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 OHBR-BPT - 60KL CAPACITY - 12mtr KHAZIPALLY AT BHEMINI MANDAL

DOC./DRG. No.

LE150883-C-WS-RW-DC-1721

SIZE: A4

REV.: A

RELEASED FOR

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

PROJECT TITLE

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

UNIT

60 KL ESR

DCI NO: -

PRINCIPAL CLIENT

RURAL WATER SUPPLY
AND
SANITATION DEPARTMENT,
TELANGANA

CONTRACTOR

L&T CONSTRUCTION
WATER & EFFLUENT TREATMENT SBG

DESIGN OF 0.6 LAC LITER CAPACITY E.S.R AT KAZHIPALLY X ROAD

BASIC DATA:

CAPACITY = 60, 000 LITER

HEIGHT OF STAGING = 12.0 M

SHAPE = SQUARE WITH COLUMN – BEAM STAGING

FREE BOARD = 0.3 M

DEAD STORAGE = 0.1 M

EARTHQUKE ZONE –II

WIND SPEED = 44 M/Sec

S.B.C.- 10 t/m2

List of Reference books & I.S

(1) IS: 456-2000: code of practice for plain and reinforced concrete.

(2) IS: 3370-2009: Code of practice for concrete structure for the storage of liquid part (I to IV).

(3) IS: 875: 1987: Code and practice for design loads for building and structure.

(4) IS: 1893-2002 (PART 1): Criteria for Earthquake resistance design of structure.

(5) IS: 11682-1985: Criteria for design of RCC staging for Overhead water tanks.

(6) IS: 1893 – Draft code of GSDMA

(7) IS 13920 : 1993 - Code of practice for Ductile detailing of RC structure subjected to seismic forces

CAPACITY CHECK:

Required capacity = 0.6 lac

Capacity of ESR

Clear Length =4.20–2 x plaster thickness
= 4.20– 2 x 0.012
= 4.176 m
Clear Width =4.20–2 x plaster thickness
= 4.20– 2 x 0.02
= 4.176 m

Water depth = 3.50 m

Volume = L x W x H
= 4.176 * 4.176 * 3.50 = 61.036 m3

Net volume =61.036> 60 hence O.K.

DESIGN OF WALL

Basic data

Container:

Length = 4.20 m
Width = 4.20 m
Water depth = 3.50 m
Free board = 0.30 m
Dead storage = 0.1 m
Plaster thickness = 0.02 m

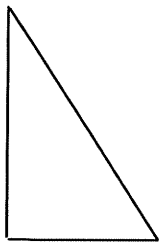
Concrete grade = M 30
Clear cover to main steel = 45.0 mm

Concrete grade = M30
Clear cover to main steel = 45.0 mm

Design as per IS 456-2000 & IS 3370-2009

Wall condition = RCC box wall, Partial fixed base, free top and subjected to triangular loading

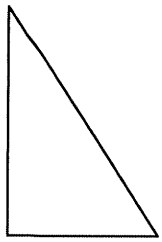
Total load on wall = 3.50 + 0.4 = 3.90 m

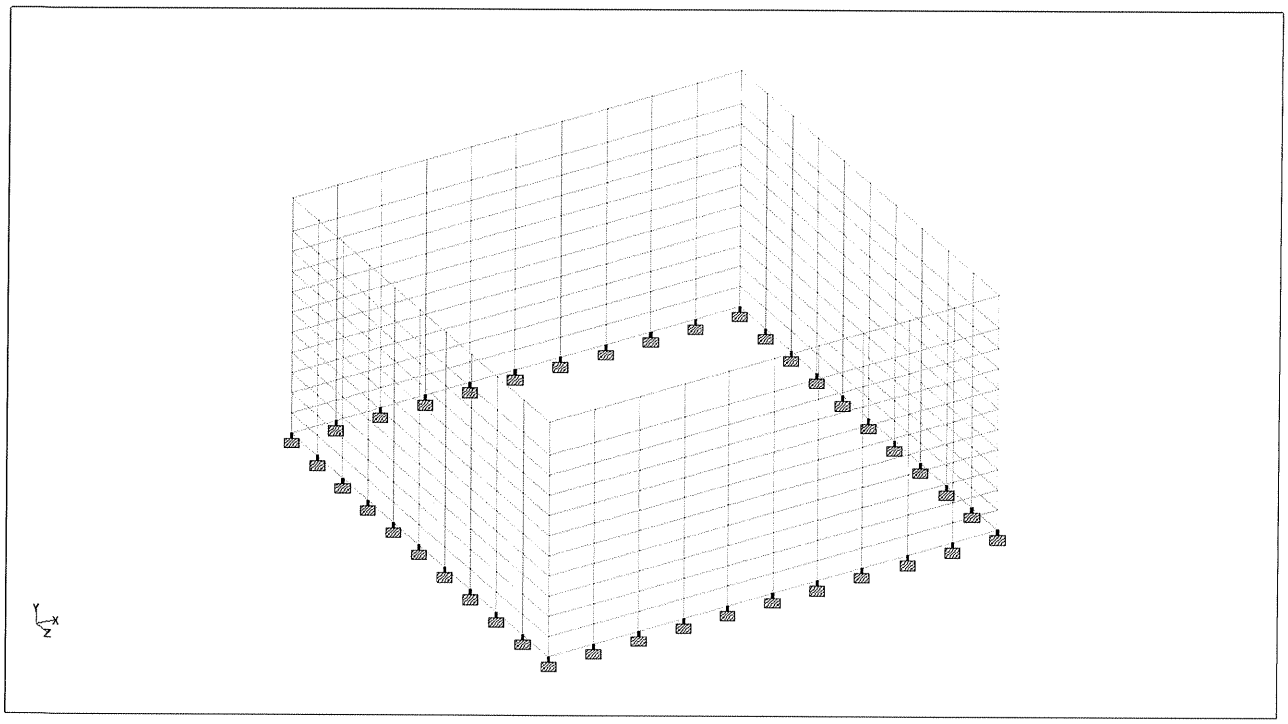


Analysis of structure is done using Stadd – Pro

Analysis of wall is done using software STADD- PRO

Water load on wall is as shown below





RCC WALL (PLATE MODEL)

```
STAAD SPACE
START JOB INFORMATION
JOB PART RCC CONTAINER 4.2  X 4.20 X 3.5+ 0.4fb
ENGINEER DATE 07
END JOB INFORMATION
INPUT WIDTH 79
**********************************************
*         STAAD.Pro Generated Comment         *
**********************************************
*1 0 0 0 11 0 3.5 0
*REPEAT ALL 10 0.42 0 0
*REPEAT 10 0 0 0.42
*REPEAT 10 -0.42  0 0
*REPEAT 9 0 0 -0.42
**********************************************
UNIT METER KN
JOINT COORDINATES
1 0 0 0; 2 0 0.35 0; 3 0 0.7 0; 4 0 1.05 0; 5 0 1.4 0; 6 0 1.75 0; 7 0 2.1 0;
8 0 2.45 0; 9 0 2.8 0; 10 0 3.15 0; 11 0 3.5 0; 12 0 3.9 0; 13 0.42 0 0;
**********************************************
*         STAAD.Pro Generated Comment         *
**********************************************
*1 1 2 14 13 TO 11 1 1
*REPEAT 38 11 12
*430 469 470 2 1 TO 440 1 1
**********************************************
ELEMENT INCIDENCES SHELL
1 1 2 14 13; 2 2 3 15 14; 3 3 4 16 15; 4 4 5 17 16; 5 5 6 18 17; 6 6 7 19 18;
7 7 8 20 19; 8 8 9 21 20; 9 9 10 22 21; 10 10 11 23 22; 11 11 12 24 23;
ELEMENT PROPERTY
1 12 23 34 45 56 67 78 89 100 111 122 133 144 155 166 177 188 199 210 221 -
232 243 254 265 276 287 298 309 320 331 342 353 364 375 386 397 408 419 -
430 THICKNESS 0.25
2 13 24 35 46 57 68 79 90 101 112 123 134 145 156 167 178 189 200 211 222 -
233 244 255 266 277 288 299 310 321 332 343 354 365 376 387 398 409 420 -
431 THICKNESS 0.25
3 14 25 36 47 58 69 80 91 102 113 124 135 146 157 168 179 190 201 212 223 -
234 245 256 267 278 289 300 311 322 333 344 355 366 377 388 399 410 421 -
432 THICKNESS 0.25
4 15 26 37 48 59 70 81 92 103 114 125 136 147 158 169 180 191 202 213 224 -
235 246 257 268 279 290 301 312 323 334 345 356 367 378 389 400 411 422 -
433 THICKNESS 0.25
5 16 27 38 49 60 71 82 93 104 115 126 137 148 159 170 181 192 203 214 225 -
236 247 258 269 280 291 302 313 324 335 346 357 368 379 390 401 412 423 -
434 THICKNESS 0.25
6 17 28 39 50 61 72 83 94 105 116 127 138 149 160 171 182 193 204 215 226 -
237 248 259 270 281 292 303 314 325 336 347 358 369 380 391 402 413 424 -
435 THICKNESS 0.25
7 18 29 40 51 62 73 84 95 106 117 128 139 150 161 172 183 194 205 216 227 -
238 249 260 271 282 293 304 315 326 337 348 359 370 381 392 403 414 425 -
436 THICKNESS 0.25
8 19 30 41 52 63 74 85 96 107 118 129 140 151 162 173 184 195 206 217 228 -
239 250 261 272 283 294 305 316 327 338 349 360 371 382 393 404 415 426 -
437 THICKNESS 0.25
9 20 31 42 53 64 75 86 97 108 119 130 141 152 163 174 185 196 207 218 229 -
240 251 262 273 284 295 306 317 328 339 350 361 372 383 394 405 416 427 -
438 THICKNESS 0.25
10 21 32 43 54 65 76 87 98 109 120 131 142 153 164 175 186 197 208 219 230 -
241 252 263 274 285 296 307 318 329 340 351 362 373 384 395 406 417 428 -
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439 THICKNESS 0.25
11 22 33 44 55 66 77 88 99 110 121 132 143 154 165 176 187 198 209 220 231 -
242 253 264 275 286 297 308 319 330 341 352 363 374 385 396 407 418 429 -
440 THICKNESS 0.25
DEFINE MATERIAL START
ISOTROPIC MATERIAL1
E 2.73e+007
POISSON 0.17
DENSITY 25
ALPHA 1.2e-011
END DEFINE MATERIAL
CONSTANTS
MATERIAL MATERIAL1 ALL
SUPPORTS
1 13 25 37 49 61 73 85 97 109 121 133 145 157 169 181 193 205 217 229 241 -
253 265 277 289 301 313 325 337 349 361 373 385 397 409 421 433 445 457 -
469 FIXED
LOAD 1 WATER
ELEMENT LOAD
1 12 23 34 45 56 67 78 89 100 111 122 133 144 155 166 177 188 199 210 221 -
232 243 254 265 276 287 298 309 320 331 342 353 364 375 386 397 408 419 -
430 TRAP X 39 35.5
2 13 24 35 46 57 68 79 90 101 112 123 134 145 156 167 178 189 200 211 222 -
233 244 255 266 277 288 299 310 321 332 343 354 365 376 387 398 409 420 -
431 TRAP X 35.5 32
3 14 25 36 47 58 69 80 91 102 113 124 135 146 157 168 179 190 201 212 223 -
234 245 256 267 278 289 300 311 322 333 344 355 366 377 388 399 410 421 -
432 TRAP X 32 28.5
4 15 26 37 48 59 70 81 92 103 114 125 136 147 158 169 180 191 202 213 224 -
235 246 257 268 279 290 301 312 323 334 345 356 367 378 389 400 411 422 -
433 TRAP X 28.5 25
5 16 27 38 49 60 71 82 93 104 115 126 137 148 159 170 181 192 203 214 225 -
236 247 258 269 280 291 302 313 324 335 346 357 368 379 390 401 412 423 -
434 TRAP X 25 21.5
6 17 28 39 50 61 72 83 94 105 116 127 138 149 160 171 182 193 204 215 226 -
237 248 259 270 281 292 303 314 325 336 347 358 369 380 391 402 413 424 -
435 TRAP X 21.5 18
7 18 29 40 51 62 73 84 95 106 117 128 139 150 161 172 183 194 205 216 227 -
238 249 260 271 282 293 304 315 326 337 348 359 370 381 392 403 414 425 -
436 TRAP X 18 14.5
8 19 30 41 52 63 74 85 96 107 118 129 140 151 162 173 184 195 206 217 228 -
239 250 261 272 283 294 305 316 327 338 349 360 371 382 393 404 415 426 -
437 TRAP X 14.5 11
9 20 31 42 53 64 75 86 97 108 119 130 141 152 163 174 185 196 207 218 229 -
240 251 262 273 284 295 306 317 328 339 350 361 372 383 394 405 416 427 -
438 TRAP X 11 7.5
10 21 32 43 54 65 76 87 98 109 120 131 142 153 164 175 186 197 208 219 230 -
241 252 263 274 285 296 307 318 329 340 351 362 373 384 395 406 417 428 -
439 TRAP X 7.5 4
11 22 33 44 55 66 77 88 99 110 121 132 143 154 165 176 187 198 209 220 231 -
242 253 264 275 286 297 308 319 330 341 352 363 374 385 396 407 418 429 -
440 TRAP X 4 0
PERFORM ANALYSIS
FINISH
```
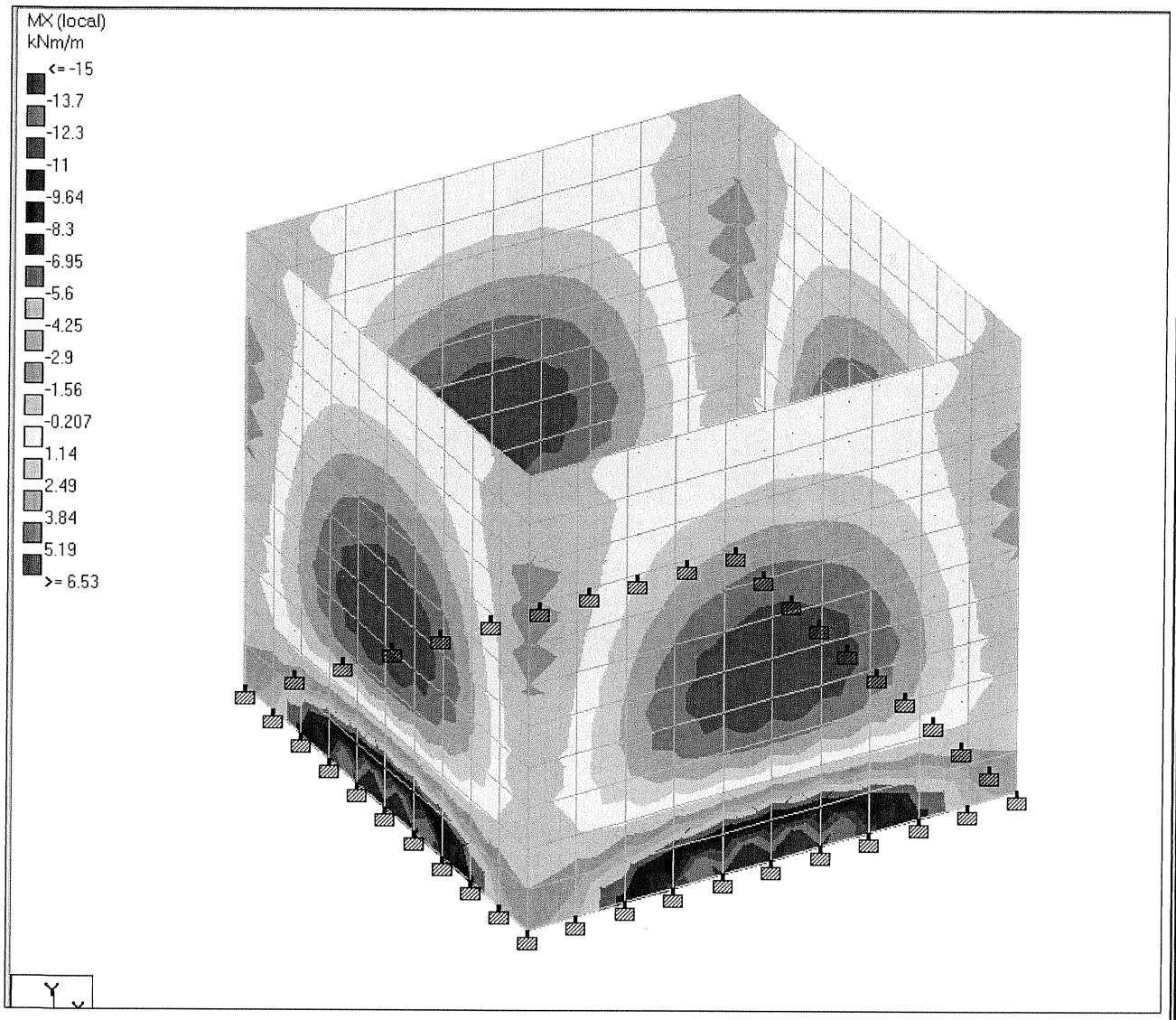
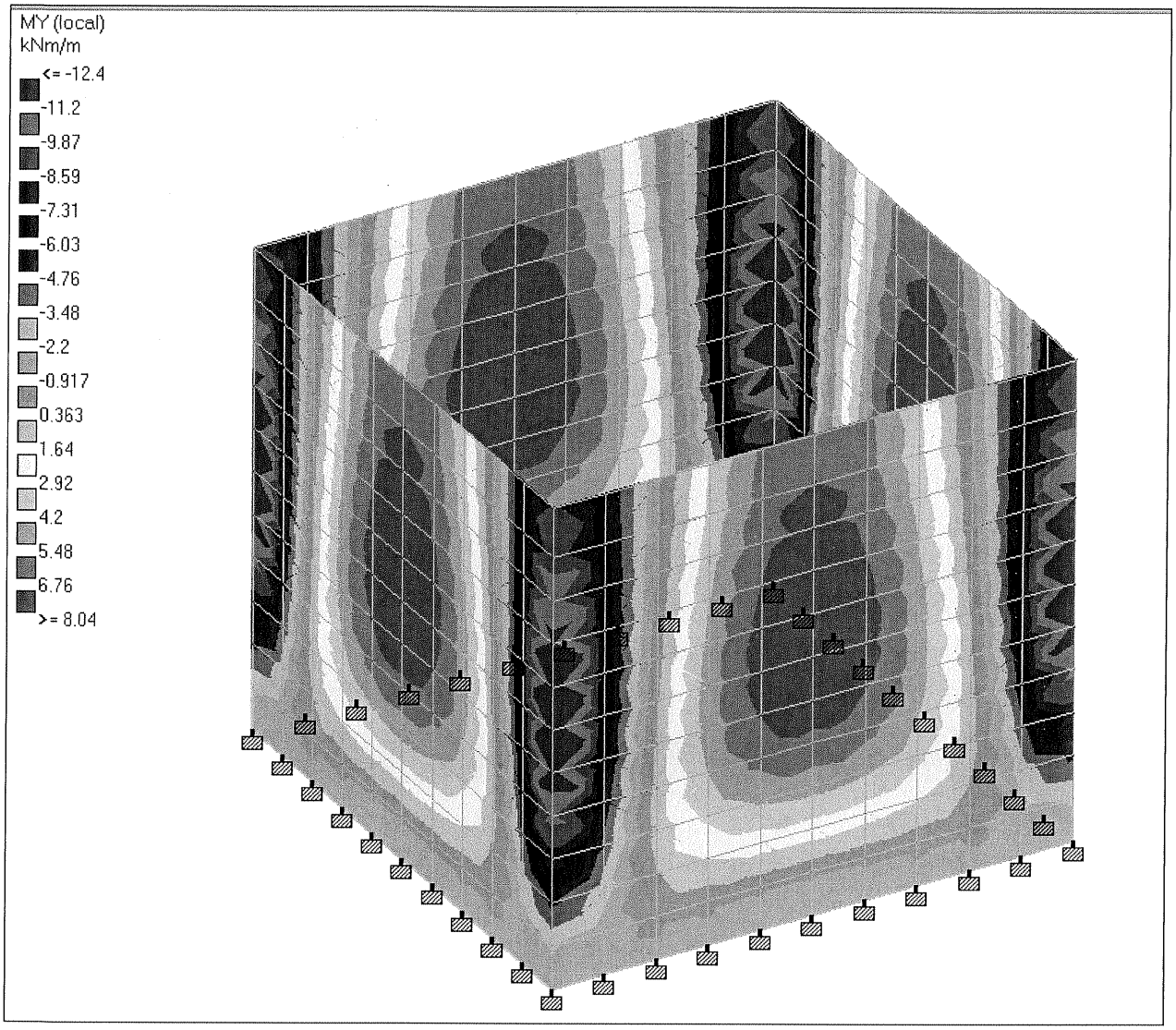


