1
Depth provided	Dp	**200**			
Width	B	1000			
Clear Cover	Cv	**45**	mm		
maximum bar dia	dbar	**10**			
Permissible stress in Steel	Fyub	**130**	N/mm2		
Calculation				equation	
Modular ratio	md	9		For Fck 30	
Per.str.in direct Tension	Pst	15	kg/cm2	For Fck 30	
Per.str.tension due to bending	Pstb	20	kg/cm2	For Fck 30	
steel	PT	0.0020		=Ast/Dp/B	
Effective depth	Def	150	mm		
Constants	ka	0.75		=Def/Dp	
	kb	1.02		=1+2*PT*ka*(md-1)	
	kc	2.03		=2+2*PT*(md-1)	
Depth of neutral axis - N	n	0.5039		=kb/kc	
Depth of neutral axis	nd	100.7733		=n*Dp	
Check for Mu/bd2					
	kd	0.0010		=(ka-n)^2*(md-1)*PT	
	ke	0.0833		=1/3-n*(1-n)	
	kf	0.0843		=kd+ke	
m/bd2	Unc	3.3983		=Pstb/(1-n)*kf	
Depth reuired	Dr	118.8	mm	=(Bm*100/Unc)^0.5*10	
Calculation od Steel	Ast				
Effective Depth	De	150	mm	=Dp-Cv-dbar/2	
Area of steel required		274	mm2	=Bm*1000000/(0.9*Fyub*De)	
Check		OK			

WALL FOOTING

WALL FOOTING DESIGN								
PROJECT : P16_02_Adilabad W.S.S						JOB : P16_02		
UNIT : 120KL GLBR								
WALL TYPE 1					**W1**			
BASIC DATA								
Density of water	denwt	**10**	kN/m3			fyuc	130	N/mm2
Density of soil	denso	**18**	kN/m3			fyucb	130	N/mm2
Density of concrete	decon	**25**	kN/m3			fckbc	10.0	N/mm2
Angle of Repose	Phi	**30**	degree			fckt	1.5	N/mm2
Safe bearing capacity of soil	Sbc	**150.0**	kN/m2		modular ratio	m	9.33	
Concrete grade	Fck	**30**	N/mm2			K	0.42	
Steel grade	Fy	**500**	N/mm2			j	0.86	
Depth below GI	Dbg	**0.50**	m					
Water depth	wtd	**2.60**	m					
free board	fb	**0.30**	m					
Wall above Ground		**2.40**	m					
Clear cover	Cv	**50**	mm					
Maximum size of bar dia	Db	**10**	mm					
Water depth with free board	Wd	**2.90**	m					
minimum % steel	pt	**0.24**	%					
Moment								
Due to Water	Mtw	**4.80**	kN-m	(From Analysis Result)				
Due to soil if any	Mts	**0.50**	kN-m					
Wt from top dome/slab/column/wall	Slabwt	**15.00**	kN-m					
Wall geometry (Figure 1)								
Straight portion	lb	**2.900**	m					
Tapered portion	lc	**0.000**	m					
	tb	**0.175**	m					
	td	**0.175**	m					
Footing geometry								
Toe projection	ht	**0.450**	m					
Heel straight projection	hh1	**0.600**	m					
Heel tapered projection	hh2	**0.000**	m					
Heel portion for soil stability	hh3	**0.450**	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	2.900	m					
Total length of wall footing	wf	1.225	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	12.69	0.54	6.82
Wall Tapered portion	W2	0.00	0.45	0.00
Walkway/slab	P	15.00	0.54	8.06
Footing				
Footing : toe	W3	2.25	0.23	0.51
Footing center	W4	0.88	0.54	0.47
Footing : heel (straight)	W5	3.00	0.93	2.78
Footing : heel (tapered)	W6	0.00	1.23	0.00
Water	W7	17.40	0.93	16.10
Total downward load		51.21		34.73

Total restoring moment @ toe	TRM	34.7	kN-m
Total over turning moment		4.8	kN-m
F.S.against over turning		7.2	
Check for over turning	Hense o.k		
Total moment due to vertical load	Tmv	34.7	kN-m
Total moment due to horizontal load	Tmh	4.8	kN-m
Total vertical load	TPv	51.2	kn
Net Moment	Tmn	29.9	kN-m
M/p	E	0.58	m
Ecc	Ecc	0.028	m
b/6	Aec	0.20	m
Net moment From ECC	Mdg	1.439	

Property of footing

Width of footing		1.00	m
Depth of footing		1.23	m
Footing Area	Fare	1.23	m2
Modulus of section	Fz	0.25	m3

Pressure distribution			
Pressure due to direct load =P/A	prea	41.81	kN/m2
Pressure due to moment =M/Z	Preb	5.75	kN/m2
Pressure			
Maximum pressure - P/A + M/Z	Pmax	47.56	kN/m2
Minimum pressure - P/A + M/Z	Pmin	36.05	kN/m2
Check for SBC			
Maximum pressure < SBC		OK	
Minimum presure > 0		OK	
Pressure difference		11.51	
Pressure difference / m		9.394	

Pressure at outer Wall face - A	preow	43.33	kN/m2
Pressure at inner Wall face B	preiw	41.69	kN/m2
Pressure at point C	preiw1	36.05	kN/m2