MX (local)
kNm/m
<= -15
-13.7
-12.3
-11
-9.64
-8.3
-6.95
-5.6
-4.25
-2.9
-1.56
-0.207
1.14
2.49
3.84
5.19
>= 6.53
Y


MY (local)
kNm/m
<= -12.4
-11.2
-9.87
-8.59
-7.31
-6.03
-4.76
-3.48
-2.2
-0.917
0.363
1.64
2.92
4.2
5.48
6.76
>= 8.04

Calculation for Coefficient of Uncrack condition					
RCC wall					
	notation		Unit		
DATA					Steel provided
Bending moment	Bm	**21**	kN-m	dia	spc
Reinforcement	Fy	**500**	N/mm2		
Concrete grade	fck	**30**	N/mm2	**10**	**190**
Area of steel provised	Ast	1009	mm2	12	190
Depth provided	Dp	**250**			
Width	B	1000			
Clear Cover	Cv	**45**	mm		
maximum bar dia	dbar	**25**			
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	0.0040			=Ast/Dp/B
Effective depth	Def	192.5	mm		
Constants	ka	0.77			=Def/Dp
	kb	1.05			=1+2*PT*ka*(md-1)
	kc	2.06			=2+2*PT*(md-1)
Depth of neutral axis - N	n	0.5084			=kb/kc
Depth of neutral axis	nd	127.1105			=n*Dp
Check for Mu/bd2					
	kd	0.0022			=(ka-n)^2*(md-1)*PT
	ke	0.0834			=1/3-n*(1-n)
	kf	0.0856			=kd+ke
m/bd2	Unc	3.4833			=Pstb/(1-n)*kf
Depth reuired	Dr	245.5	mm		=(Bm*100/Unc)^0.5*10
Calculation od Steel	Ast				
Effective Depth	De	192.5	mm		=Dp-Cv-dbar/2
Area of steel required		932	mm2		=Bm*1000000/(0.9*Fyub*De)
Check		OK			

Calculation for Coefficient of Uncrack condition					
RCC wall					
	notation		Unit		
DATA					Steel provided
Bending moment	Bm	**17**	kN-m	dia	spc
Reinforcement	Fy	**500**	N/mm2		
Concrete grade	fck	**30**	N/mm2	**10**	**190**
Area of steel provised	Ast	827	mm2	10	190
Depth provided	Dp	**250**			
Width	B	1000			
Clear Cover	Cv	**45**	mm		
maximum bar dia	dbar	**25**			
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	0.0033			=Ast/Dp/B
Effective depth	Def	192.5	mm		
Constants	ka	0.77			=Def/Dp
	kb	1.04			=1+2*PT*ka*(md-1)
	kc	2.05			=2+2*PT*(md-1)
Depth of neutral axis - N	n	0.5070			=kb/kc
Depth of neutral axis	nd	126.7397			=n*Dp
Check for Mu/bd2					
	kd	0.0018			=(ka-n)^2*(md-1)*PT
	ke	0.0834			=1/3-n*(1-n)
	kf	0.0852			=kd+ke
m/bd2	Unc	3.4566			=Pstb/(1-n)*kf
Depth reuired	Dr	221.8	mm		=(Bm*100/Unc)^0.5*10
Calculation od Steel	Ast				
Effective Depth	De	192.5	mm		=Dp-Cv-dbar/2
Area of steel required		755	mm2		=Bm*1000000/(0.9*Fyub*De)
Check		OK			

STAGING DESIGN

ESR : 60000 liter				
Basic data				
General				
No	Description	Notation	Value	Unit
(A)	Unit weight			
	Unit weight of concrete	Uwc	25.0	kN/m3
	Unit weight of water	Uww	10.00	kN/m3
	Unit weight of plaster	Uwp	21.0	kN/m3
	Unit weigth of IPS	Uips	21.0	kN/m3
	Unit weight of soil	Uws	18.0	kN/m3
(B)	Material			
	Grade of concrete of container	Fck	30	N/mm2
	Grade of concrete of Staging : column	Fckc	30	N/mm2
	Grade of concrete of Staging : Beam	Fckb	30	N/mm2
	Grade of Steel	Fy	500	N/mm2
	Mass & Wt relation factor	g	9.81	
(C)	Loading			
	Finishing load on top slab	Fl	1.00	kN/m2
	Live load on top slab	Ll	0.75	kN/m2
	Finishing load on walk way	Flwy	1.25	kN/m2
	Other			
(D)	Plaster thickness	Pt	20	mm
	Bottom IPS thickness	Bips	20	mm
	Free board	Fb	300	mm
(E)	Capacity			
	Required volumn of water	Vw	60	m3
		Vwl	60000	liter
(F)	Geometry data : Container			
	Height between Bottom slab & FSl	Hw	3.5	m
	Water depth	Wd	3.5	m
	Length of tank in to in	Ltank	4.2	m
	Width of tank in to in	Btank	4.2	m
	Actual capcity of tank	Tcap	60.57	m3
		Tcapl	60570	liter
(G)	Geometry data : Staging			
	Staging height	stgh	12	m
	Depth of foundation	dbg	3	m
	Footing thickness	ftthk	0.45	m
	Nos of column	noscol	4	
	C/C distance in x direction	xcen	4.20	m
	C/C distance in y direction	ycen	4.20	m
	Nos of Tie level	nostie	3	
(G)	RCC geometry data :container			
	Bottom slab thickness	Thkbs	200	mm
	Top slab thickness	Thkts	140	mm
	Wall thickness	Thkw	250	mm
	Progection of bottom slab	Prjbs	0	mm
	Thickness of walkway	Thkwy	0	mm
(G)	RCC geometry data :Stageing			
		Width	Depth	

	Column size				
	Width	colwd		350	mm
	Beam size	colde		350	mm
	Plinth beam size		300	450	mm
	Tie beam		230	450	mm
	Floor beam at bottom slab		300	650	mm
(H)	Earthquake data				
	Zone	Eqzone		2	
	Soil type (1,2,3) soft soil : Soil type 1 Medium soil : Soil type 2 Hard soil : soil type 3	typesoil		2	
	Importance Factor	Impfac		1.5	
(J)	Foundation data				
	Depth of foundation	Dfdn		3000	mm

SELF WEIGHT MODEL

```
STAAD SPACE
START JOB INFORMATION
JOB PART 0.6 LAC ESR_STIFFNESS MODEL
ENGINEER DATE 10
END JOB INFORMATION
INPUT WIDTH 79
UNIT METER KN
JOINT COORDINATES
1 0 2.5 0; 2 4.35 2.5 0; 3 4.35 2.5 4.35; 4 0 2.5 4.35; 5 0 0 0; 6 4.35 0 0;
7 4.35 0 4.35; 8 0 0 4.35; 9 6.35 0 2.175; 101 0 5.5 0; 102 4.35 5.5 0;
103 4.35 5.5 4.35; 104 0 5.5 4.35; 105 0 8.5 0; 106 4.35 8.5 0;
107 4.35 8.5 4.35; 108 0 8.5 4.35; 301 0 14.5 0; 302 4.35 14.5 0;
303 4.35 14.5 4.35; 304 0 14.5 4.35; 1001 2.1 15.846 2.175; 1002 0 11.5 0;
1003 4.35 11.5 0; 1004 0 11.5 4.35; 1005 4.35 11.5 4.35; 1013 6.35 2.5 2.175;
1014 6.35 5.5 2.175; 1015 6.35 8.5 2.175; 1016 6.35 11.5 2.175;
1017 6.35 14.5 2.175;
MEMBER INCIDENCES
1 1 2; 2 4 3; 3 1 4; 4 2 3; 5 101 102; 6 104 103; 7 101 104; 8 102 103;
9 105 106; 10 108 107; 11 105 108; 12 106 107; 17 5 1; 18 6 2; 19 8 4; 20 7 3;
21 1 101; 22 2 102; 23 4 104; 24 3 103; 25 101 105; 26 102 106; 27 104 108;
28 103 107; 29 105 1002; 30 106 1003; 31 108 1004; 32 107 1005; 33 1002 301;
34 1003 302; 35 1002 1003; 36 1004 304; 37 1005 303; 38 1004 1005;
39 1002 1004; 40 1003 1005; 46 9 1013; 47 1013 1014; 48 1014 1015;
49 1015 1016; 50 1016 1017; 51 2 1013; 52 3 1013; 53 102 1014; 54 103 1014;
55 106 1015; 56 107 1015; 57 1003 1016; 58 1005 1016;
DEFINE MATERIAL START
ISOTROPIC CONCRETE
E 2.73e+007
POISSON 0.17
DENSITY 25
ALPHA 1e-005
DAMP 0.05
END DEFINE MATERIAL
MEMBER PROPERTY AMERICAN
5 TO 12 35 38 TO 40 PRIS YD 0.45 ZD 0.23
17 TO 34 36 37 PRIS YD 0.35 ZD 0.35
MEMBER PROPERTY AMERICAN
1 TO 4 PRIS YD 0.45 ZD 0.3
MEMBER PROPERTY AMERICAN
46 TO 50 PRIS YD 0.25
51 TO 58 PRIS YD 0.3 ZD 0.23
CONSTANTS
MATERIAL CONCRETE ALL
SUPPORTS
5 TO 9 PINNED
SLAVE RIGID MASTER 1001 JOINT 301 TO 304 1001 1017
LOAD 101
JOINT LOAD
1001 FX 10
LOAD 102
JOINT LOAD
1001 FZ 10
LOAD 3 SELF WT
SELFWEIGHT Y -1
PERFORM ANALYSIS
FINISH
```

SELF WEIGHT

STAGING LOAD							
Node	L/C	Horizontal Force-X kN	Vertical Force-Y kN	Horizontal Force-Z kN	Moment Moment-X kNm	Moment-Y kNm	Moment-Z kNm
5	3	0.671	92.981	0.697	0	0	0
6	3	-0.595	102.646	0.803	0	0	0
7	3	-0.595	102.646	-0.803	0	0	0
8	3	0.671	92.981	-0.697	0	0	0
9	3	-0.152	38.733	0	0	0	0
TOTAL			**430**				

Node	L/C	X-Trans mm	Y-Trans mm	Z-Trans mm	Absolute mm	X-Rotan rad	Y-Rotan rad	Z-Rotan rad
1001	101	2.483	0.007	0	2.483	0	0	0
	102	0	0	2.562	2.562	0	0	0

Tank Geomtry : Rectangular with top slab ESR : 60000 liter				
Weight calculation				
Container				
(A)	Top slab : Self wt			
	Out to out length of top slab (x dir)	ltop	4.70	
	Out to out width of top slab (Z dir)	btop	4.70	
	Thickness of top slab		0.14	
	Volume	Vts	3.09	
	Weight of top slab	Wts	77.3	kn
(B)	Top slab : Finishing			
	Plan area	Tsarea	22.09	
	Loading		1.00	
	Weight of Finishing	Wtsfl	22.1	kn
(C)	Wall			
	Center to center length - x direction		4.45	
	Center to center length - Z direction		4.45	
	Total length		17.80	
	Thickness of wall		0.25	
	Heigth of wall	Thw	3.8	3.5
	Volume	Vwall	16.91	
		Wwall	422.75	kn
(D)	Bottom slab & Walk way			
	out to out length of bottom slab		4.70	
	out to out width of bottom slab		4.70	
	Thickness of bottom slab		0.20	
	out to out length of walkway		4.70	
	out to out width of walkway		4.70	
	thick ness of walkway		0.00	
	Volume of bottom slab	Vbs	4.42	
	Wt of bottom slab	Wbs	110.45	

(E)	volume of walway	Vwy	0.00	
	Wt of walkway	Wwy	0.00	
(F)	Wt of IPS	Wips	7.41	kn
(G)	wt of finishing at walk way level	Wwyf	0.00	kn
(H)	Wt of plaster	Wpl	26.81	kn
	Container Summary			
(A)	Top slab : Self wt		77.32	kn
(B)	Top slab : Finishing		22.09	kn
(C)	Wall		422.75	kn
(D)	Bottom slab		110.45	kn
(E)	Wt of walkway		0.00	kn
(F)	Wt of IPS		7.41	kn
(G)	wt of finishing at walk way level		0.00	kn
(H)	Wt of plaster		26.81	kn
(I)	Beam at bottom slab		163.80	kn
	Total		830.63	kn
	Water			
	Weight of water upto FSL	Wwfsl	605.70	kN
	Mass of water upto FSL	Mwfsl	61743	kg
	Weight of water in free board	Wwfb	52.92	kN
	Mass of water in free board	Mwfb	5394	kg
	Total weigth of water	Tww	658.62	kN
	Total mass of water	Tmw	67137	kg
	Mass			
	Weight of staging from staad	ws	430	kn
	Ms = mass of empty container + 1/3 mass of staging	Ms	99045	kg

	Tank Geomtry : Rectangular with top slab ESR : 60000 liter Spring mass Parameter		
(A)	H/L calculation Heigth of tank including Freeboard Inside Diameter of tank H/L ratio - Ra L/H ratio Rb	 Ra Rb	 0.905 1.105
(B)	Mass calculation Total mass of water Calculation of Impusive mass mi/m = $\frac{\tanh(0.866L/h)}{0.866\ L/h}$ Mi/m - Ratio Rd	 M Rd Mi	 67137 0.776 52116
	Calculation of Convective mass mc/m = 0.264 * $\frac{\tanh(3.16h/L)}{h/L}$ Mc/m - Ratio Re Total mass of water	 Re Mc Tm	 0.290 19462 71578
(C)	Calculation of Height Hi & Hc for hydrudynamic pressure on tank wall only For H/L < 0.75 , hi = 0.375 For H/L > 0.75 hi/h = 0.5 - 0.09375/ (h/L) -Ratio Rf hc/h = $1-\frac{\cosh(3.16\ h/L)-1}{3.16\ h/L\ \sinh(3.16\ h/L)}$	 Rf hia Rg hca	 -0.53618 -2.04 0.688 2.62
(D)	Calculation of Height Hi* & Hc* Hi for hydrudynamic pressure on tank wall and base slab For H/L < 1.33 hi*/h = $\frac{0.866L/h\ *0.125}{2\tanh(\ 0.866\ L/h)}$ For L/D > 1.33 hi*/h =0.45 hc*/h = $1-\frac{\cosh(3.68\ h/L)-2.01}{3.68\ h/d\ \sinh(3.68\ h/l)}$	 Rh hib Ri Hcb	 0.519 1.973 0.729 2.769
(E)	Calculation of spring stiffness kc = $0.833*mg/h*\tanh^2(3.68\ h/L)$	 kc	 142490