Design of Toe - At Point A

Moment at face of outer wall			
Due to rectangle diagram	Mreco	4.39	kN-m
	Mtrio	0.29	kN-m
Total moment due to upward pressure		4.67	kN-m
Net moment at A from Toe side	Toem	4.67	kN-m
Thickness at toe		200	mm
Effective depth	Deftoe	145	mm
Ast required =		288	mm2
Check for minimum steel			
top		240	mm2
bottom		0	mm2
Design Steel			
Main steel - Top		240	mm2
Main steel - bottom		288	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	6.5	kN-m
	Mtrii	0.3	kN-m
Total Upward moment		6.8	kN-m
Due to water (down ward)		5.2	kN-m
Net downward moment at B from heel side	heelm	1.6	kN-m
Thickness Provided		200	mm
	defheel	145	mm
Ast required =		99	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	145	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	47.6	<	150	OK
2>	P/A - M/Z	36.1	>	0	OK

Reinforcement

	AstR	dia	spc	+ dia	spc	Astp	
Toe							
Top - main	240	10	200	0	0	393	OK
Bottom main	288	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
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

DESIGN OF FLAT SLAB

Top slab

Loading:

Assume top slab = 160 th

(1) Dead load = 0.160 x 2.5 = 0.4 t/m2
(2) Live load = 0.150 t/m2
(3) Finishing load = 0.125 t/m2

Total load = 0.675 t/m2

Analysis of Slab is done on STAAD.Pro with Slab is Plate.