Tank Geomtry : Rectangular with top slab				
ESR : 60000 liter				
C.G. of container				
		C.G. from top of floor slab		
		Weight (a)	Distance (b)	(a) X (b)
(A)	Top slab : Self wt	77.32	3.87	299.2
(B)	Top slab : Finishing	22.09	3.94	87.0
(C)	Wall	422.75	1.9	803.2
(D)	Bottom slab	110.45	-0.1	-11.0
(E)	Wt of walkway	0.00	0	0.0
(F)	Wt of IPS	7.41	0.01	0.1
(G)	wt of finishing at walk way level	0.00	0	0.0
(H)	Wt of plaster	26.81	1.9	50.9
(I)	Floor level beam	163.80	-0.525	-86.0
(I)	Total	830.63		1143.4
	Distance from top of bottom slab	1.377	m	

Tank Geomtry : Rectangular with top slab				
ESR : 60000 liter				
Time period				
(A)	Time period in impulsive mode			
	Ti = 2 * pi * ((Mi+ms)/ks)^0.5			
	Mass Ms		99045	
	mass Mi		52116	
	Deflection due to 10 kn	defl	2.483	mm
	Lateral stiffness	Ks	4080	kn/m
		Ti	1.209	sec
(B)	Time period in convective mode			
	Tc = Cc *(L/g)^0.5			
	h/l		0.905	
	Cc=2*pi/(3.16tanh(3.16(h/l))^0.5	Cc	3.546	
		Tc	2.320	sec

Tank type : Elevated storage resrvoir : Small capacity

ESR : 60000 liter

Horizontal seismic coefficient

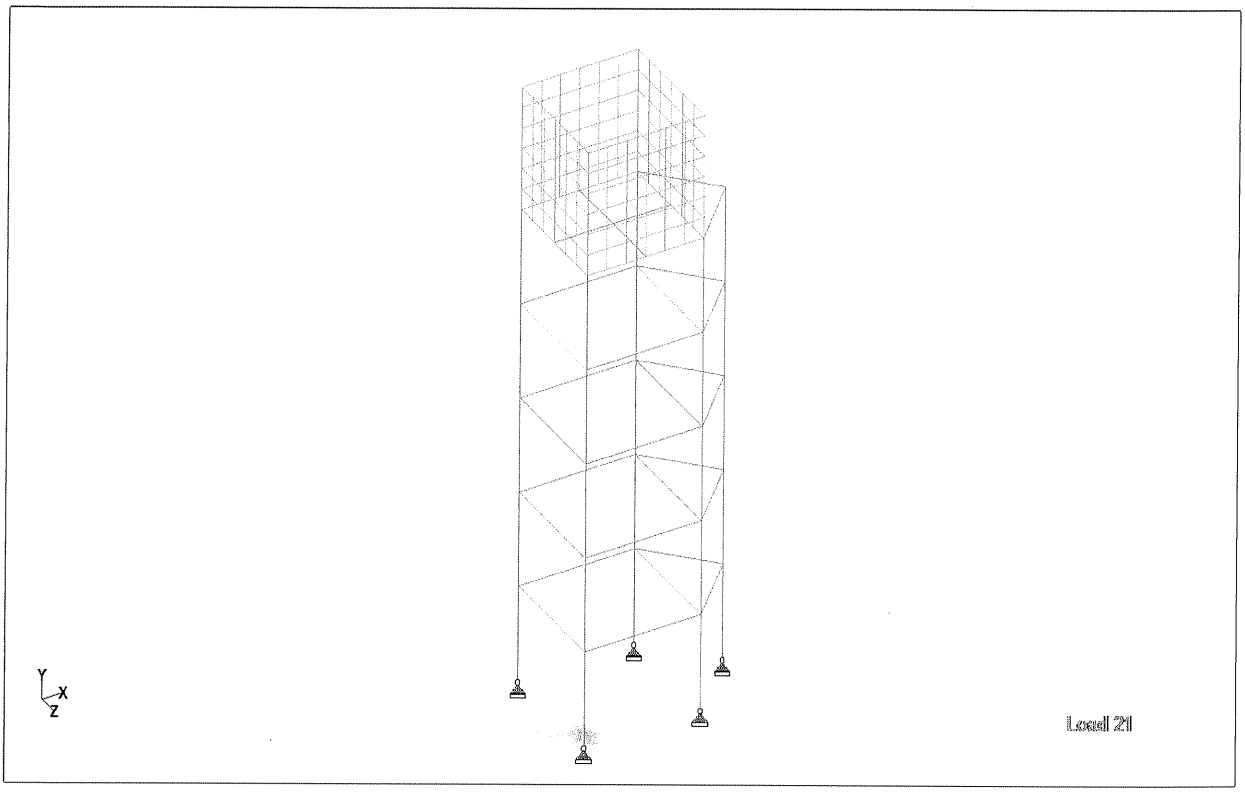
(A)	Zone factor Z			
	Earthquake zone		2	
	Zone Factor : Z	Z		0.1
	Imporatnce factor	I		1.5
	Soil type	st		2
(B)	Response reduction factor	Rrf		2.5
(C)	Calculation for Sa/g : for impulsive mode			
	Time Period Ti		1.21 seconds	
	Sa/g : For Soft soil	saga		1.381
	Sa/g : For Medium soil	sagb		1.125
	Sa/g : For hard soil	sagc		0.827
		sag		1.125
(D)	Seismic coeficient for implusive mode			
	Ahi = Z / 2 * I /R * Sa/g	Ahi		0.034
(E)	Calculation for Sa/g : for convective			
	Time Period Tc		2.32 seconds	
	Sa/g : For Soft soil	saga1		0.720
	Sa/g : For Medium soil	sagb1		0.586
	Sa/g : For hard soil	sagc1		0.431
	Sag for 0.5 % damping = sag * 1.75	sag1		1.026
(F)	Seismic coeficient for implusive mode			
	Ahc = Z / 2 * I /R * Sa/g	Ahc		0.031
(G)	Vi = Ahi*(Mi+ms)*g			
	mi			52116 kg
	ms			99045 kg
		Vi		50 kn
(H)	Vc = Ahc*mc*G			
	mc			19462 kg
		Vc		6 kn
(I)	Total base shear			
	V= (vi^2+vc^2)^0.5	Vt		50 kn
	Total secimic wt =(Mi+mc+ms)*g			1674 kn
	% lateral base shear			3.01 %

Tank type : Elevated storage resrvoir : Small capacity

ESR : 50000 liter

Horizontal seismic coefficient

(A)	Zone factor Z			
	Earthquake zone		2	
	Zone Factor : Z	Z		0.1
	Imporatnce factor	I		1.5
	Soil type	st		2
(B)	Response reduction factor	Rrf		2.5
(C)	Calculation for Sa/g : for impulsive mode			
	Time Period Ti		0.99 seconds	
	Sa/g : For Soft soil	saga		1.681
	Sa/g : For Medium soil	sagb		1.369
	Sa/g : For hard soil	sagc		1.007
		sag		1.369
(D)	Seismic coeficient for implusive mode			
	Ahi = Z / 2 * I /R * Sa/g	Ahi		0.041
(E)	Calculation for Sa/g : for convective			
	Time Period Tc		2.32 seconds	
	Sa/g : For Soft soil	saga1		0.720
	Sa/g : For Medium soil	sagb1		0.586
	Sa/g : For hard soil	sagc1		0.431
	Sag for 0.5 % damping = sag * 1.75	sag1		1.026
(F)	Seismic coeficient for implusive mode			
	Ahc = Z / 2 * I /R * Sa/g	Ahc		0.031
(G)	Vi = Ahi*(Mi+ms)*g			
	mi			4188 kg
	ms			97760 kg
		Vi		41 kn
(H)	Vc = Ahc*mc*G			
	mc			1564 kg
		Vc		0 kn
(I)	Total base shear			
	V= (vi^2+vc^2)^0.5	Vt		41 kn
	Total secimic wt =(Mi+mc+ms)*g			1015 kn
	% lateral base shear			4.05 %


Y
X
Z
Load 21

3D MODEL

```
STAAD SPACE
START JOB INFORMATION
JOB PART 0.6 LAC ESR_STIFFNESS MODEL
ENGINEER DATE 10
END JOB INFORMATION
INPUT WIDTH 79
UNIT METER KN
JOINT COORDINATES
1 0 2.5 0; 2 4.35 2.5 0; 3 4.35 2.5 4.35; 4 0 2.5 4.35; 5 0 -0.5 0;
6 4.35 -0.5 0; 7 4.35 -0.5 4.35; 8 0 -0.5 4.35; 9 6.35 -0.5 2.175; 101 0 5.5 0;
102 4.35 5.5 0; 103 4.35 5.5 4.35; 104 0 5.5 4.35; 105 0 8.5 0; 106 4.35 8.5 0;
107 4.35 8.5 4.35; 108 0 8.5 4.35; 301 0 14.5 0; 302 4.35 14.5 0;
MEMBER INCIDENCES
101 1 2; 102 4 3; 103 1 4; 104 2 3; 105 2 1013; 106 3 1013; 201 101 102;
202 104 103; 203 101 104; 204 102 103; 205 102 1014; 206 103 1014; 301 105 106;
302 108 107; 303 105 108; 304 106 107; 305 106 1015; 306 107 1015;
ELEMENT INCIDENCES SHELL
801 301 1031 1032 1033; 802 1031 1034 1035 1032; 803 1034 1036 1037 1035;
804 1036 1038 1039 1037; 805 1038 1040 1041 1039; 806 1040 1023 1042 1041;
807 1033 1032 1043 1044; 808 1032 1035 1045 1043; 809 1035 1037 1046 1045;
ELEMENT PROPERTY
801 TO 944 THICKNESS 0.25
DEFINE MATERIAL START
ISOTROPIC CONCRETE
E 2.73e+007
POISSON 0.17
DENSITY 25
ALPHA 1e-005
DAMP 0.05
END DEFINE MATERIAL
MEMBER PROPERTY INDIAN
201 TO 204 301 TO 304 401 TO 404 PRIS YD 0.45 ZD 0.23
601 TO 620 PRIS YD 0.35 ZD 0.35
101 TO 104 PRIS YD 0.45 ZD 0.3
701 TO 705 PRIS YD 0.25
105 106 205 206 305 306 405 406 529 530 PRIS YD 0.3 ZD 0.23
501 TO 504 PRIS YD 0.65 ZD 0.3
505 TO 528 PRIS YD 0.65 ZD 0.25
CONSTANTS
MATERIAL CONCRETE ALL
SUPPORTS
5 TO 9 PINNED
SLAVE FX FZ MASTER 1001 JOINT 301 TO 304 1017
*********************************************************************************
* Normal load
*Dead load
LOAD 1 D.L
SELFWEIGHT Y -1
FLOOR LOAD
YRANGE 14.5 14.5 FLOAD -5.5 XRANGE 0 4.35  ZRANGE 0 4.35  GY
*********************************************************************************
*live load
LOAD 2 L.L
MEMBER LOAD
101 UNI GY -0.01
*********************************************************************************
* from walk way
```

```
LOAD 3 OTHER LOAD
JOINT LOAD
301 TO 304 1023 TO 1026 FY -30
MEMBER LOAD
529 530 UNI GY -6.5
*******************************************************************************
***top slab load
LOAD 4 WATER LOAD
FLOOR LOAD
YRANGE 14.5 14.5 FLOAD -39 XRANGE 0 4.35  ZRANGE 0 4.35  GY
*******************************************************************************
*Earthquake - full load
LOAD 5 EQLOAD - X DIRECTION
JOINT LOAD
1001 FX 50
LOAD 6 EQLOAD - Z DIRECTION
JOINT LOAD
1001 FZ 50
LOAD 7 EQLOAD - X DIRECTION (REV)
JOINT LOAD
1001 FX -50
LOAD 8 EQLOAD - Z DIRECTION (REV)
JOINT LOAD
1001 FZ -50
*******************************************************************************
*Earthquake - empty condtion
LOAD 9 EQLOAD - X DIRECTION
JOINT LOAD
1001 FX 41
LOAD 10 EQLOAD - Z DIRECTION
JOINT LOAD
1001 FZ 41
LOAD 11 7 EQLOAD - X DIRECTION (REV)
JOINT LOAD
1001 FX -41
LOAD 12 EQLOAD - Z DIRECTION (REV)
JOINT LOAD
1001 FZ -41
*******************************************************************************
*wind load
LOAD 13 WIND LOAD - X DIRECTION
JOINT LOAD
1001 FX 19.4
MEMBER LOAD
602 TO 605 607 TO 610 612 TO 620 702 TO 705 UNI GX 0.46
203 204 303 304 403 404 UNI GX 0.85
LOAD 14 WIND LOAD - Z DIRECTION
JOINT LOAD
1001 FZ 19.4
MEMBER LOAD
602 TO 605 607 TO 610 612 TO 620 702 TO 705 UNI GZ 0.46
201 202 301 302 401 402 UNI GZ 0.85
LOAD 15 WIND LOAD - X DIRECTION (REV)
JOINT LOAD
1001 FX -19.4
MEMBER LOAD
602 TO 605 607 TO 610 612 TO 620 702 TO 705 UNI GX -0.46
203 204 303 304 403 404 UNI GX -0.85
LOAD 16 WIND LOAD - Z DIRECTION (REV)
```

```
JOINT LOAD
1001 FZ -19.4
MEMBER LOAD
602 TO 605 607 TO 610 612 TO 620 702 TO 705 UNI GZ -0.46
201 202 301 302 401 402 UNI GZ -0.85
*******************************************************************************
*Normal load
LOAD COMB 21 1.5DL+1.5LL
1 1.5 2 1.5 3 1.5 4 1.5
*Total dead load + EQ load - tank full condition
LOAD COMB 22 1.5DL+1.5EQX+0.45EQZ
1 1.5 3 1.5 4 1.5 5 1.5 6 0.45
LOAD COMB 23 1.5DL+1.5EQX-0.45EQZ
1 1.5 3 1.5 4 1.5 5 1.5 8 0.45
LOAD COMB 24 1.5DL-1.5EQX+0.45EQZ
1 1.5 3 1.5 4 1.5 7 1.5 6 0.45
LOAD COMB 25 1.5DL-1.5EQX-0.45EQZ
1 1.5 3 1.5 4 1.5 7 1.5 8 0.45
LOAD COMB 26 1.5DL+0.45EQX+1.50EQZ
1 1.5 3 1.5 4 1.5 5 0.45 6 1.5
LOAD COMB 27 1.5DL-0.45EQX+1.50EQZ
1 1.5 3 1.5 4 1.5 7 0.45 6 1.5
LOAD COMB 28 1.5DL+0.45EQX-1.50EQZ
1 1.5 3 1.5 4 1.5 5 0.45 8 1.5
LOAD COMB 29 1.5DL-0.45EQX-1.50EQZ
1 1.5 3 1.5 4 1.5 7 0.45 8 1.5
*Total load + EQ load - tank full condition
LOAD COMB 30 1.2DL+1.2LL+1.2EQX+0.36EQZ
1 1.2 2 1.2 3 1.2 4 1.2 5 1.2 6 0.36
LOAD COMB 31 1.2DL+1.2LL+1.2EQX-0.36EQZ
1 1.2 2 1.2 3 1.2 4 1.2 5 1.2 8 0.36
LOAD COMB 32 1.2DL+1.2LL-1.2EQX+0.36EQZ
1 1.2 2 1.2 3 1.2 4 1.2 7 1.2 6 0.36
LOAD COMB 33 1.2DL+1.2LL-1.2EQX-0.36EQZ
1 1.2 2 1.2 3 1.2 4 1.2 7 1.2 8 0.36
LOAD COMB 34 1.2DL+1.2LL+0.36EQX+1.20EQZ
1 1.2 2 1.2 3 1.2 4 1.2 5 0.36 6 1.2
LOAD COMB 35 1.2DL+1.2LL-0.36EQX+1.20EQZ
1 1.2 2 1.2 3 1.2 4 1.2 7 0.36 6 1.2
LOAD COMB 36 1.2DL+1.2LL+0.36EQX-1.20EQZ
1 1.2 2 1.2 3 1.2 4 1.2 5 0.36 8 1.2
LOAD COMB 37 1.2DL+1.2LL-0.36EQX-1.20EQZ
1 1.2 2 1.2 3 1.2 4 1.2 7 0.36 8 1.2
* 0.9 time dead load + EQ load - tank full condition
*******************************************************************************
LOAD COMB 38 0.9DL+1.5EQX+0.45EQZ
1 0.9 3 0.9 4 0.9 5 1.5 6 0.45
LOAD COMB 39 0.9DL+1.5EQX-0.45EQZ
1 0.9 3 0.9 4 0.9 5 1.5 8 0.45
LOAD COMB 40 0.9DL-1.5EQX+0.45EQZ
1 0.9 3 0.9 4 0.9 7 1.5 6 0.45
LOAD COMB 41 0.9DL-1.5EQX-0.45EQZ
1 0.9 3 0.9 4 0.9 7 1.5 8 0.45
LOAD COMB 42 0.9DL+0.45EQX+1.50EQZ
1 0.9 3 0.9 4 0.9 5 0.45 6 1.5
LOAD COMB 43 0.9DL-0.45EQX+1.50EQZ
1 0.9 3 0.9 4 0.9 7 0.45 6 1.5
LOAD COMB 44 0.9DL+0.45EQX-1.50EQZ
1 0.9 3 0.9 4 0.9 5 0.45 8 1.5
```

```
LOAD COMB 45 0.9DL-0.45EQX-1.50EQZ
1 0.9 3 0.9 4 0.9 7 0.45 8 1.5
*Total dead load + EQ load - tank emptycondition
LOAD COMB 46 1.5DL+1.5EQX+0.45EQZ
1 1.5 3 1.5 9 1.5 10 0.45
LOAD COMB 47 1.5DL+1.5EQX-0.45EQZ
1 1.5 3 1.5 9 1.5 12 0.45
LOAD COMB 48 1.5DL-1.5EQX+0.45EQZ
1 1.5 3 1.5 11 1.5 10 0.45
LOAD COMB 49 1.5DL-1.5EQX-0.45EQZ
1 1.5 3 1.5 11 1.5 10 0.45
LOAD COMB 50 1.5DL+0.45EQX+1.50EQZ
1 1.5 3 1.5 9 0.45 10 1.5
LOAD COMB 51 1.5DL-0.45EQX+1.50EQZ
1 1.5 3 1.5 11 0.45 10 1.5
LOAD COMB 52 1.5DL+0.45EQX-1.50EQZ
1 1.5 3 1.5 9 0.45 12 1.5
LOAD COMB 53 1.5DL-0.45EQX-1.50EQZ
1 1.5 3 1.5 11 0.45 12 1.5
* 0.9 time dead load + EQ load - tank empty condition
LOAD COMB 54 0.9DL +1.5EQX+0.45EQZ
1 0.9 3 0.9 9 1.5 10 0.45
LOAD COMB 55 0.9DL+1.5EQX-0.45EQZ
1 0.9 3 0.9 9 1.5 12 0.45
LOAD COMB 56 0.9DL-1.5EQX+0.45EQZ
1 0.9 3 0.9 11 1.5 10 0.45
LOAD COMB 57 0.9DL-1.5EQX-0.45EQZ
1 0.9 3 0.9 11 1.5 12 0.45
LOAD COMB 58 0.9DL+0.45EQX+1.50EQZ
1 0.9 3 0.9 9 0.45 10 1.5
LOAD COMB 59 0.9DL-0.45EQX+1.50EQZ
1 0.9 3 0.9 11 0.45 10 1.5
LOAD COMB 60 0.9DL+0.45EQX-1.50EQZ
1 0.9 3 0.9 9 0.45 12 1.5
LOAD COMB 61 0.9DL-0.45EQX-1.50EQZ
1 0.9 3 0.9 11 0.45 12 1.5
LOAD COMB 62 1.5TL+1.5WLX
1 1.5 2 1.5 3 1.5 4 1.5 13 1.5
LOAD COMB 63 1.5TL+1.5WLZ
1 1.5 2 1.5 3 1.5 4 1.5 14 1.5
LOAD COMB 64 1.5TL-1.5WLX
1 1.5 2 1.5 3 1.5 4 1.5 15 1.5
LOAD COMB 65 1.5TL+1.5WLZ
1 1.5 2 1.5 3 1.5 4 1.5 16 1.5
LOAD COMB 66 1.5DL+1.5WLX
1 1.5 3 1.5 13 1.5
LOAD COMB 67 1.5DL+1.5WLZ
1 1.5 3 1.5 14 1.5
LOAD COMB 68 1.5DL-1.5WLX
1 1.5 3 1.5 15 1.5
LOAD COMB 69 1.5DL+1.5WLZ
1 1.5 3 1.5 16 1.5
********************************************************************************
PERFORM ANALYSIS
LOAD LIST 21 TO 69
START CONCRETE DESIGN
CODE INDIAN
UNIT MMS NEWTON
FC 30 ALL
```

```
FYMAIN 415 ALL
MAXMAIN 25 ALL
MINMAIN 20 ALL
ENSH 0 ALL
ENSH 1 ALL
CLEAR 25 MEMB 101 TO 106 201 TO 206 301 TO 306 401 TO 406 501 TO 530
DESIGN COLUMN 601 TO 620 701 TO 705
DESIGN BEAM 101 TO 106 201 TO 206 301 TO 306 401 TO 406 501 TO 504 529 530
END CONCRETE DESIGN
UNIT METER KN
PERFORM ANALYSIS
LOAD LIST 21 TO 69
FINISH
```

FOOTING DESIGN

TYPICAL CALCULATION OF FOOTING : -

SBC for Samlaya = 15 t/m2

Safe bearing capacity of soil = 15 T/ M^2
Increase in S.B.C for the combination of Earthquake forces = 25 %
S.B.C for Eq forces = 18.75 T/m2
Footing area & loads are also design for following combination

```
LOAD COMB 21 1.5DL+1.5LL
1 1.5 2 1.5 3 1.5 4 1.5
*Total dead load + EQ load - tank full condition
LOAD COMB 22 1.5DL+1.5EQX+0.45EQZ
1 1.5 3 1.5 4 1.5 5 1.5 6 0.45
LOAD COMB 23 1.5DL+1.5EQX-0.45EQZ
1 1.5 3 1.5 4 1.5 5 1.5 8 0.45
LOAD COMB 24 1.5DL-1.5EQX+0.45EQZ
1 1.5 3 1.5 4 1.5 7 1.5 6 0.45
LOAD COMB 25 1.5DL-1.5EQX-0.45EQZ
1 1.5 3 1.5 4 1.5 7 1.5 8 0.45
LOAD COMB 26 1.5DL+0.45EQX+1.50EQZ
1 1.5 3 1.5 4 1.5 5 0.45 6 1.5
LOAD COMB 27 1.5DL-0.45EQX+1.50EQZ
1 1.5 3 1.5 4 1.5 7 0.45 6 1.5
LOAD COMB 28 1.5DL+0.45EQX-1.50EQZ
1 1.5 3 1.5 4 1.5 5 0.45 8 1.5
LOAD COMB 29 1.5DL-0.45EQX-1.50EQZ
1 1.5 3 1.5 4 1.5 7 0.45 8 1.5
*Total load + EQ load - tank full condition
LOAD COMB 30 1.2DL+1.2LL+1.2EQX+0.36EQZ
1 1.2 2 1.2 3 1.2 4 1.2 5 1.2 6 0.36
LOAD COMB 31 1.2DL+1.2LL+1.2EQX-0.36EQZ
1 1.2 2 1.2 3 1.2 4 1.2 5 1.2 8 0.36
LOAD COMB 32 1.2DL+1.2LL-1.2EQX+0.36EQZ
1 1.2 2 1.2 3 1.2 4 1.2 7 1.2 6 0.36
LOAD COMB 33 1.2DL+1.2LL-1.2EQX-0.36EQZ
1 1.2 2 1.2 3 1.2 4 1.2 7 1.2 8 0.36
LOAD COMB 34 1.2DL+1.2LL+0.36EQX+1.20EQZ
1 1.2 2 1.2 3 1.2 4 1.2 5 0.36 6 1.2
LOAD COMB 35 1.2DL+1.2LL-0.36EQX+1.20EQZ
1 1.2 2 1.2 3 1.2 4 1.2 7 0.36 6 1.2
LOAD COMB 36 1.2DL+1.2LL+0.36EQX-1.20EQZ
1 1.2 2 1.2 3 1.2 4 1.2 5 0.36 8 1.2
LOAD COMB 37 1.2DL+1.2LL-0.36EQX-1.20EQZ
1 1.2 2 1.2 3 1.2 4 1.2 7 0.36 8 1.2
LOAD COMB 62 1.5TL+1.5WLX
1 1.5 2 1.5 3 1.5 4 1.5 13 1.5
LOAD COMB 63 1.5TL+1.5WLZ
1 1.5 2 1.5 3 1.5 4 1.5 14 1.5
LOAD COMB 64 1.5TL-1.5WLX
1 1.5 2 1.5 3 1.5 4 1.5 15 1.5
LOAD COMB 65 1.5TL+1.5WLZ
1 1.5 2 1.5 3 1.5 4 1.5 16 1.5
```

Attached Excel sheet shows the typical footing design

JOB :60,000 LITER ESR

SBC of Soil 100 Kn/m2 at 3.0 m depth

SBC after increase 125

COLUMN LOADS

Col.no	Load case	Fy : factor	Fy : unfactor	Allowable SBC	Required area	Design load	Area reqd
5	21 1.5DL+1.5LL	757	505	100	5.05	607	5.05
	22 1.5DL+1.5EQX+0.45EQZ	607	405	125	3.24		
	23 1.5DL+1.5EQX-0.45EQZ	678	452	125	3.62		
	24 1.5DL-1.5EQX+0.45EQZ	835	557	125	4.45		
	25 1.5DL-1.5EQX-0.45EQZ	907	605	125	4.84		
	26 1.5DL+0.45EQX+1.50EQZ	603	402	125	3.22		
	27 1.5DL-0.45EQX+1.50EQZ	672	448	125	3.58		
	28 1.5DL+0.45EQX-1.50EQZ	842	561	125	4.49		
	29 1.5DL-0.45EQX-1.50EQZ	910	607	125	4.86		
	30 1.2DL+1.2LL+1.2EQX+0.36EQZ	486	405	125	3.24		
	31 1.2DL+1.2LL+1.2EQX-0.36EQZ	543	452	125	3.62		
	32 1.2DL+1.2LL-1.2EQX+0.36EQZ	668	557	125	4.46		
	33 1.2DL+1.2LL-1.2EQX-0.36EQZ	725	605	125	4.84		
	34 1.2DL+1.2LL+0.36EQX+1.20EQZ	483	402	125	3.22		
	35 1.2DL+1.2LL-0.36EQX+1.20EQZ	538	448	125	3.58		
	36 1.2DL+1.2LL+0.36EQX-1.20EQZ	673	561	125	4.49		
	37 1.2DL+1.2LL-0.36EQX-1.20EQZ	728	607	125	4.86		
	62 1.5TL+1.5WLX	644	429	125	3.44		
	63 1.5TL+1.5WLZ	641	427	125	3.42		
	64 1.5TL-1.5WLX	870	580	125	4.64		
	65 1.5TL+1.5WLZ	873	582	125	4.66		
6	21 1.5DL+1.5LL	757	505	100	5.05	614	5.05
	22 1.5DL+1.5EQX+0.45EQZ	796	531	125	4.25		
	23 1.5DL+1.5EQX-0.45EQZ	880	587	125	4.69		
	24 1.5DL-1.5EQX+0.45EQZ	634	422	125	3.38		
	25 1.5DL-1.5EQX-0.45EQZ	717	478	125	3.83		
	26 1.5DL+0.45EQX+1.50EQZ	642	428	125	3.42		
	27 1.5DL-0.45EQX+1.50EQZ	593	395	125	3.16		
	28 1.5DL+0.45EQX-1.50EQZ	921	614	125	4.91		
	29 1.5DL-0.45EQX-1.50EQZ	872	581	125	4.65		
	30 1.2DL+1.2LL+1.2EQX+0.36EQZ	637	531	125	4.25		
	31 1.2DL+1.2LL+1.2EQX-0.36EQZ	704	587	125	4.69		
	32 1.2DL+1.2LL-1.2EQX+0.36EQZ	507	422	125	3.38		
	33 1.2DL+1.2LL-1.2EQX-0.36EQZ	574	478	125	3.83		
	34 1.2DL+1.2LL+0.36EQX+1.20EQZ	513	428	125	3.42		
	35 1.2DL+1.2LL-0.36EQX+1.20EQZ	474	395	125	3.16		
	36 1.2DL+1.2LL+0.36EQX-1.20EQZ	737	614	125	4.91		
	37 1.2DL+1.2LL-0.36EQX-1.20EQZ	697	581	125	4.65		
	62 1.5TL+1.5WLX	837	558	125	4.46		
	63 1.5TL+1.5WLZ	617	412	125	3.29		
	64 1.5TL-1.5WLX	677	451	125	3.61		
	65 1.5TL+1.5WLZ	896	598	125	4.78		
7	21 1.5DL+1.5LL	757	505	100	5.05	614	5.05
	22 1.5DL+1.5EQX+0.45EQZ	880	587	125	4.69		
	23 1.5DL+1.5EQX-0.45EQZ	796	531	125	4.25		
	24 1.5DL-1.5EQX+0.45EQZ	717	478	125	3.83		
	25 1.5DL-1.5EQX-0.45EQZ	634	422	125	3.38		
	26 1.5DL+0.45EQX+1.50EQZ	921	614	125	4.91		
	27 1.5DL-0.45EQX+1.50EQZ	872	581	125	4.65		
	28 1.5DL+0.45EQX-1.50EQZ	642	428	125	3.42		
	29 1.5DL-0.45EQX-1.50EQZ	593	395	125	3.16		

	30 1.2DL+1.2LL+1.2EQX+0.36EQZ	704	587	125	4.69		
	31 1.2DL+1.2LL+1.2EQX-0.36EQZ	637	531	125	4.25		
	32 1.2DL+1.2LL-1.2EQX+0.36EQZ	574	478	125	3.83		
	33 1.2DL+1.2LL-1.2EQX-0.36EQZ	507	422	125	3.38		
	34 1.2DL+1.2LL+0.36EQX+1.20EQZ	737	614	125	4.91		
	35 1.2DL+1.2LL-0.36EQX+1.20EQZ	697	581	125	4.65		
	36 1.2DL+1.2LL+0.36EQX-1.20EQZ	513	428	125	3.42		
	37 1.2DL+1.2LL-0.36EQX-1.20EQZ	474	395	125	3.16		
	62 1.5TL+1.5WLX	836	558	125	4.46		
	63 1.5TL+1.5WLZ	896	598	125	4.78		
	64 1.5TL-1.5WLX	677	451	125	3.61		
	65 1.5TL+1.5WLZ	617	412	125	3.29		
8	21 1.5DL+1.5LL	757	505	100	5.05	607	5.05
	22 1.5DL+1.5EQX+0.45EQZ	678	452	125	3.62		
	23 1.5DL+1.5EQX-0.45EQZ	607	405	125	3.24		
	24 1.5DL-1.5EQX+0.45EQZ	907	605	125	4.84		
	25 1.5DL-1.5EQX-0.45EQZ	835	557	125	4.45		
	26 1.5DL+0.45EQX+1.50EQZ	842	561	125	4.49		
	27 1.5DL-0.45EQX+1.50EQZ	910	607	125	4.86		
	28 1.5DL+0.45EQX-1.50EQZ	603	402	125	3.22		
	29 1.5DL-0.45EQX-1.50EQZ	672	448	125	3.58		
	30 1.2DL+1.2LL+1.2EQX+0.36EQZ	543	452	125	3.62		
	31 1.2DL+1.2LL+1.2EQX-0.36EQZ	485	405	125	3.24		
	32 1.2DL+1.2LL-1.2EQX+0.36EQZ	725	605	125	4.84		
	33 1.2DL+1.2LL-1.2EQX-0.36EQZ	668	557	125	4.45		
	34 1.2DL+1.2LL+0.36EQX+1.20EQZ	673	561	125	4.49		
	35 1.2DL+1.2LL-0.36EQX+1.20EQZ	728	607	125	4.86		
	36 1.2DL+1.2LL+0.36EQX-1.20EQZ	483	402	125	3.22		
	37 1.2DL+1.2LL-0.36EQX-1.20EQZ	538	448	125	3.58		
	62 1.5TL+1.5WLX	644	430	125	3.44		
	63 1.5TL+1.5WLZ	873	582	125	4.66		
	64 1.5TL-1.5WLX	869	580	125	4.64		
	65 1.5TL+1.5WLZ	641	427	125	3.42		
9	21 1.5DL+1.5LL	130	86	100	0.86	130	1.04
	22 1.5DL+1.5EQX+0.45EQZ	195	130	125	1.04		
	23 1.5DL+1.5EQX-0.45EQZ	195	130	125	1.04		
	24 1.5DL-1.5EQX+0.45EQZ	64	43	125	0.34		
	25 1.5DL-1.5EQX-0.45EQZ	64	43	125	0.34		
	26 1.5DL+0.45EQX+1.50EQZ	149	100	125	0.80		
	27 1.5DL-0.45EQX+1.50EQZ	110	73	125	0.59		
	28 1.5DL+0.45EQX-1.50EQZ	149	100	125	0.80		
	29 1.5DL-0.45EQX-1.50EQZ	110	73	125	0.59		
	30 1.2DL+1.2LL+1.2EQX+0.36EQZ	156	130	125	1.04		
	31 1.2DL+1.2LL+1.2EQX-0.36EQZ	156	130	125	1.04		
	32 1.2DL+1.2LL-1.2EQX+0.36EQZ	51	43	125	0.34		
	33 1.2DL+1.2LL-1.2EQX-0.36EQZ	51	43	125	0.34		
	34 1.2DL+1.2LL+0.36EQX+1.20EQZ	119	100	125	0.80		
	35 1.2DL+1.2LL-0.36EQX+1.20EQZ	88	73	125	0.59		
	36 1.2DL+1.2LL+0.36EQX-1.20EQZ	119	100	125	0.80		
	37 1.2DL+1.2LL-0.36EQX-1.20EQZ	88	73	125	0.59		
	62 1.5TL+1.5WLX	195	130	125	1.04		
	63 1.5TL+1.5WLZ	130	86	125	0.69		
	64 1.5TL-1.5WLX	64	43	125	0.34		
	65 1.5TL+1.5WLZ	130	86	125	0.69		

JOB :60,000 LITER ESR						
MAIN BUILDING						
	Column Load	Design load	Required area	b	d	Area
C1	5	307	5.05	2.4	2.4	5.76
	6	614	5.05			
	7	614	5.05			
	8	607	5.05			
c2	9	130	1.04	1.5	1.5	2.25