STAAD INPUT DATA

```
STAAD SPACE
START JOB INFORMATION
JOB NAME 1.20 lac GSR
JOB PART 8.0 m dia WATER HEIGHT 2.6 + 0.3 fb
ENGINEER DATE 11-Jul-16
END JOB INFORMATION
INPUT WIDTH 79
UNIT METER KN
JOINT COORDINATES
1 4 0 0; 5 3.06418 0 -2.57115; 6 2.57115 0 -3.06418; 10 -2.55903e-006 0 -4;
15 -3.06418 0 -2.57115; 19 -4 0 5.11806e-006; 28 7.67709e-006 0 4;
32 2.57116 0 3.06417; 45 -1.35 0 1.35; 46 -1.35 0 -1.35; 47 1.35 0 1.35;
48 1.35 0 -1.35; 49 -3.76362 0 -1.35; 50 3.76362 0 -1.35; 51 1.35 0 -3.76362;
52 -1.35 0 -3.76361; 53 -3.76361 0 1.35001; 54 -1.34999 0 3.76362;
55 1.35001 0 3.76361; 56 3.76362 0 1.35; 57 -1.08 0 -1.35; 58 -1.08 0 -1.08;
59 -1.35 0 -1.08; 60 -0.809999 0 -1.35; 61 -0.809999 0 -1.08;
62 -0.539999 0 -1.35; 63 -0.539999 0 -1.08; 64 -0.269999 0 -1.35;
65 -0.269999 0 -1.08; 66 8.34465e-007 0 -1.35; 67 1.19209e-006 0 -1.08;
68 0.270001 0 -1.35; 69 0.270001 0 -1.08; 70 0.540001 0 -1.35;
71 0.540001 0 -1.08; 72 0.810001 0 -1.35; 73 0.810001 0 -1.08; 74 1.08 0 -1.35;
ELEMENT INCIDENCES SHELL
82 46 57 58 59; 84 57 60 61 58; 86 60 62 63 61; 88 62 64 65 63; 90 64 66 67 65;
92 66 68 69 67; 94 68 70 71 69; 96 70 72 73 71; 98 72 74 75 73;
100 74 48 76 75; 102 59 58 77 78; 103 58 61 79 77; 104 61 63 80 79;
105 63 65 81 80; 106 65 67 82 81; 107 67 69 83 82; 108 69 71 84 83;
109 71 73 85 84; 110 73 75 86 85; 112 75 76 87 86; 114 78 77 88 89;
115 77 79 90 88; 116 79 80 91 90; 117 80 81 92 91; 118 81 82 93 92;
119 82 83 94 93; 120 83 84 95 94; 121 84 85 96 95; 122 85 86 97 96;
124 86 87 98 97; 126 89 88 99 100; 127 88 90 101 99; 128 90 91 102 101;
129 91 92 103 102; 130 92 93 104 103; 131 93 94 105 104; 132 94 95 106 105;
133 95 96 107 106; 134 96 97 108 107; 136 97 98 109 108; 138 100 99 110 111;
139 99 101 112 110; 140 101 102 113 112; 141 102 103 114 113;
142 103 104 115 114; 143 104 105 116 115; 144 105 106 117 116;
DEFINE MATERIAL START
ISOTROPIC CONCRETE
E 2.7386e+007
POISSON 0.17
DENSITY 25
ALPHA 1e-005
DAMP 0.05
TYPE CONCRETE
STRENGTH FCU 27579
END DEFINE MATERIAL
CONSTANTS
MATERIAL CONCRETE ALL
ELEMENT PROPERTY
84 86 88 90 92 94 96 98 102 TO 110 112 114 TO 122 124 126 TO 134 136 -
138 TO 146 148 150 TO 158 160 162 TO 170 172 174 TO 182 184 186 TO 194 196 -
200 202 204 206 208 210 212 214 225 TO 229 231 TO 235 237 TO 241 243 TO 247 -
249 TO 253 255 TO 259 261 TO 265 267 TO 271 273 TO 277 279 TO 286 -
288 TO 292 294 TO 298 300 TO 304 306 TO 310 312 TO 316 318 TO 322 -
324 TO 328 330 TO 334 336 TO 340 344 TO 347 349 TO 353 355 TO 359 -
361 TO 365 367 TO 371 373 TO 377 379 TO 383 385 TO 389 391 TO 404 -
407 TO 410 412 TO 416 418 TO 422 424 TO 428 430 TO 434 436 TO 440 -
442 TO 446 448 TO 452 454 TO 459 463 465 467 469 471 473 475 477 TO 558 562 -
564 566 568 570 572 574 576 577 579 581 583 585 587 589 591 593 595 -
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597 TO 676 678 680 682 684 686 688 690 692 694 736 TO 744 749 752 755 758 -
761 764 767 770 TO 772 775 778 781 784 787 790 793 796 799 802 805 808 811 -
814 817 820 823 826 829 832 835 841 844 847 850 853 856 859 862 865 871 874 -
877 880 883 887 890 TO 893 899 900 903 910 TO 916 970 TO 977 980 981 984 -
987 990 993 996 999 1002 1003 1006 1009 1012 1015 1018 1021 1024 1025 1028 -
1031 THICKNESS 0.16
1034 1037 1040 1043 1044 1047 1050 1053 1056 1059 1063 1066 1069 1072 1075 -