FOOTING F1

FOOTING DESIGN				
PROJECT : 0.60 Lac Cap ESR			JOB : L16_02	
UNIT : ESR				
FOOTING NO			**F1**	
Concrete grade		Fck	**30**	N/mm2
Steel		Fy	**500**	N/mm2
Clear cover		Cv	**50**	mm
Maximum Bar Dia		Db	**10**	
FOOTING GEOMETRY				
Column length - X dir		Cx	**0.35**	m
Column Width - Z Direction		Cz	**0.35**	m
Pedestal projection		Ppj	**0.05**	m
Footing length - X dir		Fx	**2.4**	m
Footing Width - Z Direction		Fz	**2.4**	m
Edge thickness		Ed	**0.2**	m
Total thicness		Td	**0.60**	m
Loading				
Load Combination		LC	**36**	
Vertical load - Working load		P	**650.0**	Kn
S.B.C		sbc	**100.0**	kn/m2
% increase in SBC		ptsbc	**25.0**	%
OUTPUT				
Area required // el to X axis (i.e @ Z axis) =			499	mm2
Area provided dia **10**	=		785	mm2
spc **100**				
Area required // el to Z axis (i.e @ X axis) =			499	mm2
Area provided dia **10**	=		785	mm2
spc **100**				
Check for Shear				
Actual Shear Stress @ Z direction	=		0.21	N/mm2
permissble Shear Stress @ Z direction	=		0.38	N/mm2
Actual Shear Stress @ X direction	=		0.21	N/mm2
permissble Shear Stress @ X direction	=		0.38	N/mm2
Punching Shear : Actual	=		0.45	N/mm2
: permissble	=		1.37	N/mm2
Calculation				
Calculation footing property				
area of footing		Af	5.76	m2
Modulus of Section - Zxx i.e @ X		Zxx	2.30	m3
Modulus of Section - Zzz i.e @ Z		Zzz	2.30	m3
Self wt of footing				
Footing top dimenstion - X dir		cxp	0.45	m
Footing top dimenstion - Z dir		czp	0.45	m
Flat potion			28.80	kN
Tapered portion			23.48	kN
Total wt		Pfself	52.3	kN
Total P		P	702.3	kN
Calculation Pressure check				
Pressure due to vertical load		Pv	121.92	kN/m2
Alloawable SBC		Asbc	125.00	kN/m2
Total pre at corner 1		Pcor1	121.9	kN/m2

Total pre at corner 2		Pcor2	121.9		kN/m2
Total pre at corner 3		Pcor3	121.9		kN/m2
Total pre at corner 4		Pcor4	121.9		kN/m2
Check for SBC					kN/m2
P/a+ Mx/z		Chka	o.k		mm
P/a- Mx/z		Chkb	o.k		mm
P/a+ Mx/z		Chkc	o.k		mm
P/a- Mx/z		chkd	o.k		mm
	Design				
	Reinforcement Calculation				
Effective depth		De	535.00		mm
		dee	0.54		m
Width		Bx	400.00		mm
		Bz	400.00		mm
Moment at Face of footing in X direction					
Distance of footing from face of column		Disxa	0.975		m
Presure variation/m		Pvaryx	0.0	kN/m2/m	
Presure at face of column		Prefcx	121.9		
Moment at the face of column '					
due to UDL		Mudlx	57.95		kN-m
		Mtrax	0.00		kN-m
Total moment		Tmx	58		kN-m
Total Factored moment		Ftmx	87		kN-m
Ast		Astx	385		mm2
Area of footing					
Flat portion			0.48		m2
Tapered portion			0.52		m2
Total C/S Area			1.00		m2
Min area of steel (0.12 %) (Total rf in footing)			1198		mm2
Min area of steel (0.12 %) / m			499		mm2
Governing reinforcement			499		mm2
Reinforcment provided	dia	10			
	spc	100			
Reinforcement provided			785		mm2
Moment at Face of footing in Z direction					
Distance of footing from face of column		Disza	0.975		
Presure variation/m		Pvaryz	0.0		kn/m2/m
Presure at face of column		Prefcz	121.9		
Moment at the face of column '					
due to UDL		Mudlz	57.95		Kn-m
		Mtraz	0.00		Kn-m
Total moment		Tmz	57.95		Kn-m
Total Factored moment		Ftmz	86.93		Kn-m
Ast		Astz	385		mm2
Area of footing					
Flat potion			0.48		m2
Tapered portion			0.52		m2
Total Area			1.00		m2
Min steel (0.12 %) (Total steel in footing)			1198		mm2
Min area of steel (0.12 %) / m			499		mm2
Governing reinforcement			499		mm2
Reinforcment provided	dia	10			
	spc	100			
Reinforcement provided			785		mm2
	Shear Calculation				
	One way Shear				

Shear about Z direction :				
Shear to be check at distance Deff from the face of the column				
Distance of shear section from face of footing		disvx	0.440	m
Pressure at that distance		Prefcvx	122	kN/m
Shear at a distance		Vxs	128.8	kn
Top width of footing at a distance		Wvb	1.52	m
Effective depth at a distance				
Depth of tapered portion		tapered	0.40	m
Depth at distance		TDvx	0.181	m
Total depth at Section		Devx	0.381	m
Aera to resist the shear				
arae of flat portion		Ax1	0.34	m2
area of taperd portion		Ax2	0.35	m2
		Arvx	0.69	m2
Angle tanbx			22.31	theta
		tanbx	0.410	
Moment at a distance	due to rect. Portion		28.33	kn-m
	due to tri.. Portion		0.00	kn-m
		momvx	28.33	kn-m
Shear reduction		vxsrd	30.5	kn
Net shear		Vnetxs	98.2	kn
Facored Shear at a distance		FVxs	147.3	kn
actual Shear Stress			0.21	N/mm2
Shear Capacity				
Actual Renforcment provided /m			785	mm2
Total area of reinforcment			1885	mm2
Area of concrete to resist shear			0.69	m2
% Pt			0.27	%
% pt for Shear check			0.27	
=0.8*Fck/(6.89*pt)		Beta	12.75	
		Vucx	0.38	N/mm2
=0.85*(0.8*Fck)^0.5*((1+5*beta)^0.5-1) /(6*beta)				
One way Shear				
Shear about X direction :				
Shear to be check at distance Deff from the face of the column				
Distance of shear section from face of footing		disvz	0.440	m
Pressure at that distance		Prefcvz	121.9	kN/m
Shear at a distance		Vzs	128.75	kn
Top width of footing at a distance		Wvd	1.52	m
Effective depth at a distance				
Depth of tapered portion		tapered	0.40	m
Depth at at distance		TDvz	0.181	m
		Devz	0.381	m
Aera to resist the shear				
arae of flat portion			0.34	m2
area of taperd portion			0.35	m2
		Arvz	0.69	m2
Angle tanbx			22.31	theta
		tanbz	0.41	
Moment at a distance			28.33	kn-m
			0.00	kn-m
		momvz	28.33	kn-m
Shear reduction		vzsrd	30.54	kn
Net shear		Vnetzs	98.21	kn
Facored Shear at a distance		FVzs	147.32	kn
Shear Stress			0.21	N/m2

Shear Capacity				
Actual Renforcment provided /m			785	mm2
Total area of reinforcment			1885	
Area of concrete to resist shear			0.69	m2
% Pt			0.27	%
% pt for Shear check			0.27	
=0.8*Fck/(6.89*pt)		Beta	12.75	
=0.85*(0.8*Fck)^0.5*((1+5*beta)^0.5-1)	/(6*beta)	Vucx	0.38	N/mm2
		Two way Shear		
Two way Shear at a distace de/2				
effective twoway shear				
legth of shear plane		Spx	0.99	m
width of shear plane		Spz	0.99	m
Area of twoway shear	A3	areatws	4.79	m
Shear in X - direction		vtwayx	584	kN
Shear in Z - direction		vtwayz	584	kN
Maximum shear		vtwaym	584	kN
Factored shear			876	kN
arae to resist shear				
Peridery			3.94	m2
Depth // el to Fz			0.490	m
Depth // el to Fx			0.490	m
Area to resist //el to Fz			0.966	m2
Area to resist //el to Fx			0.966	m2
Total area			1.932	m2
Actual shear Stress due to punching			0.45	m2
Permisible stress for M30		tcperm	1.37	m2
Check		Ok		

FOOTING F2

FOOTING DESIGN			
PROJECT : 0.6 Lac Cap ESR		JOB : P16-02	
UNIT : ESR			
FOOTING NO		**F2**	
Concrete grade	Fck	**30**	N/mm2
Steel	Fy	**500**	N/mm2
Clear cover	Cv	**50**	mm
Maximum Bar Dia	Db	**10**	
FOOTING GEOMETRY			
Column length - X dir	Cx	**0.25**	m
Column Width - Z Direction	Cz	**0.25**	m
Pedestal projection	Ppj	**0.05**	m
Footing length - X dir	Fx	**1.5**	m
Footing Width - Z Direction	Fz	**1.5**	m
Edge thickness	Ed	**0.15**	m
Total thicness	Td	**0.45**	m
Loading			
Load Combination	LC	**36**	
Vertical load - Working load	P	**150.0**	Kn
S.B.C	sbc	**100.0**	kn/m2
% increase in SBC	ptsbc	**25.0**	%
OUTPUT			
Area required // el to X axis (i.e @ Z axis) =		386	mm2
Area provided dia **10** spc **125**	=	628	mm2
Area required // el to Z axis (i.e @ X axis) =		386	mm2
Area provided dia **10** spc **125**	=	628	mm2
Check for Shear			
Actual Shear Stress @ Z direction	=	0.10	N/mm2
permissble Shear Stress @ Z direction	=	0.43	N/mm2
Actual Shear Stress @ X direction	=	0.10	N/mm2
permissble Shear Stress @ X direction	=	0.43	N/mm2
Punching Shear : Actual	=	0.18	N/mm2
: permissble	=	1.37	N/mm2
Calculation			
Calculation footing property			
area of footing	Af	2.25	m2
Modulus of Section - Zxx i.e @ X	Zxx	0.56	m3
Modulus of Section - Zzz i.e @ Z	Zzz	0.56	m3
Self wt of footing			
Footing top dimenstion - X dir	cxp	0.35	m
Footing top dimenstion - Z dir	czp	0.35	m
Flat potion		8.44	kN
Tapered portion		7.24	kN
Total wt	Pfself	15.7	kN
Total P	P	165.7	kN
Calculation Pressure check			
Pressure due to vertical load	Pv	73.64	kN/m2
Alloawable SBC	Asbc	125.00	kN/m2
Total pre at corner 1	Pcor1	73.6	kN/m2

Total pre at corner 2		Pcor2	73.6		kN/m2
Total pre at corner 3		Pcor3	73.6		kN/m2
Total pre at corner 4		Pcor4	73.6		kN/m2
Check for SBC					kN/m2
P/a+ Mx/z		Chka	o.k		mm
P/a- Mx/z		Chkb	o.k		mm
P/a+ Mx/z		Chkc	o.k		mm
P/a- Mx/z		chkd	o.k		mm
	Design				
	Reinforcement Calculation				
Effective depth		De	385.00		mm
		dee	0.39		m
Width		Bx	300.00		mm
		Bz	300.00		mm
Moment at Face of footing in X direction					
Distance of footing from face of column		Disxa	0.575		m
Presure variation/m		Pvaryx	0.0	kN/m2/m	
Presure at face of column		Prefcx	73.6		
Moment at the face of column '					
due to UDL		Mudlx	12.17		kN-m
		Mtrax	0.00		kN-m
Total moment		Tmx	12		kN-m
Total Factored moment		Ftmx	18		kN-m
Ast		Astx	111		mm2
Area of footing					
Flat portion			0.23		m2
Tapered portion			0.26		m2
Total C/S Area			0.48		m2
Min area of steel (0.12 %) (Total rf in footing)			579		mm2
Min area of steel (0.12 %) / m			386		mm2
Governing reinforcement			386		mm2
Reinforcment provided	dia	10			
	spc	125			
Reinforcement provided			628		mm2
Moment at Face of footing in Z direction					
Distance of footing from face of column		Disza	0.575		
Presure variation/m		Pvaryz	0.0		kn/m2/m
Presure at face of column		Prefcz	73.6		
Moment at the face of column '					
due to UDL		Mudlz	12.17		Kn-m
		Mtraz	0.00		Kn-m
Total moment		Tmz	12.17		Kn-m
Total Factored moment		Ftmz	18.26		Kn-m
Ast		Astz	111		mm2
Area of footing					
Flat potion			0.23		m2
Tapered portion			0.26		m2
Total Area			0.48		m2
Min steel (0.12 %) (Total steel in footing)			579		mm2
Min area of steel (0.12 %) / m			386		mm2
Governing reinforcement			386		mm2
Reinforcment provided	dia	10			
	spc	125			
Reinforcement provided			628		mm2
	Shear Calculation				
	One way Shear				

Shear about Z direction :				
Shear to be check at distance Deff from the face of the column				
Distance of shear section from face of footing		disvx	0.190	m
Pressure at that distance		Prefcvx	74	kN/m
Shear at a distance		Vxs	21.0	kn
Top width of footing at a distance		Wvb	1.12	m
Effective depth at a distance				
Depth of tapered portion		tapered	0.30	m
Depth at distance		TDvx	0.099	m
Total depth at Section		Devx	0.249	m
Aera to resist the shear				
arae of flat portion		Ax1	0.14	m2
area of taperd portion		Ax2	0.13	m2
		Arvx	0.26	m2
Angle tanbx			27.55	theta
		tanbx	0.522	
Moment at a distance	due to rect. Portion		1.99	kn-m
	due to tri.. Portion		0.00	kn-m
		momvx	1.99	kn-m
Shear reduction		vxsrd	4.2	kn
Net shear		Vnetxs	16.8	kn
Facored Shear at a distance		FVxs	25.2	kn
actual Shear Stress			0.10	N/mm2
Shear Capacity				
Actual Renforcment provided /m			628	mm2
Total area of reinforcment			942	mm2
Area of concrete to resist shear			0.26	m2
% Pt			0.36	%
% pt for Shear check			0.36	
=0.8*Fck/(6.89*pt)		Beta	9.79	
		Vucx	0.43	N/mm2
=0.85*(0.8*Fck)^0.5*((1+5*beta)^0.5-1) /(6*beta)				
One way Shear				
Shear about X direction :				
Shear to be check at distance Deff from the face of the column				
Distance of shear section from face of footing		disvz	0.190	m
Pressure at that distance		Prefcvz	73.6	kN/m
Shear at a distance		Vzs	20.99	kn
Top width of footing at a distance		Wvd	1.12	m
Effective depth at a distance				
Depth of tapered portion		tapered	0.30	m
Depth at at distance		TDvz	0.099	m
		Devz	0.249	m
Aera to resist the shear				
arae of flat portion			0.14	m2
area of taperd portion			0.13	m2
		Arvz	0.26	m2
Angle tanbx			27.55	theta
		tanbz	0.52	
Moment at a distance			1.99	kn-m
			0.00	kn-m
		momvz	1.99	kn-m
Shear reduction		vzsrd	4.18	kn
Net shear		Vnetzs	16.81	kn
Facored Shear at a distance		FVzs	25.22	kn
Shear Stress			0.10	N/m2

Shear Capacity				
Actual Renforcment provided /m			628	mm2
Total area of reinforcment			942	
Area of concrete to resist shear			0.26	m2
% Pt			0.36	%
% pt for Shear check			0.36	
=0.8*Fck/(6.89*pt)		Beta	9.79	
=0.85*(0.8*Fck)^0.5*((1+5*beta)^0.5-1)	/(6*beta)	Vucx	0.43	N/mm2
		Two way Shear		
Two way Shear at a distace de/2				
effective twoway shear				
legth of shear plane		Spx	0.74	m
width of shear plane		Spz	0.74	m
Area of twoway shear	A3	areatws	1.71	m
Shear in X - direction		vtwayx	126	kN
Shear in Z - direction		vtwayz	126	kN
Maximum shear		vtwaym	126	kN
Factored shear			189	kN
arae to resist shear				
Peridery			2.94	m2
Depth // el to Fz			0.350	m
Depth // el to Fx			0.350	m
Area to resist //el to Fz			0.514	m2
Area to resist //el to Fx			0.514	m2
Total area			1.028	m2
Actual shear Stress due to punching			0.18	m2
Permisible stress for M30		tcperm	1.37	m2
Check		Ok		