1076 1079 1082 1085 1086 1089 1092 1095 1098 1102 1105 1106 1109 TO 1114 -
1116 1121 1122 1124 TO 1128 1167 TO 1174 1177 1180 1183 1186 1189 1192 1195 -
1198 1201 1204 1207 1210 1213 1216 1219 1222 1225 1228 1231 1234 1237 1240 -
1243 1246 1249 1252 1255 1258 1261 1264 1267 1270 1273 1276 1279 1282 1285 -
1288 1291 1294 1297 1304 1305 1308 1312 1315 1318 1319 1323 1326 TO 1328 -
1331 1333 1340 TO 1345 1385 TO 1393 1396 1399 1402 1405 1408 1411 1414 1417 -
1420 1423 1426 1429 1432 1435 1438 1441 1444 1447 1450 1453 1456 1459 1462 -
1465 1468 1471 1474 1477 1480 1483 1486 1489 1492 1495 1498 1503 TO 1505 -
1512 TO 1514 1517 1520 1523 1526 1530 1533 1536 1537 1541 1547 1551 1554 -
1555 TO 1559 THICKNESS 0.16
82 100 198 215 278 341 343 406 461 560 596 695 735 953 1166 1384 THICKNESS 0.3
SUPPORTS
1 5 6 10 15 19 28 32 45 TO 56 174 177 179 181 232 234 236 238 335 TO 338 384 -
385 TO 387 406 416 426 436 455 465 475 485 497 515 525 535 554 564 574 584 -
630 631 676 TO 678 681 682 684 TO 686 722 759 TO 766 795 837 839 840 842 -
843 TO 848 876 912 921 TO 928 PINNED
LOAD 1 DL
SELFWEIGHT Y -1
ELEMENT LOAD
82 84 86 88 90 92 94 96 98 100 102 TO 110 112 114 TO 122 124 126 TO 134 136 -
138 TO 146 148 150 TO 158 160 162 TO 170 172 174 TO 182 184 186 TO 194 196 -
198 200 202 204 206 208 210 212 214 215 225 TO 229 231 TO 235 237 TO 241 -
243 TO 247 249 TO 253 255 TO 259 261 TO 265 267 TO 271 273 TO 286 -
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560 562 564 566 568 570 572 574 576 577 579 581 583 585 587 589 591 593 595 -
596 TO 676 678 680 682 684 686 688 690 692 694 695 735 TO 744 749 752 755 -
758 761 764 767 770 TO 772 775 778 781 784 787 790 793 796 799 802 805 808 -
811 814 817 820 823 826 829 832 835 841 844 847 850 853 856 859 862 865 871 -
874 877 880 883 887 890 TO 893 899 900 903 910 TO 916 953 970 TO 977 980 -
981 984 987 990 993 996 999 1002 1003 1006 1009 1012 1015 1018 -
1021  PR GY -1.25
LOAD 2 LL
ELEMENT LOAD
82 84 86 88 90 92 94 96 98 100 102 TO 110 112 114 TO 122 124 126 TO 134 136 -
138 TO 146 148 150 TO 158 160 162 TO 170 172 174 TO 182 184 186 TO 194 196 -
198 200 202 204 206 208 210 212 214 215 225 TO 229 231 TO 235 237 TO 241 -
243 TO 247 249 TO 253 255 TO 259 261 TO 265 267 TO 271 273 TO 286 -
288 TO 292 294 TO 298 300 TO 304 306 TO 310 312 TO 316 318 TO 322 -
324 TO 328 330 TO 334 336 TO 341 343 TO 347 349 TO 353 355 TO 359 -
361 TO 365 367 TO 371 373 TO 377 379 TO 383 385 TO 389 391 TO 404 -
406 TO 410 412 TO 416 418 TO 422 424 TO 428 430 TO 434 436 TO 440 -
442 TO 446 448 TO 452 454 TO 459 461 463 465 467 469 471 473 475 477 TO 558 -
560 562 564 566 568 570 572 574 576 577 579 581 583 585 587 589 591 593 595 -
596 TO 676 678 680 682 684 686 688 690 692 694 695 735 TO 744 749 752 755 -
758 761 764 767 770 TO 772 775 778 781 784 787 790 793 796 799 802 805 808 -
811 814 817 820 823 826 829 832 835 841 844 847 850 853 856 859 862 865 871 -
874 877 880 883 887 890 TO 893 899 900 903 910 TO 916 953 970 TO 977 980 -
981 984 987 990 993 996 999 1002 1003 1006 1009 1012 1015 1018 -
1021  PR GY -1.5
```
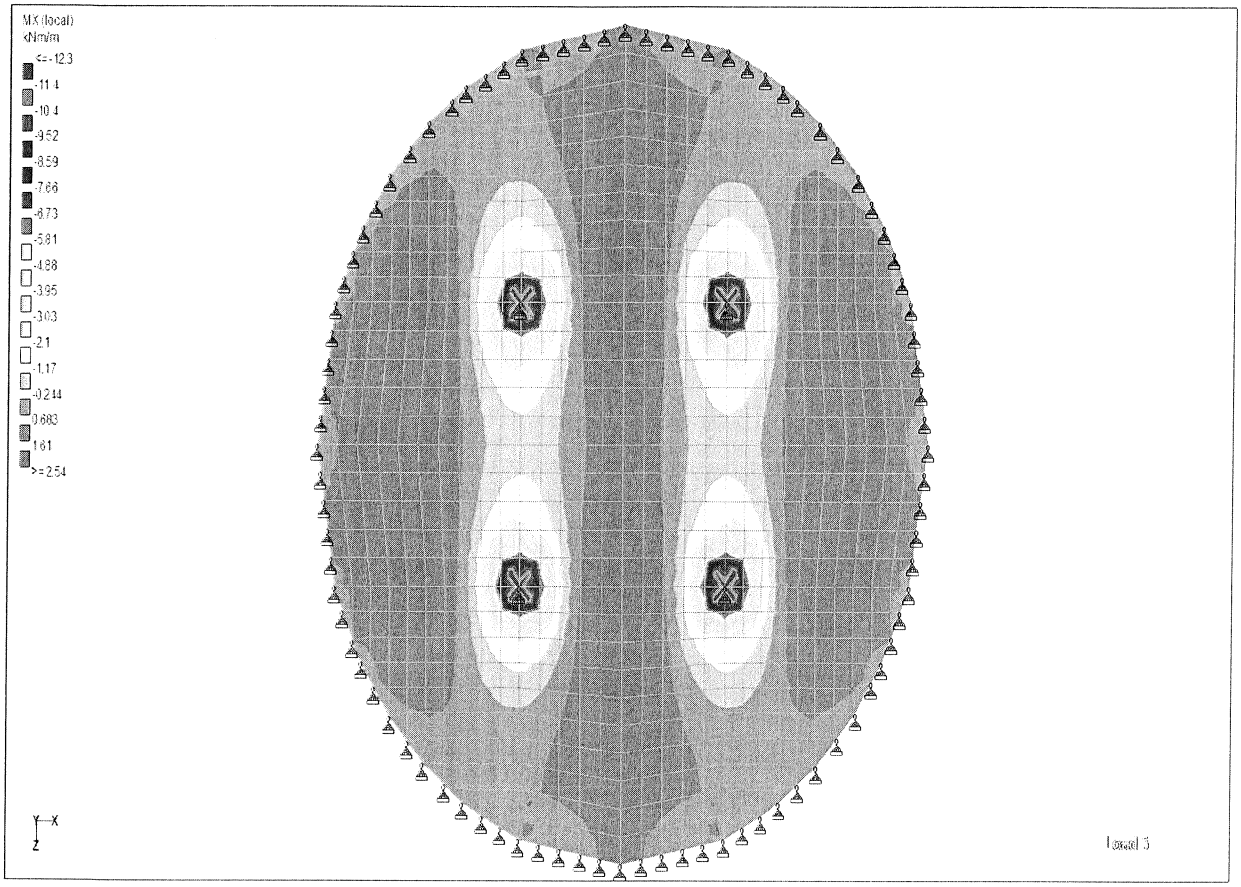
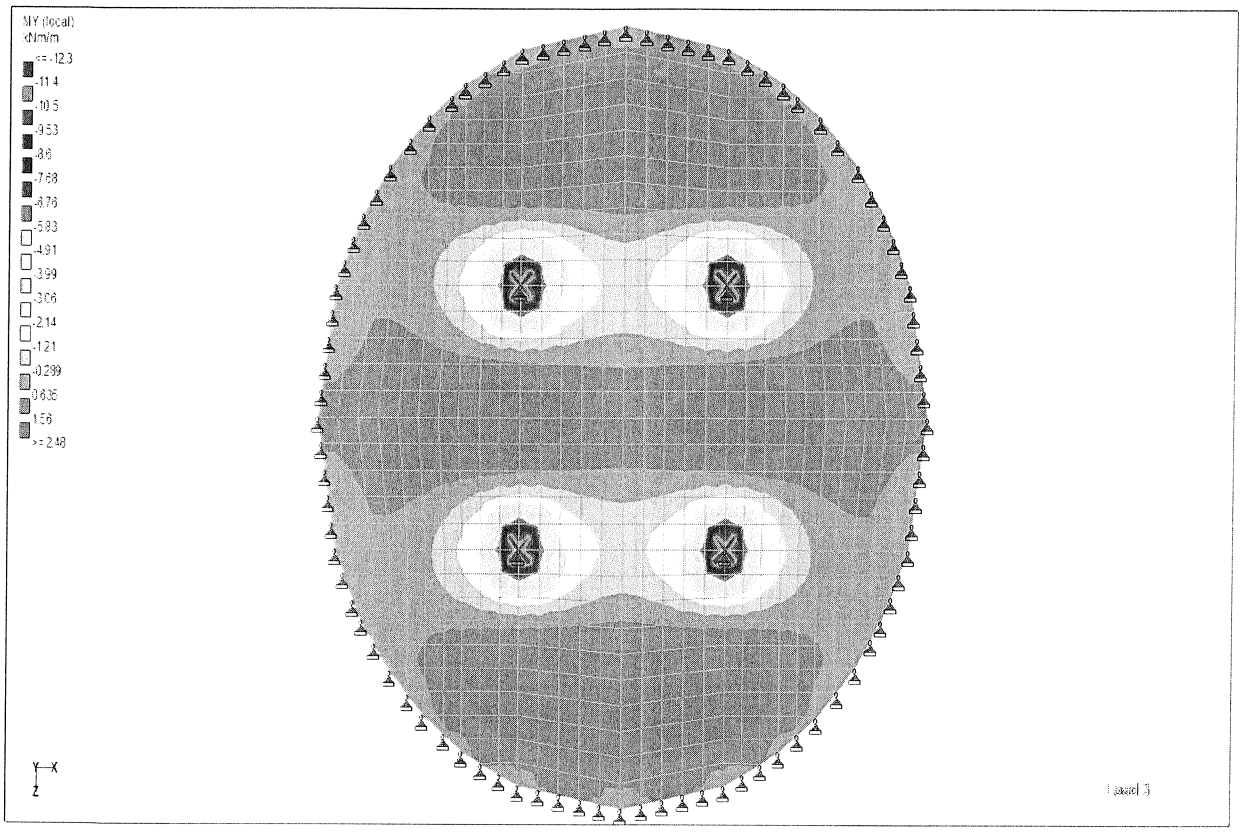

```
LOAD COMB 3 COMBINE LOAD : DL + LL
1 1.0 2 1.0
PERFORM ANALYSIS
FINISH
```



STRESS DIAGRAM – MX



STRESS DIAGRAM – MY

Check for Shear:

Slab is to be checked at a distance d/2 from column head

Total depth D = 160

Effective depth = 160-45-5 =110 mm

Length at critical section for shear = 1060, Similar area = 0.94 x0.94

Total panel load = 2.7 x 2.7 x 0.675 = 4.93 T

Net load at critical section

= 4.93 – 0.94x0.94 x 0.675

= 4.33 T

Net load at critical section = 4.33 T

Actual shear stress = $4.33 \times 10^4 / (940 \times 4 \times 110)$

$= 0.104\ N/mm^2$

Permissible stress = Ks x Tc

$Tc = 0.16 * fck^{0.5}$

$= 0.16 * 30^{0.5}$

=0.87

Ks = (0.5 + beta) or Ks < 1

Beta = 1

Hence Ks = 1.0

$Tc = 0.87 * 1 = 0.87\ N/mm^2 >> 0.104$ O.K.

COLUMN REACTION

Node	L/C	Force-X kN	Force-Y kN	Force-Z kN	Moment-X kNm	Moment-Y kNm	Moment-Z kNm
45	3	0	53.854	0	0	0	0
46	3	0	53.806	0	0	0	0
47	3	0	53.844	0	0	0	0
48	3	0	53.849	0	0	0	0

Maximum load on column = 5.4 T (Refer computer output)
Add self wt = 1.0 T

Total = 6.4 t

Capacity of column = σ_{cc}*Ac + σ_{sc} *Ast

= 8*70686 + 275*1206

= 89.7 T > > 6.4 T O.K

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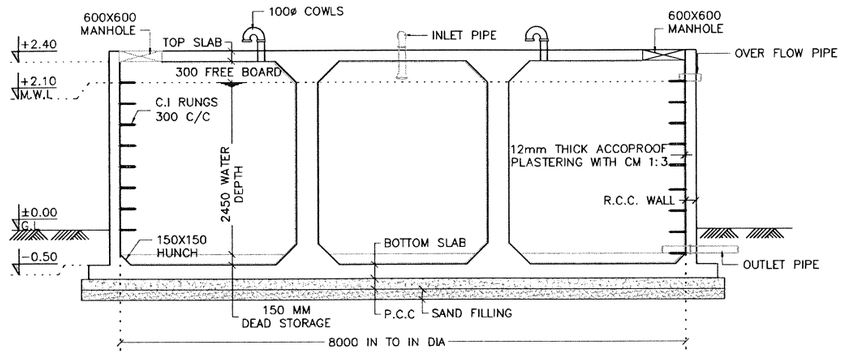
Asst. Executive Engineer
TDWSP Asifabad

Dy. Executive Engineer
TDWSP Asifabad

Executive Engineer
TDWSP Asifabad

Superintendent Engineer
TDWSP Nirmal



SECTION : A - A

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

BOTTOM PLAN

TOP PLAN

"Drawings Vetted"

M/s. S.K. ASSOCIATES Hyd-08.