COLUMN DESIGN: -

COLUMN C1

```
================================================================================

C O L U M N   N O.    606  D E S I G N   R E S U L T S

M30                     FE415 (MAIN)                FE415 (SEC.)

LENGTH:  3000.0 MM   CROSS SECTION:  350.0 MM X  350.0 MM  COVER: 40.0 MM

** GUIDING LOAD CASE:    67 END JOINT:      2  SHORT COLUMN
REQD. STEEL AREA   :       914.11 SQ.MM.
REQD. CONCRETE AREA:    121585.89 SQ.MM.
MAIN REINFORCEMENT : PROVIDE   4 - 20 DIA. (1.03%,   1256.64 SQ.MM.)
(EQUALLY DISTRIBUTED)
TIE REINFORCEMENT  : PROVIDE  8 MM DIA. RECTANGULAR TIES @ 300 MM C/C
SECTION CAPACITY BASED ON REINFORCEMENT REQUIRED (KNS-MET)
----------------------------------------------------------
PUZ :   1925.93   MUZ1 :     82.67   MUY1 :     82.67
INTERACTION RATIO: 1.00 (AS PER CL. 39.6, IS456:2000)
SECTION CAPACITY BASED ON REINFORCEMENT PROVIDED (KNS-MET)
----------------------------------------------------------
WORST LOAD CASE:    67
END JOINT:     2 PUZ :   2027.91   MUZ :    102.21   MUY :    102.21   IR: 0.81
================================================================================
================================================================================
C O L U M N   N O.    607  D E S I G N   R E S U L T S
M30                     FE415 (MAIN)                FE415 (SEC.)

LENGTH:  3000.0 MM   CROSS SECTION:  350.0 MM X  350.0 MM  COVER: 40.0 MM

** GUIDING LOAD CASE:    28 END JOINT:      2  SHORT COLUMN
REQD. STEEL AREA   :       496.90 SQ.MM.
REQD. CONCRETE AREA:    122003.10 SQ.MM.
MAIN REINFORCEMENT : PROVIDE   4 - 20 DIA. (1.03%,   1256.64 SQ.MM.)
(EQUALLY DISTRIBUTED)
TIE REINFORCEMENT  : PROVIDE  8 MM DIA. RECTANGULAR TIES @ 300 MM C/C

SECTION CAPACITY BASED ON REINFORCEMENT REQUIRED (KNS-MET)
----------------------------------------------------------
PUZ :   1801.70   MUZ1 :     83.51   MUY1 :     83.51
INTERACTION RATIO: 0.29 (AS PER CL. 39.6, IS456:2000)
SECTION CAPACITY BASED ON REINFORCEMENT PROVIDED (KNS-MET)
----------------------------------------------------------
WORST LOAD CASE:    66
END JOINT:   102 PUZ :   2027.91   MUZ :    114.29   MUY :    114.29   IR: 0.42
================================================================================
================================================================================

C O L U M N   N O.    608  D E S I G N   R E S U L T S

M30                     FE415 (MAIN)                FE415 (SEC.)

LENGTH:  3000.0 MM   CROSS SECTION:  350.0 MM X  350.0 MM  COVER: 40.0 MM

** GUIDING LOAD CASE:    28 END JOINT:    102  SHORT COLUMN
```

```
REQD. STEEL AREA    :       458.29 SQ.MM.
REQD. CONCRETE AREA:    122041.71 SQ.MM.
MAIN REINFORCEMENT : PROVIDE   4 - 20 DIA. (1.03%,   1256.64 SQ.MM.)
(EQUALLY DISTRIBUTED)
TIE REINFORCEMENT  : PROVIDE  8 MM DIA. RECTANGULAR TIES @ 300 MM C/C

SECTION CAPACITY BASED ON REINFORCEMENT REQUIRED (KNS-MET)
-----------------------------------------------------------
PUZ :   1790.21   MUZ1 :     83.25   MUY1 :     83.25
INTERACTION RATIO: 0.30 (AS PER CL. 39.6, IS456:2000)
SECTION CAPACITY BASED ON REINFORCEMENT PROVIDED (KNS-MET)
-----------------------------------------------------------
WORST LOAD CASE:    66
END JOINT:   106 PUZ :   2027.91   MUZ :    110.66   MUY :    110.66   IR: 0.37
================================================================================
================================================================================
C O L U M N   N O.    609  D E S I G N   R E S U L T S
M30                    FE415 (MAIN)               FE415 (SEC.)
LENGTH:  3000.0 MM   CROSS SECTION:  350.0 MM X  350.0 MM  COVER: 40.0 MM
** GUIDING LOAD CASE:   28 END JOINT:   106  SHORT COLUMN
REQD. STEEL AREA    :       421.53 SQ.MM.
REQD. CONCRETE AREA:    122078.47 SQ.MM.
MAIN REINFORCEMENT : PROVIDE   4 - 20 DIA. (1.03%,   1256.64 SQ.MM.)
(EQUALLY DISTRIBUTED)
TIE REINFORCEMENT  : PROVIDE  8 MM DIA. RECTANGULAR TIES @ 300 MM C/C

SECTION CAPACITY BASED ON REINFORCEMENT REQUIRED (KNS-MET)
-----------------------------------------------------------
PUZ :   1779.26   MUZ1 :     81.85   MUY1 :     81.85
INTERACTION RATIO: 0.30 (AS PER CL. 39.6, IS456:2000)
SECTION CAPACITY BASED ON REINFORCEMENT PROVIDED (KNS-MET)
-----------------------------------------------------------
WORST LOAD CASE:    38
END JOINT:  1003 PUZ :   2027.91   MUZ :    107.85   MUY :    107.85   IR: 0.39
================================================================================
================================================================================
C O L U M N   N O.    610  D E S I G N   R E S U L T S

M30                    FE415 (MAIN)               FE415 (SEC.)
LENGTH:  3000.0 MM   CROSS SECTION:  350.0 MM X  350.0 MM  COVER: 40.0 MM
** GUIDING LOAD CASE:   28 END JOINT:  1003  SHORT COLUMN
REQD. STEEL AREA    :       388.28 SQ.MM.
REQD. CONCRETE AREA:    122111.72 SQ.MM.
MAIN REINFORCEMENT : PROVIDE   4 - 20 DIA. (1.03%,   1256.64 SQ.MM.)
(EQUALLY DISTRIBUTED)
TIE REINFORCEMENT  : PROVIDE  8 MM DIA. RECTANGULAR TIES @ 300 MM C/C

SECTION CAPACITY BASED ON REINFORCEMENT REQUIRED (KNS-MET)
-----------------------------------------------------------
PUZ :   1769.36   MUZ1 :     79.88   MUY1 :     79.88

INTERACTION RATIO: 0.28 (AS PER CL. 39.6, IS456:2000)
SECTION CAPACITY BASED ON REINFORCEMENT PROVIDED (KNS-MET)
-----------------------------------------------------------
WORST LOAD CASE:    39
END JOINT:   302 PUZ :   2027.91   MUZ :    106.71   MUY :    106.71   IR: 0.46
================================================================================
```

COLUMN C2

```
==========================================================================
C O L U M N   N O.    701  D E S I G N   R E S U L T S

M30                      Fe415 (Main)               Fe415 (Sec.)
LENGTH:  3000.0 mm   CROSS SECTION:  250.0 mm dia.  COVER: 40.0 mm
** GUIDING LOAD CASE:    67 BRACED LONG COLUMN
REQD. STEEL AREA   :       413.43 Sq.mm.
REQD. CONCRETE AREA:     48673.96 Sq.mm.
MAIN REINFORCEMENT : Provide   6 - 20 dia. (3.84%,   1884.96 Sq.mm.)
(Equally distributed)
TIE REINFORCEMENT  : Provide  8 mm dia. circular ties @ 250 mm c/c

SECTION CAPACITY BASED ON REINFORCEMENT REQUIRED (KNS-MET)
-----------------------------------------------------------
Puz :    785.78   Muz1 :     18.74   Muy1 :     18.74

INTERACTION RATIO: 1.00 (as per Cl. 39.6, IS456:2000)

SECTION CAPACITY BASED ON REINFORCEMENT PROVIDED (KNS-MET)
-----------------------------------------------------------
WORST LOAD CASE:    62
Puz :   1223.93   Muz :     39.88   Muy :     40.98   IR: 0.55
==========================================================================
==========================================================================

C O L U M N   N O.    702  D E S I G N   R E S U L T S

M30                      Fe415 (Main)               Fe415 (Sec.)

LENGTH:  3000.0 mm   CROSS SECTION:  250.0 mm dia.  COVER: 40.0 mm

** GUIDING LOAD CASE:    40 END JOINT:  1014  SHORT COLUMN
REQD. STEEL AREA   :       169.62 Sq.mm.
REQD. CONCRETE AREA:     48917.77 Sq.mm.
MAIN REINFORCEMENT : Provide   6 - 20 dia. (3.84%,   1884.96 Sq.mm.)
(Equally distributed)
TIE REINFORCEMENT  : Provide  8 mm dia. circular ties @ 250 mm c/c

SECTION CAPACITY BASED ON REINFORCEMENT REQUIRED (KNS-MET)
-----------------------------------------------------------
Puz :    713.18   Muz1 :      7.59   Muy1 :      7.59

INTERACTION RATIO: 0.97 (as per Cl. 39.6, IS456:2000)
SECTION CAPACITY BASED ON REINFORCEMENT PROVIDED (KNS-MET)
-----------------------------------------------------------
WORST LOAD CASE:    62
END JOINT:  1014 Puz :   1223.93   Muz :     40.05   Muy :     40.53   IR: 0.71
==========================================================================
==========================================================================
C O L U M N   N O.    703  D E S I G N   R E S U L T S

M30                      Fe415 (Main)               Fe415 (Sec.)

LENGTH:  3000.0 mm   CROSS SECTION:  250.0 mm dia.  COVER: 40.0 mm

** GUIDING LOAD CASE:    42 END JOINT:  1015  SHORT COLUMN
REQD. STEEL AREA   :       146.08 Sq.mm.
```

```
REQD. CONCRETE AREA:    48941.30 Sq.mm.
MAIN REINFORCEMENT : Provide   6 - 20 dia. (3.84%,   1884.96 Sq.mm.)
(Equally distributed)
TIE REINFORCEMENT  : Provide  8 mm dia. circular ties @ 250 mm c/c
SECTION CAPACITY BASED ON REINFORCEMENT REQUIRED (KNS-MET)
-----------------------------------------------------------
Puz :    706.18   Muz1 :     10.48   Muy1 :     10.48
INTERACTION RATIO: 0.99 (as per Cl. 39.6, IS456:2000)
SECTION CAPACITY BASED ON REINFORCEMENT PROVIDED (KNS-MET)
-----------------------------------------------------------
WORST LOAD CASE:    22
END JOINT:  1015 Puz :   1223.93   Muz :     40.14   Muy :     40.19   IR: 0.68
================================================================================
================================================================================
C O L U M N   N O.    704  D E S I G N   R E S U L T S
M30                    Fe415 (Main)              Fe415 (Sec.)
LENGTH:  3000.0 mm   CROSS SECTION:  250.0 mm dia.  COVER: 40.0 mm
** GUIDING LOAD CASE:   22 BRACED LONG COLUMN
REQD. STEEL AREA   :      259.72 Sq.mm.
REQD. CONCRETE AREA:    48827.66 Sq.mm.
MAIN REINFORCEMENT : Provide   6 - 20 dia. (3.84%,   1884.96 Sq.mm.)
(Equally distributed)
TIE REINFORCEMENT  : Provide  8 mm dia. circular ties @ 250 mm c/c

SECTION CAPACITY BASED ON REINFORCEMENT REQUIRED (KNS-MET)
-----------------------------------------------------------
Puz :    740.01   Muz1 :     14.85   Muy1 :     14.85
INTERACTION RATIO: 0.99 (as per Cl. 39.6, IS456:2000)
SECTION CAPACITY BASED ON REINFORCEMENT PROVIDED (KNS-MET)
-----------------------------------------------------------
WORST LOAD CASE:    22
Puz :   1223.93   Muz :     40.11   Muy :     39.74   IR: 0.37
================================================================================
================================================================================
C O L U M N   N O.    705  D E S I G N   R E S U L T S
M30                    Fe415 (Main)              Fe415 (Sec.)
LENGTH:  3000.0 mm   CROSS SECTION:  250.0 mm dia.  COVER: 40.0 mm
** GUIDING LOAD CASE:   22 END JOINT:  1017  SHORT COLUMN
REQD. STEEL AREA   :      494.30 Sq.mm.
REQD. CONCRETE AREA:    48593.08 Sq.mm.
MAIN REINFORCEMENT : Provide   6 - 20 dia. (3.84%,   1884.96 Sq.mm.)
(Equally distributed)
TIE REINFORCEMENT  : Provide  8 mm dia. circular ties @ 250 mm c/c

SECTION CAPACITY BASED ON REINFORCEMENT REQUIRED (KNS-MET)
-----------------------------------------------------------
Puz :    809.86   Muz1 :     17.48   Muy1 :     17.48

INTERACTION RATIO: 1.00 (as per Cl. 39.6, IS456:2000)

SECTION CAPACITY BASED ON REINFORCEMENT PROVIDED (KNS-MET)
-----------------------------------------------------------
WORST LOAD CASE:    22
END JOINT:  1017 Puz :   1223.93   Muz :     39.90   Muy :     38.83   IR: 0.56
================================================================================
```

BEAM DESIGN: -

Beam No	Staad No	l * b * d in mm	Reinforcement in mm2 Top/Bottom					Stirrups Dia * spacing * leggs				
PB1	101	4350										
		300	811	349	0	322	771	8 - 165	8 - 165	8 - 165	8 - 165	8 - 165
		450	699	286	255	371	689	2	2	2	2	2
PB1	102	4350										
		300	815	353	0	322	773	8 - 165	8 - 165	8 - 165	8 - 165	8 - 165
		450	702	388	255	371	691	2	2	2	2	2
PB1	103	4350										
		300	804	277	0	339	803	8 - 165	8 - 165	8 - 165	8 - 165	8 - 165
		450	707	382	255	382	707	2	2	2	2	2
PB1	104	4350										
		300	755	323	0	322	754	8 - 165	8 - 165	8 - 165	8 - 165	8 - 165
		450	661	367	255	366	660	2	2	2	2	2
PB2	105	2955										
		230	241	125	0	125	233	8 - 110	8 - 110	8 - 110	8 - 110	8 - 110
		300	231	142	125	125	181	2	2	2	2	2
PB2	106	2955										
		230	240	125	0	125	235	8 - 110	8 - 110	8 - 110	8 - 110	8 - 110
		300	230	142	125	125	181	2	2	2	2	2
TB1	201	4350										
		230	477	202	0	196	440	8 - 145	8 - 145	8 - 145	8 - 145	8 - 145
		450	369	213	196	217	387	2	2	2	2	2
TB1	202	4350										
		230	476	202	0	196	439	8 - 145	8 - 145	8 - 145	8 - 145	8 - 145
		450	368	212	196	216	386	2	2	2	2	2
TB1	203	4350										
		230	480	202	0	202	480	8 - 145	8 - 145	8 - 145	8 - 145	8 - 145
		450	397	223	196	223	397	2	2	2	2	2
TB1	204	4350										
		230	426	196	0	196	426	8 - 145	8 - 145	8 - 145	8 - 145	8 - 145
		450	343	196	196	200	343	2	2	2	2	2
TB2	205	2955										
		230	159	125	0	125	213	8 - 110	8 - 110	8 - 110	8 - 110	8 - 110
		300	208	129	125	125	125	2	2	2	2	2
TB2	206	2955										
		230	159	125	0	125	213	8 - 110	8 - 110	8 - 110	8 - 110	8 - 110
		300	208	129	125	125	125	2	2	2	2	2
TB101	301	4350										
		230	418	196	0	196	353	8 - 145	8 - 145	8 - 145	8 - 145	8 - 145
		450	313	196	196	196	340	2	2	2	2	2
TB101	302	4350										
		230	418	196	0	196	353	8 - 145	8 - 145	8 - 145	8 - 145	8 - 145
		450	313	196	196	196	340	2	2	2	2	2
TB101	303	4350										
		230	427	196	0	196	427	8 - 145	8 - 145	8 - 145	8 - 145	8 - 145
		450	365	203	196	203	365	2	2	2	2	2
TB101	304	4350										
		230	350	196	0	196	350	8 - 145	8 - 145	8 - 145	8 - 145	8 - 145
		450	285	196	196	196	285	2	2	2	2	2
TB102	305	2955										
		230	130	125	0	125	231	8 - 110	8 - 110	8 - 110	8 - 110	8 - 110
		300	234	145	125	125	125	2	2	2	2	2
TB102	306	2955										
		230	130	125	0	125	231	8 - 110	8 - 110	8 - 110	8 - 110	8 - 110
		300	234	145	125	125	125	2	2	2	2	2
TB101	401	4350										
		230	395	196	0	196	311	8 - 145	8 - 145	8 - 145	8 - 145	8 - 145
		450	272	196	196	196	311	2	2	2	2	2

TB101	**402**	4350										
		230	395	196	0	196	311	8 - 145	8 - 145	8 - 145	8 - 145	8 - 145
		450	272	196	196	196	311	2	2	2	2	2
TB101	**403**	4350										
		230	388	196	0	196	388	8 - 145	8 - 145	8 - 145	8 - 145	8 - 145
		450	320	196	196	196	320	2	2	2	2	2
TB101	**404**	4350										
		230	330	196	0	196	330	8 - 145	8 - 145	8 - 145	8 - 145	8 - 145
		450	251	196	196	196	251	2	2	2	2	2
TB102	**405**	2955										
		230	125	125	0	125	250	8 - 110	8 - 110	8 - 110	8 - 110	8 - 110
		300	252	155	125	125	125	2	2	2	2	2
TB102	**406**	2955										
		230	125	125	0	125	250	8 - 110	8 - 110	8 - 110	8 - 110	8 - 110
		300	252	155	125	125	125	2	2	2	2	2
B1	**501**	2175										
		300	378	0	0	0	0	8 - 215	8 - 215	8 - 215	8 - 215	8 - 215
		650	0	378	401	537	560	2	2	2	2	2
B1	**502**	2175										
		300	0	0	0	0	378	8 - 215	8 - 215	8 - 215	8 - 215	8 - 215
		650	559	537	400	378	0	2	2	2	2	2
B1	**503**	2175										
		300	378	0	0	0	0	8 - 215	8 - 215	8 - 215	8 - 215	8 - 215
		650	0	378	402	538	560	2	2	2	2	2
B1	**504**	2175										
		300	0	0	0	0	378	8 - 215	8 - 215	8 - 215	8 - 215	8 - 215
		650	560	538	402	378	0	2	2	2	2	2
B2	**529**	2955										
		230	125	0	0	125	190	8 - 110	8 - 110	8 - 110	8 - 110	8 - 110
		300	125	136	139	125	0	2	2	2	2	2
B2	**530**	2955										
		230	125	0	0	125	190	8 - 110	8 - 110	8 - 110	8 - 110	8 - 110
		300	125	136	139	125	0	2	2	2	2	2

Tank Beam design: -

JOB : L16-02
Beam Design
Botttom slab of back wash tank

Concrete grade	Fck	**30**
Steel	Fy	**500**
Clear cover	Cv	**45**
Density of concrete	Wd	**25**
Width	B	**1000**
Max.Dia. of Bar	Db	**32**
Permissble stress in Steel	fyucb	**130**
per. stress in con. for direct comp	fckc	8
per. stress in con in com.due to bending	fckbc	10
per. stress in con. for direct tension	fckt	1.5
per. stress in con. In ten due to bending	fcktb	2
Modular ratio	m	9.333333
	k	0.41791
	j	0.860697

		beam width	beam depth	effective depth		Moment	Per. Stress	Ast req
		mm	mm	mm		kN-m	N/mm2	mm2
1	B1	300	650	589	Sup - top	50.00	130	758.7
					mid	80.00	130	1213.9
					Sup - top	50.00	130	758.7