Asst. Executive Engineer
TDWSP Asifabad

Dy. Executive Engineer
TDWSP Asifabad

Executive Engineer
TDWSP Asifabad

Superintendent Engineer
TDWSP Nirmal

L&T Construction Komarambheem Bhim Asifabad Segment Construction-TDWSP-ADILABAD

REV. No	DESCRIPTION	DATE	DESIGNED	DRAWN	CHECKED	APPROVED
A	FOR APPROVAL	04/07/16	–	DAP	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		04/07/16
DRWN	DAP		04/07/16
CHKD	RMM		04/07/16
APPD	–		04/07/16

JOB No. : LE150883

TITLE : 120KL CAPACITY GLBR AT GOLLETING GUTA (GENERAL ARRANGEMENT DRAWING)

SCALE 1:75

PROJECTION

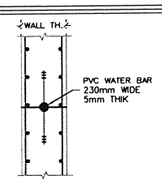
DRAWING No. LE150883-C-WS-RW-GA-1593 | SIZE A3 | REV. A

COMP. DATA : P16-02_40-01-01 SHEET 1 OF 1

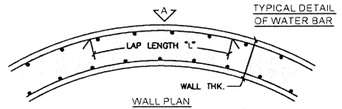
RELEASED FOR ☐ PRELIMINARY ☐ TENDER ☐ INFORMATION ☑ APPROVAL ☐ CONSTRUCTION

वाप्कोस लिमिटेड हैदराबाद WAPCOS LTD.

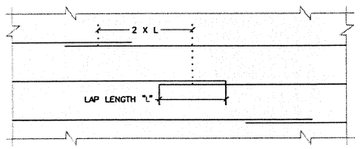
LAP LENGTH SECHDULE	
DIA OF BAR	LAP LENGTH "L" IN mm
8	368
10	460
12	552
16	736
20	920
25	1150



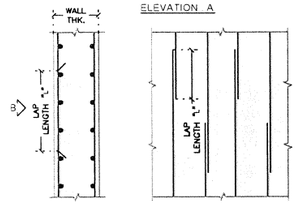
TYPICAL DETAIL OF WATER BAR



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

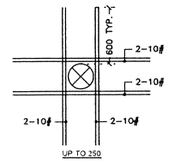


ELEVATION A

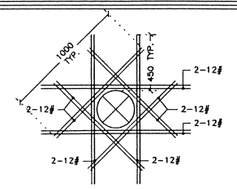


WALL SECTION
LAP DETAILS FOR VERTICAL STEEL
(LAP SHALL BE STAGGERED AS PER ELEVATION – B)