TWO WAY SLAB DESIGN

PROJECT : ADILABAD | JOB : P16-02

UNIT: 60 KL OHBR

LEVEL : BOTTTOM SLAB

GENERAL DATA

Concrete grade	Fck	**30**	N/mm2
Steel	Fy	**500**	N/mm2
Clear cover	Cv	**45**	mm
Density of concrete	Wd	**25**	Kn/m3
Width	B	**1000**	mm
Max.Dia. of Bar	Db	**12**	mm
Permissble stress in Steel	fyucb	**130**	N/mm2
per. stress in con. for direct comp	fckc	8	N/mm2
per. stress in con in com.due to bending	fckbc	10	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	N/mm2
Modular ratio	m	9.333	
	k	0.418	
	j	0.861	

Slab Data

Slab No			S1	S2	S3	S4	S5	S6	S7	S8
shorter span	Lx	m	**2.175**							
longer span	Ly	m	**2.175**							
Slab type	St		**4**							
Depth	D	mm	**200**							

Loading

Live load	Ll	kN/m2	**0.75**							
Finishing load	Fl	kN/m2	**0.5**							
Sunk load	Sl	kN/m2								
Other Load	Ol	kN/m2	**39.2**							

CALCULATION

Calculation of loading

Self wt (Dead load)	Dl	Kn/m2	5
Total Load	Tl	Kn/m2	45.45
Effective depth	De	mm	149

Calcultation of Two slab coefficient

Ratio Ly/lx	Rat	1.00
Short span		
Negative mom. At continuous edge	Axs	0.047
Positive momenet at mid span	Axm	0.035
Long span		
Negative mom. At continuous edge	Ays	0.047
Positive momenet at mid span	Aym	0.035

Moment - Factored

Short span		
Neg. mom. At contin. edge	kN-m	10.11
Positive momenet at mid span	kN-m	7.53
Long span		
Neg. mom. At cont.edge	kN-m	10.11
Positive momenet at mid span	kN-m	7.53

Reinforcement Required

Short span		
Neg. mom. At contin. edge	mm2	606

Positive momenet at mid span		mm2	451
Long span			
Neg. mom. At cont.edge		mm2	606
Positive momenet at mid span		mm2	451
Reinforcement provided			
Short span			
Neg. mom. At contin. edge		mm2	628
Positive momenet at mid span		mm2	628
Long span			
Neg. mom. At cont.edge		mm2	628
Positive momenet at mid span		mm2	628
Check for Shear			
Shear at support	Vus	Kn	49.43
Actual Shear stress	Vuact	N/mm2	0.33
Ast provide	Astsh	mm2	628
% Ast	pt	%	0.42
beta			8.26
permissible shear for pt			0.46
k value corrosponds to slab thk			1.20
permissible shear for pt			0.55
Check for Deflection			
basic span /deph ratio	bsd		26
fs	fs		208.3
% steel provided	pt		0.42
Moification factor	mf		1.517
permissible span/ depth ratio	psd		39.43
actual span /depth ratio	sdr		14.6
Deflecttion Check			OK

TWO WAY SLAB DESIGN															
PROJECT : 30MLD WTP AT ASIFABAD									JOB : P16-02						
UNIT:															
LEVEL :															
REINFORCEMENT DATA															
	-ve At cont edge short span					+ve momenet At mid short span					-ve At cont edge long span					+ve momenet At mid long span				
S1 ASTR	606					451					606					451				
bar	10	250	10	250		10	125				10	250	10	250		10	125			
ASTR	628					628					628					628				

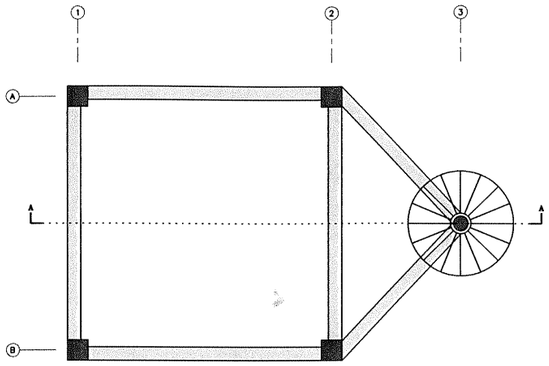
"Designs Vetted"

M/s. L. A. ASSOCIATES Hyd-08.

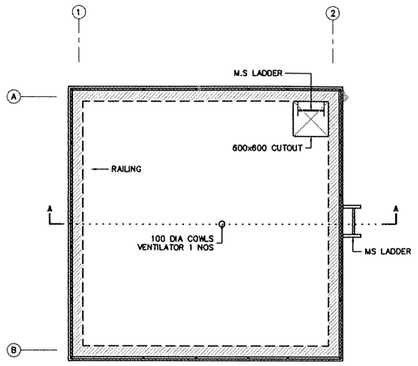
Asst. Executive Engineer
TDWSP Asifabad

Dy. Executive Engineer
TDWSP Asifabad

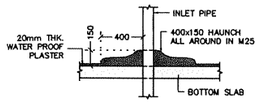
Executive Engineer
TDWSP Asifabad



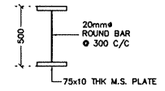
TIE LEVEL PLAN (+6.00 mt LVL)



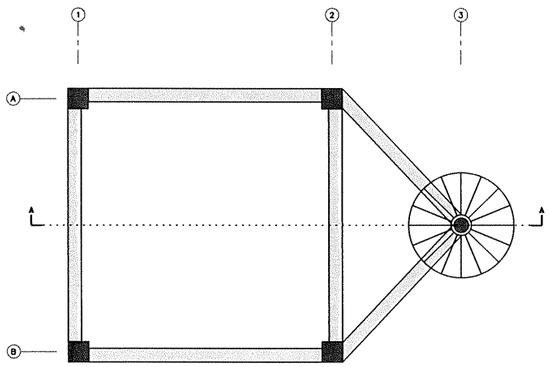
WATER TANK TOP PLAN LEVEL



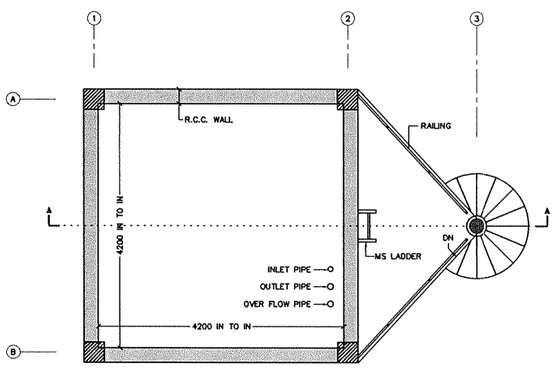
TYPICAL DETAIL FOR INLET PIPE



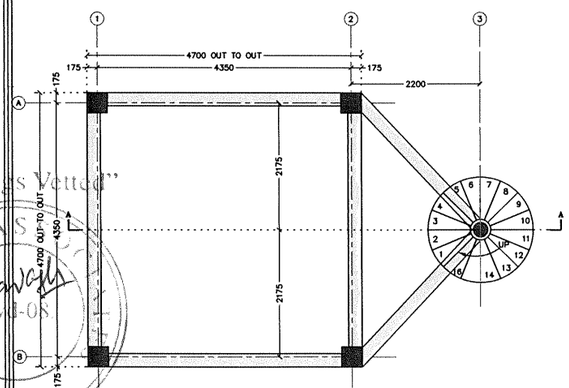
M.S. LADDER DETAIL'S



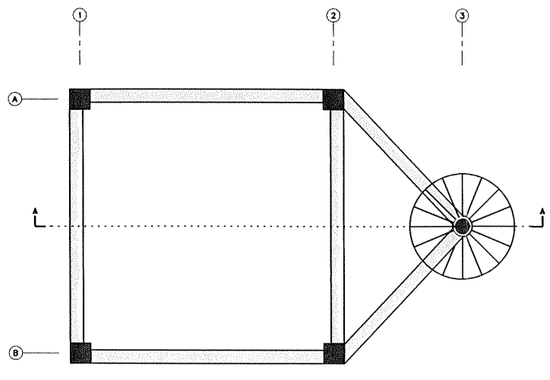
TIE LEVEL PLAN (+3.00 mt LVL)



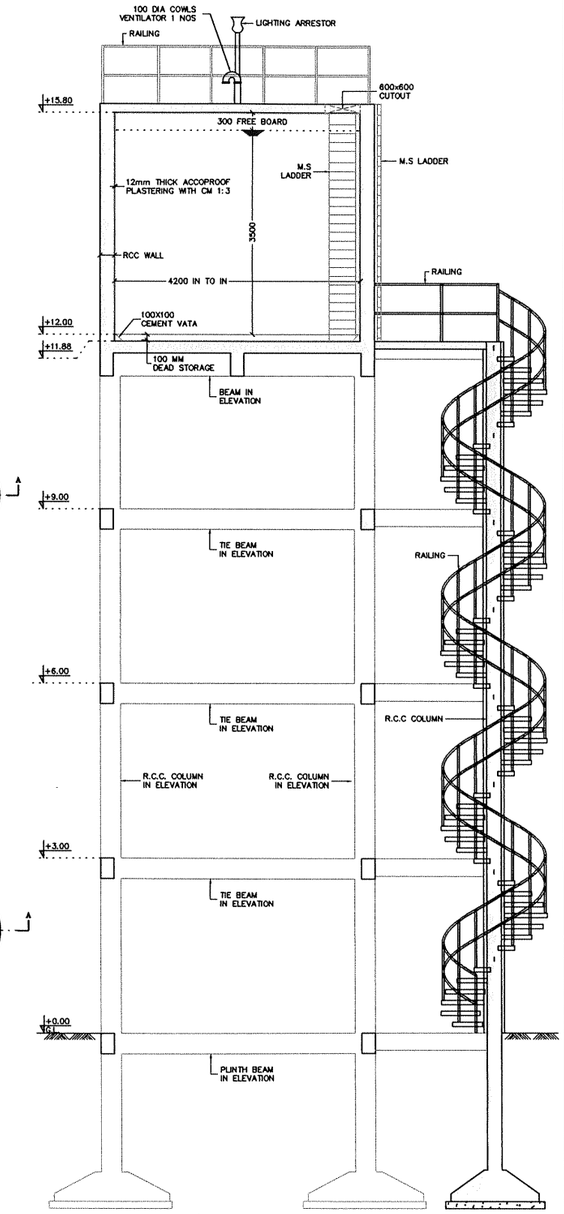
WATER TANK BOTTOM SLAB LEVEL PLAN (+11.88 MT LVL)



GROUND FLOOR PLAN (0.00 mt LVL)



TIE LEVEL PLAN (+9.00 mt LVL)



SECTION : A - A

NOTES :

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

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

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

Asst. Executive Engineer
TDWSP Asifabad

Dy. Executive Engineer
TDWSP Asifabad

Executive Engineer
TDWSP Asifabad

WAPCOS LTD
Hyderabad

L&T Construction
Komaram Bheem - Asifabad
Construction - TDWSP - ADILABAD

REV. No	DESCRIPTION	DATE	DESIGNED	DRAWN	CHECKED	APPROVED
A	FOR APPROVAL	26/08/16	–	HTP	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 (30 MLD WTP)
SUPPLIER / CONTRACTOR :	L&T Construction Water & Effluent Treatment SBG

JOB No. : LE150883

	NAME	SIGN	DATE
DSGN	HMP		26/08/16
DRWN	HTP		26/08/16
CHKD	RMM		26/08/16
APPD	–		26/08/16

TITLE :
60 KL CAPACITY 12M HEIGHT ESR AT KAZHIPALLY X ROAD
(GENERAL ARRANGEMENT DRAWING)

SCALE 1:60

PROJECTION

DRAWING No. LE150883-C-WS-RW-GA-XXXX

SIZE A2 | REV. A

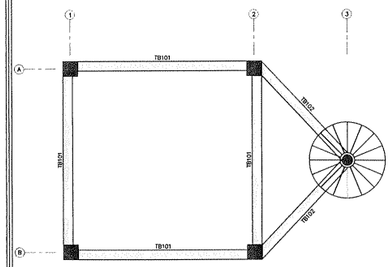
COMP. DATA : P16-02_30-01-01

SHEET 1 OF 1

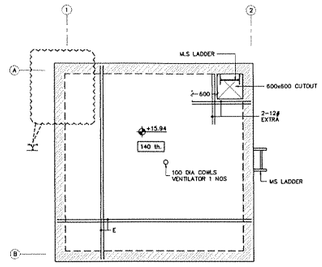
RELEASED FOR ☐ PRELIMINARY ☐ TENDER ☐ INFORMATION ☑ APPROVAL ☐ CONSTRUCTION

TYPE	DESCRIPTION	LEVEL	SHAPE
	H=HORIZONTAL BARS		
H1	10 ϕ 190 C/C THROUGH BAR	-	
H2	10 ϕ 190 C/C CORNER BAR	-	

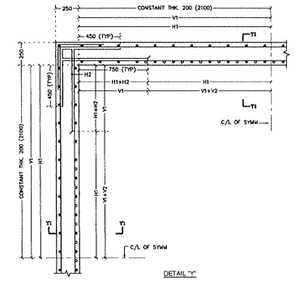
TYPE	DESCRIPTION	SHAPE
	V=VERTICAL BARS	
V1	10 ϕ 190 C/C THROUGH BAR	
V2	12 ϕ 180 C/C CUT BAR	



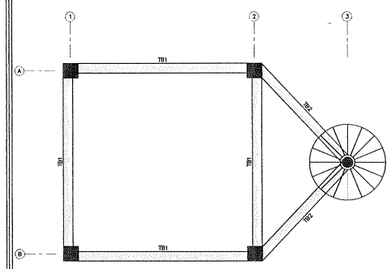
TIE LEVEL PLAN (+6.00 mt LVL)



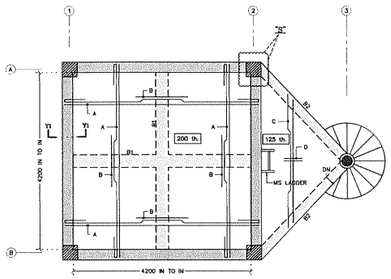
WATER TANK TOP PLAN +15.94 LEVEL



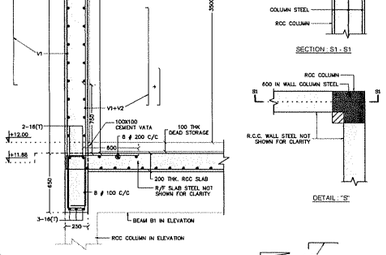
DETAIL 'X'



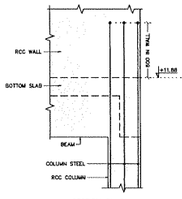
TIE LEVEL PLAN (+3.00 mt LVL)



WATER TANK BOTTOM SLAB LEVEL PLAN (+11.88 MT LVL)

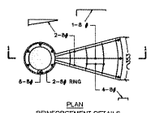


SECTION : Y1 - Y1

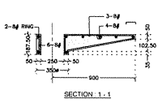


SECTION : S1 - S1

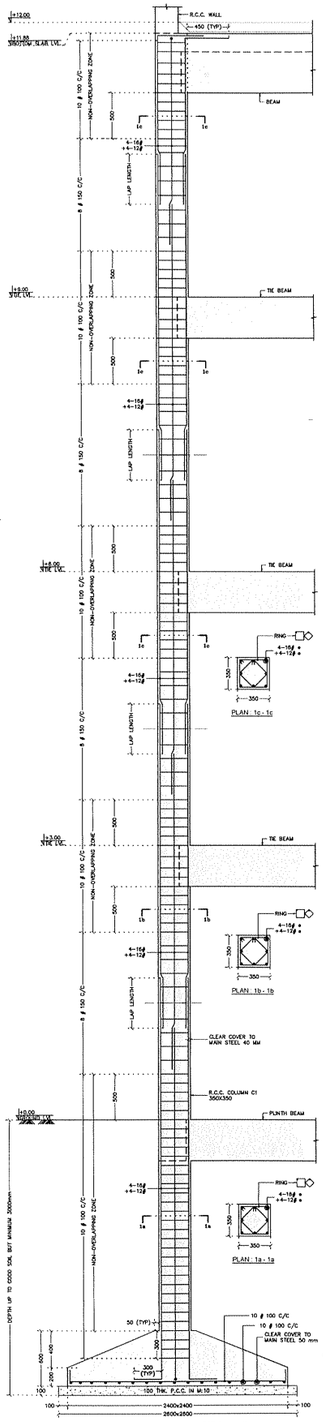
DETAIL 'R'

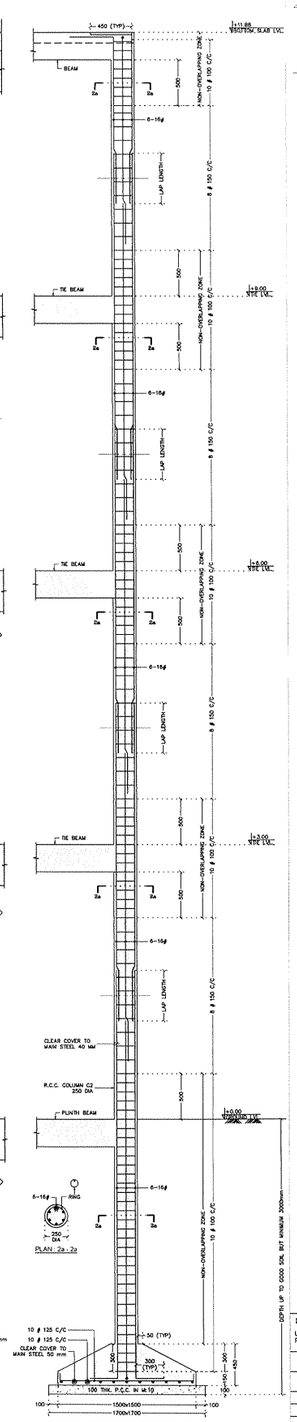


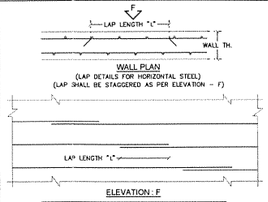
PLAN
REINFORCEMENT DETAILS OF PRECAST STEPS