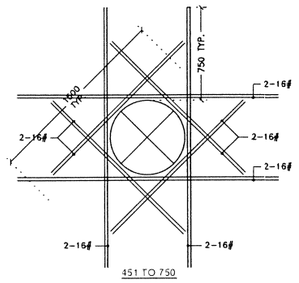
ELEVATION B



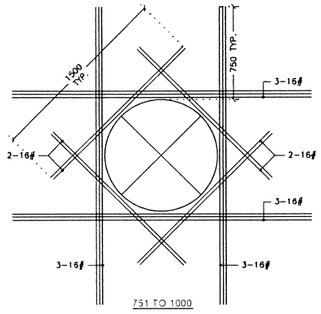
UP TO 250



251 TO 450

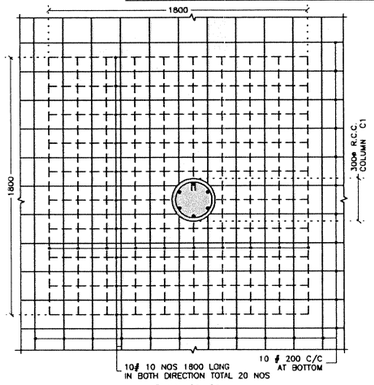


451 TO 750

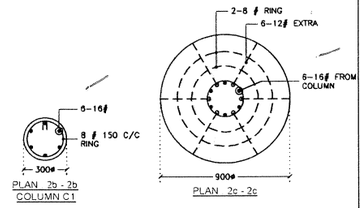


751 TO 1000

TYPICAL DETAIL FOR EXTRA STEEL BAR AT CUT-OUT

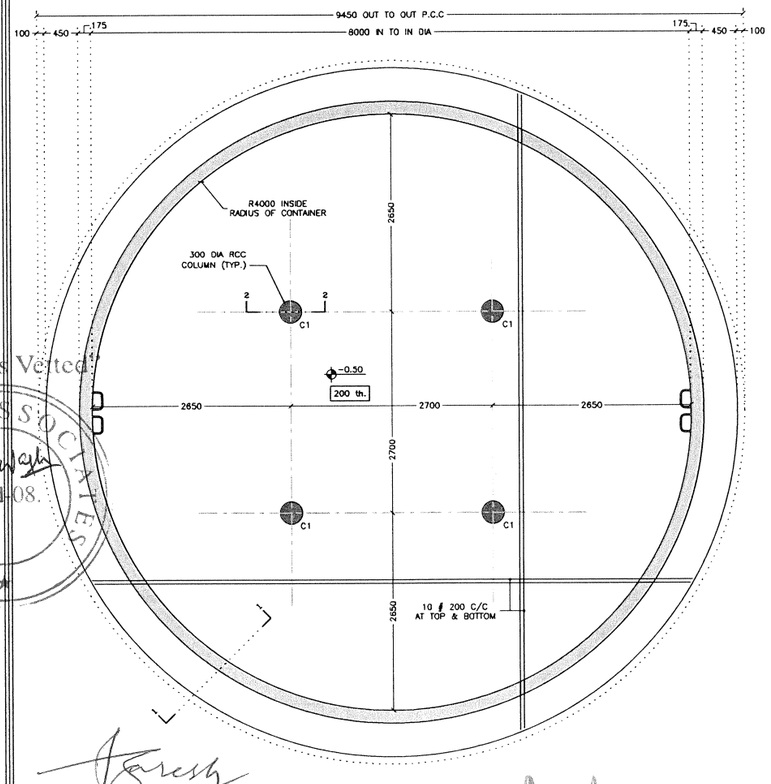


PLAN 2a - 2a

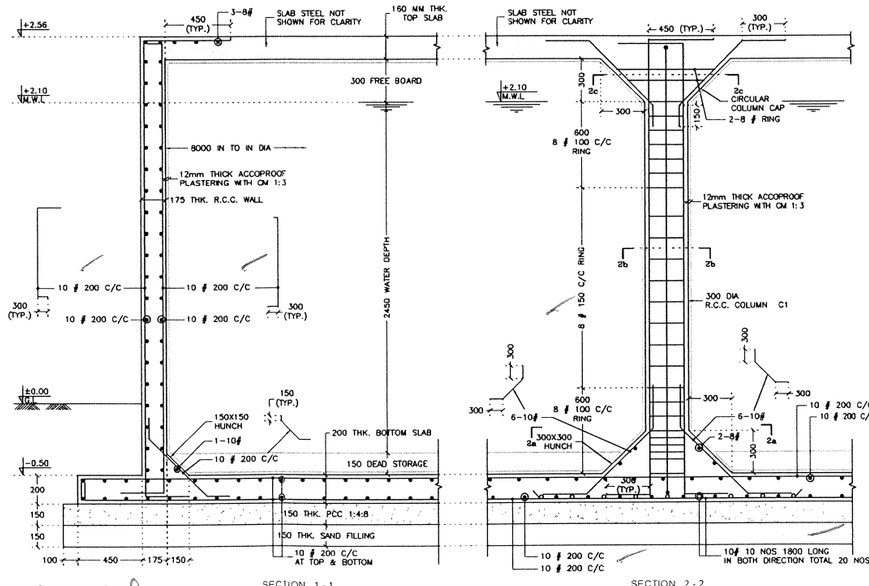


PLAN 2b - 2b
COLUMN C1

PLAN 2c - 2c



FOUNDATION PLAN



SECTION 1 - 1

SECTION 2 - 2

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. ϕ – INDICATE HYSD-TMT BAR FE-500 GRADE 1 COMFORMING TO I.S 1786-LATEST REVISION
5. CLEAR COVER TO WATER RETAINING STRUCTURE
   (A) BOTTOM SLAB : 50mm
   (b) WALL WATER FACE : 45mm & SOIL FACE : 30mm
   (c) TOP SLAB : 45mm
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 15 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
11. READ THIS DRAWING ALONG WITH SHEET NO. 1 OF 2 TO 2 OF 2.

"Drawings Vetted"
M/s. S.K. ASSOCIATES
Hyd-08.

Asst. Executive Engineer
TDWSP Asifabad

Dy. Executive Engineer
TDWSP Asifabad

Executive Engineer
TDWSP Asifabad

Superintendent Engineer
TDWSP Nirmal

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

WAPCOS LIMITED

REV. No	DESCRIPTION	DATE	DESIGNED	DRAWN	CHECKED	APPROVED
A	FOR APPROVAL	08/09/16	RPS	DAP	RMM	–

REVISIONS

L&T Construction
Water, Smart World & Communication.

CLIENT	RURAL WATER SUPPLY AND SANITATION DEPARTMENT, TELANGANA
CONSULTANT	-
PROJECT	PROVIDING DRINKING WATER TO HARITATIONS IN KOMARAMBHEEM ASIFABAD SEGMENT IN ADILABAD DISTRICT
SUPPLIER / CONTRACTOR	L&T Construction, Water & Effluent Treatment SBG

JOB No	LE150883		
	NAME	SIGN	DATE
DSGN	RPS		08/09/16
DRWN	DAP		08/09/16
CHKD	RMM		08/09/16
APPD	–		08/09/16

TITLE: 120KL CAPACITY GLBR AT GOLLETING GUTA (FOUNDATION PLAN & SECTION DETAILS)

SCALE: 1: 50,25

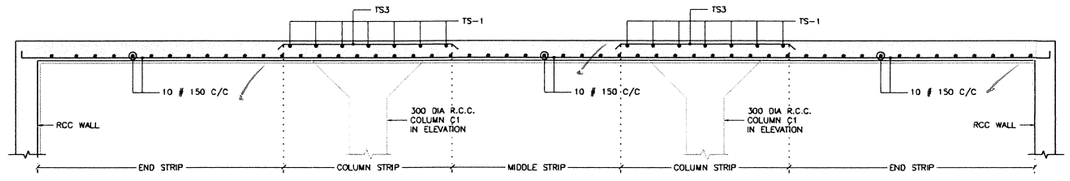
PROJECTION

DRAWING No. LE150883-C-WS-RW-RC-1596 SHEET 1 OF 2

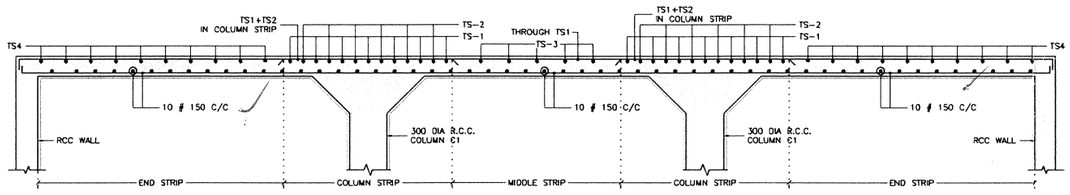
SIZE A2 REV. A

COMP. DATA : P16-02_40-02-01

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

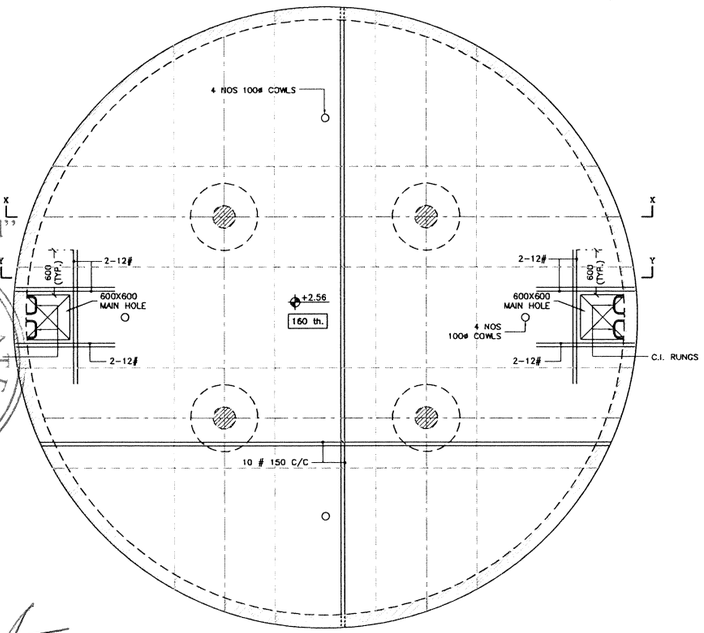


SECTION Y - Y

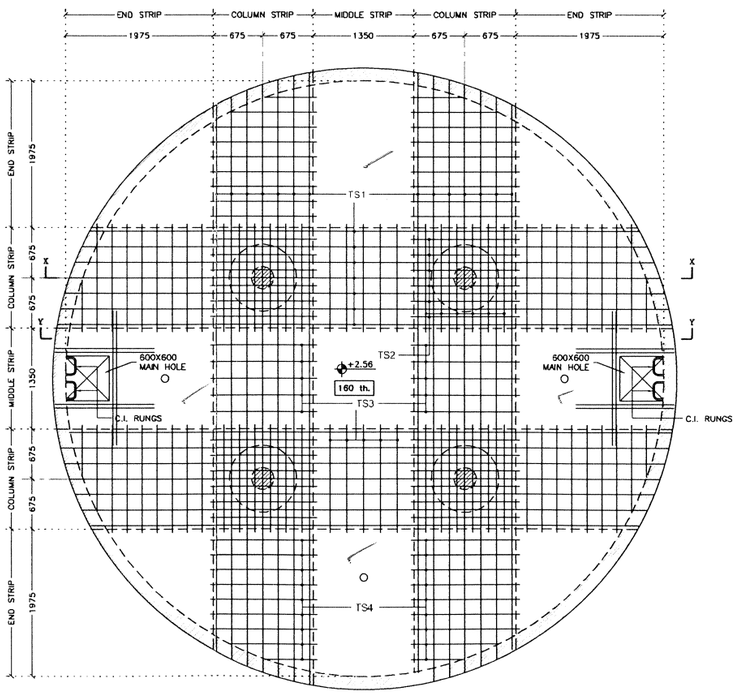


SECTION X - X

STEEL CHAIRS SHALL BE PROVIDE TO KEPT TOP REINFORCEMENT OF SLAB IN PROPER POSITION



PLAN FOR TOP SLAB BOTTOM REINFORCEMENT
ALL SLAB ARE 160 THK (CONCRETE MIX M 30)



PLAN FOR TOP SLAB TOP REINFORCEMENT
ALL SLAB ARE 160 THK (CONCRETE MIX M 30)

NOTES :
<1> ALL DIMENSION ARE IN MM AND LEVELS ARE IN METER.
<2> FOR ALL OTHER NOTES REFER SHEET NO 1 OF 2.
<3> READ THIS DRAWING ALONG WITH DRG.NO. 1 OF 2 TO 2 OF 2.

SLAB SCHEDULE

TYPE	DESCRIPTION
TS - 1	10 # THROUGH 7 NOS
TS - 2	12 # 1350 LONG 6 NOS BOTH WAYS (TOTAL 12 NOS)
TS - 3	5 # 1350 LONG 5 NOS
TS - 4	8 # 200 C/C AT END STRIP

Superintendent Engineer
TDWSP Nirmal

REV. No	DESCRIPTION	DATE	DESIGNED	DRAWN	CHECKED	APPROVED
A	FOR APPROVAL	08/09/16	RPS	DAP	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	RPS		08/09/16
DRWN	DAP		08/09/16
CHKD	RMM		08/09/16
APPD	–		08/09/16

TITLE : 120KL CAPACITY GLBR AT GOLLETING GUTA (STRUCTURAL LAYOUT AT TOP SLAB TOP & BOTTOM REINFORCEMENT & SECTION DETAILS)
SCALE : 1:50,25
PROJECTION

DRAWING No. LE150883-C-WS-RW-RC-15961 | SIZE A2 | REV. A
COMP. DATA : P16-02_40-02-02 | SHEET 2 OF 2

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

"Drawings Vetted"
M/s. S.K. ASSOCIATES
Hyd-08

Asst. Executive Engineer
TDWSP Asifabad

Dy. Executive Engineer
TDWSP Asifabad

Executive Engineer
TDWSP Asifabad