SECTION : 1 - 1



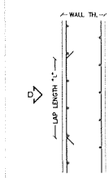




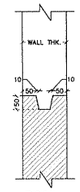
WALL PLAN
(LAP DETAILS FOR HORIZONTAL STEEL)
(LAP SHALL BE STAGGERED AS PER ELEVATION - F)

ELEVATION : F

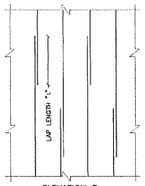
FOR CONTAINER STEEL (WALL,CONICAL WALL & BEAM)
LAP LENGTH : 2 X L FOR HORIZONTAL STEEL



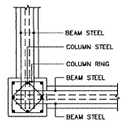
WALL SECTION
LAP DETAILS FOR VERTICAL STEEL
(LAP SHALL BE STAGGERED AS PER ELEVATION - D)



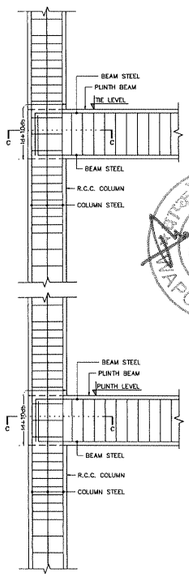
TYPICAL CONSTRUCTION JOINT IN VERTICAL WALL



ELEVATION : D



PLAN : C - C



TYPICAL COLUMN & BEAM JOINT DETAIL

IMPORTANT NOTE :
L BEND AT (BEAM, COLUMN JUNCTION / BEAM JUNCTION) SHALL BE PROVIDED PROPERLY, IT IS IMPORTANT TO RESIST SEISMIC FORCE

VALUE OF " ld +10db " WITH 90° BENT

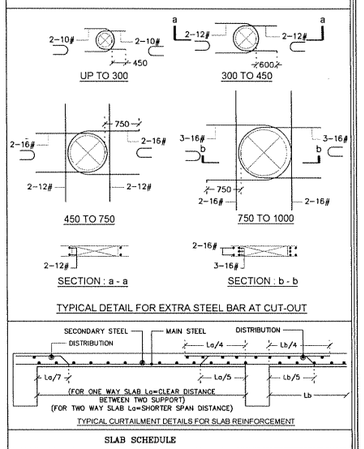
DIA OF BAR	ld+10db
12	520
16	690
20	860
25	1075

IMPORTANT NOTES

1 AS PER SOIL INVESTIGATION REPORT, NO GROUND WATER TABLE WAS FOUND UP TO DEPTH OF INVESTIGATION. IF WATER TABLE IS FOUND DURING THE EXECUTION, WORK SHALL BE STOP AND SAME SHALL BE INFORMED TO CONCERNED AUTHORITY AND DESIGNER. PROPER STORM WATER DRAINAGE SYSTEM FOR SURROUNDING AREA SHALL ALSO BE PROVIDED TO AVOID LOCALIZED TEMPORARY WATER TABLE EFFECTS.
2 FOUNDATION SHALL REST ON GOOD SOIL. IT SHOULD NOT REST ON BLACK COTTON SOIL OR SOIL HAVING EXPANSIVE PROPERTY.
3 AFTER EXCAVATION UP TO 3.0m DEPTH, SOIL STRATA SHALL BE VERIFIED BY SOIL CONSULTANT FOR GIVEN FOUNDATION SYSTEM. AFTER WRITTEN CONFORMATION & APPROVAL FROM SOIL CONSULTANT EXECUTION SHALL BE START
4 RECOMMENDATION OF SOIL CONSULTANT SHALL BE STRICTLY FOLLOWED

NOTES :-

1 ALL DIMENSION ARE IN MM AND LEVELS ARE IN METER.
2 CONCRETE MIX
(a) CONTAINER M:30
(b) COLUMN & BEAM M:30
(c) FOOTING M:30
ALL CONCRETE MIX M:30 WITH MAXIMUM FREE WATER CEMENT RATIO OF 0.45 FOR WATER RETAINING STRUCTURE
3 ALL CONCRETE SHALL BE MACHINE MIXED AND MACHINE VIBRATED
4 ϕ - INDICATE MYSD-TMT FE-500 GRADE CONFORMING TO I.S 1786-LATEST REVISION, HOWEVER STEEL GRADE AND TYPE SHALL BE VERIFIED WITH TENDER SPECIFICATION
5 CLEAR COVER TO MAIN STEEL, FOR ELEMENT OTHER THAN WATER RETAINING SHALL BE 50mm IN FOOTING, 25mm IN WALL, 15mm IN SLAB, 40mm IN COLUMN, 25mm IN BEAM.
6 CLEAR COVER 45mm FOR WATER RETAINING STRUCTURE
7 FOUNDATION SHOULD BE IN-SITU SOIL AND IT SHOULD NOT BE ON FILLING MATERIAL I.e. MADE UP SOIL
8 BACK FILLING SHALL BE DONE IN WELL COMPACTED AND WELL WATER LAYER NOT EXCEEDING 300mm IN DEPTH
9 SBC CONSIDERED IN DESIGN IS 10 T/m2 AT 3.0 mt. DEPTH
10 LOCATION & SIZE OF SUCTION PIT SHALL BE DECIDED AS PER SITE CONDITION BEFORE EXECUTION
11 INLET & OVERFLOW PIPE SHALL BE DECIDED AS PER SITE CONDITION
12 LOCATION & LEVELS OF INLET/OUTLET & OVERFLOW PIPE SHALL BE VERIFY WITH ENGINEER INCHARGE BEFORE EXECUTION
13 READ THIS DRAWING ALONG WITH DRG NO. 30-01-01.



TYPICAL DETAIL FOR EXTRA STEEL BAR AT CUT-OUT

TYPICAL CURTAILMENT DETAILS FOR SLAB REINFORCEMENT

SLAB SCHEDULE

TYPE	DESCRIPTION
A	10 ϕ 125 C/C ALT BENT UP BAR
B	1-10 ϕ EXTRA AT TOP BET'n TWO BENT UP BAR
C	8 ϕ 150 C/C ALT BENT UP BAR
D	8 ϕ 200 C/C DISTRIBUTION BAR
E	10 ϕ 150 C/C STRAIGHT AT BOTTOM

DESIGN DATA

<1> SEISMIC ZONE - II
<2> IMPORTANCE FACTOR 1.5
<3> WIND SPEED - 44m/s

LAP LENGTH SECHDULE

DIA OF BAR	LAP LENGTH "L" IN mm
	M:30 CONCRETE
8	320
10	400
12	480
16	640
20	800
25	1000

REV. No	DESCRIPTION	DATE	DESIGNED	DRAWN	CHECKED	APPROVED
A	FOR APPROVAL	26/08/16	HMP	HTP	RMM	-

REVISIONS

L&T Construction
Water, Smart World & Communication.

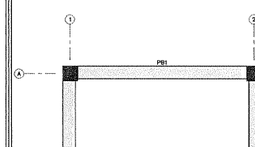
CLIENT :	RURAL WATER SUPPLY AND SANITATION DEPARTMENT, TELANGANA.
CONSULTANT :	-
PROJECT :	PROVIDING DRINKING WATER TO HABITATIONS IN KOMARAMBHEEM ASIFABAD SEGMENT IN ADILABAD DISTRICT (30 MLD WTP)
SUPPLIER / CONTRACTOR :	L&T Construction Water & Effluent Treatment SBG

	NAME	SIGN	DATE
DSGN	HMP		26/08/16
DRWN	HTP		26/08/16
CHKD	RMM		26/08/16
APPD	-		26/08/16

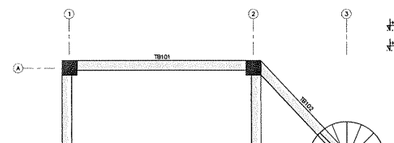
Job No. LE150883
TITLE : 60 KL CAPACITY 12M HEIGHT ESR AT KAZIPPALLY X ROAD (STRUCTURAL DETAILS)
SCALE 1:60,25
PROJECTION

DRAWING No. L E 1 5 0 8 8 3 - C - W S - R W - R C - X X X X
SIZE A1 REV. A
COMP. DATA : P18-02_30-02-01
SHEET 1 OF 1

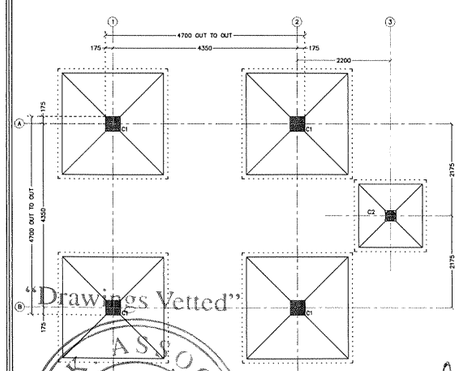
RELEASED FOR ☐ PRELIMINARY ☐ TENDER ☐ INFORMATION ☑ APPROVAL ☐ CONSTRUCTION



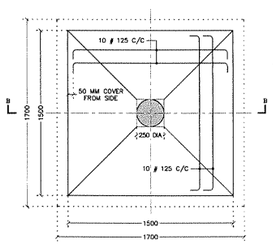
PLINTH BEAM AT (+0.00 mt LVL)



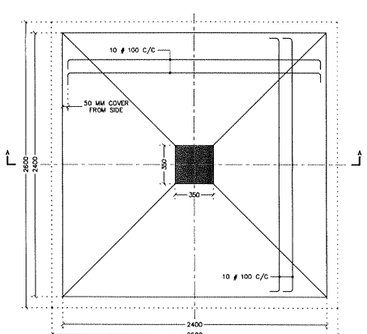
TIE LEVEL PLAN (+9.00 mt LVL)



FOUNDATION PLAN



PLAN FOR COLUMN-FOOTING MKD. C2



PLAN FOR COLUMN-FOOTING MKD. C1

"Drawings Vetted"
M/s. L&T ASSOCIATES
Hyd-08
FOUNDATION PLAN

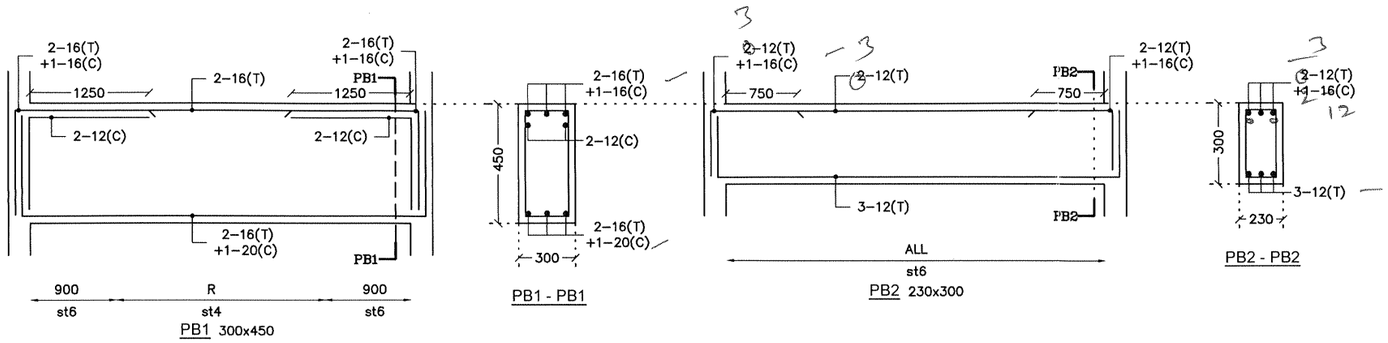
Asst. Executive Engineer
TDWSP Asifabad

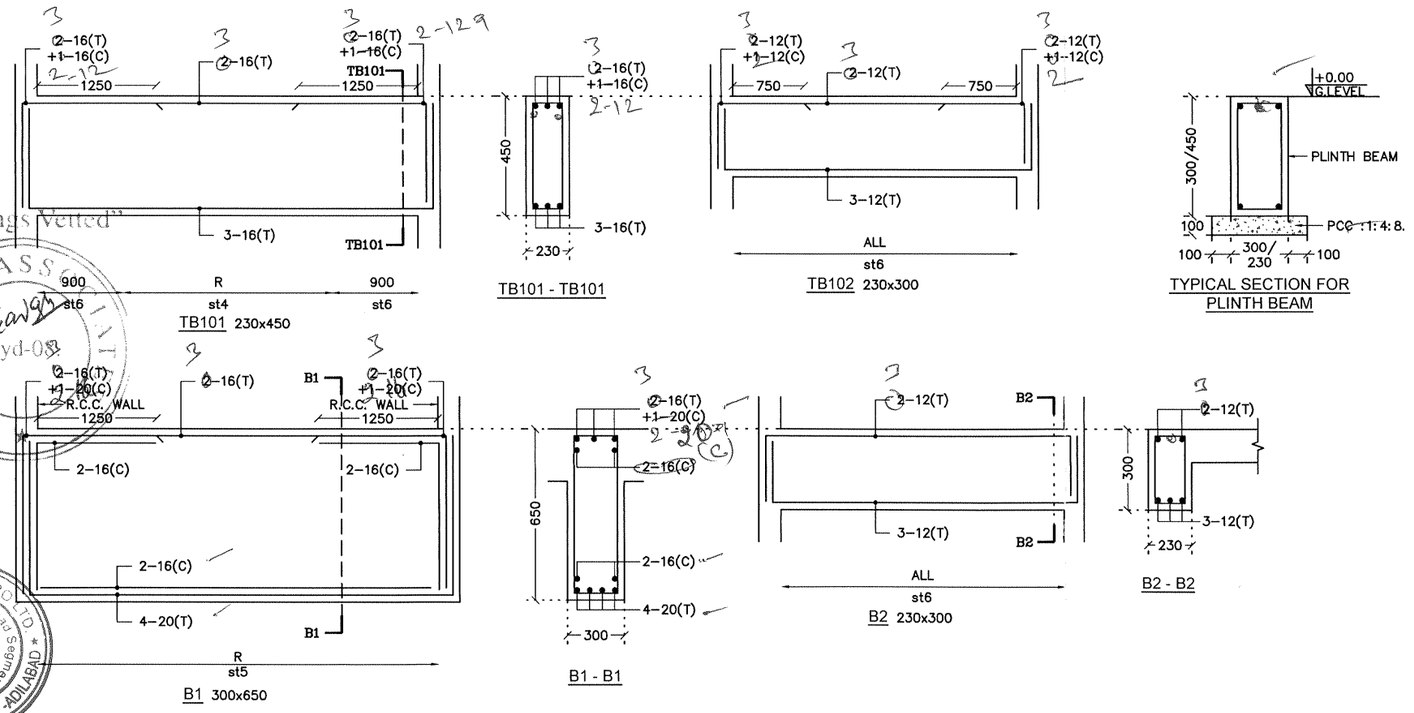
Dy. Executive Engineer
TDWSP Asifabad

Executive Engineer
TDWSP Asifabad

APCOS (INDIA) LIMITED
Hyderabad

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



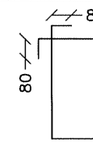


NOTES :

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

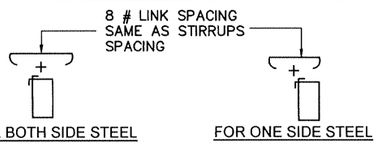
<2> FOR ALL OTHER NOTES REFER DRG.NO. 30-02-01

<3> READ THIS DRAWING ALONG WITH DRG.NO. 30-02-01



TYPICAL DETAIL FOR BEAM STIRRUPS

T-THROUGH BAR
C-CUT BAR



TYPICAL RING / STIRRUPS DETAILS FOR BEAM TOP BARS IN SLAB

STIRRUPS SCHEDULE
(2 Legged STIRRUPS UNLESS OTHERWISE SPECIFIED)

TYPE	DESCRIPTION	TYPE	DESCRIPTION	TYPE	DESCRIPTION
st1	8 # 225 C/C	st2	8 # 200 C/C	st3	8 # 175 C/C
st4	8 # 150 C/C	st5	8 # 125 C/C	st6	8 # 100 C/C
st7	10 # 150 C/C	st8	10 # 125 C/C	st9	10 # 100 C/C
st10	12 # 125 C/C	st11	12 # 100 C/C	st12	12 # 75 C/C

REV. No	DESCRIPTION	DATE	DESIGNED	DRAWN	CHECKED	APPROVED
A	FOR APPROVAL	26/08/16	HMP	HTP	RMM	–

REVISIONS

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Water, Smart World & Communication.

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CONSULTANT : -

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

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

JOB No. : LE150883

	NAME	SIGN	DATE
DSGN	HMP		26/08/16
DRWN	HTP		26/08/16
CHKD	RMM		26/08/16
APPD	–		26/08/16

TITLE :
60 KL CAPACITY 12M HEIGHT ESR AT KAZHIPALLY X ROAD
(BEAM DETAILS)

SCALE 1:60

PROJECTION

DRAWING No. LE150883-W-WS-WT-RC-XXXX
COMP. DATA : P16-02_30-02-02
SHEET 1 OF 1

SIZE A3 | REV. A

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

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

HANSEN & TOUBRO LTD. Komaram Bheem Asifabad Water Supply Project Segment Construction-TDWSP -ADILABAD

Asst. Executive Engineer
TDWSP Asifabad

Dy. Executive Engineer
TDWSP Asifabad

Executive Engineer
TDWSP Asifabad