Isolated Footing Design(ACI 318-11)

Design For Isolated Footing 181

Design For Isolated Footing 182

Design For Isolated Footing 183

Design For Isolated Footing 184

Design For Isolated Footing 185

Design For Isolated Footing 186

Design For Isolated Footing 187

Design For Isolated Footing 188

Design For Isolated Footing 189

Design For Isolated Footing 190

Design For Isolated Footing 191

Design For Isolated Footing 192

Design For Isolated Footing 193

Design For Isolated Footing 194

Design For Isolated Footing 195

Design For Isolated Footing 196

Design For Isolated Footing 197

Design For Isolated Footing 198

Design For Isolated Footing 199

Design For Isolated Footing 200

Design For Isolated Footing 201

Design For Isolated Footing 202

Design For Isolated Footing 203

Design For Isolated Footing 204

Design For Isolated Footing 205

Design For Isolated Footing 206

Design For Isolated Footing 207

Design For Isolated Footing 208

Design For Isolated Footing 209

Design For Isolated Footing 210

Design For Isolated Footing 211

Design For Isolated Footing 213

Design For Isolated Footing 282

Footing No.	Group ID	Foundation Geometry		
-	-	Length	Width	Thickness
181	1	1.000m	1.000m	0.300m

Footing No.	Footing Reinforcement				Pedestal Reinforcement	
-	Bottom Reinforcement(M_z)	Bottom Reinforcement(M_x)	Top Reinforcement(M_z)	Top Reinforcement(M_x)	Main Steel	Trans Steel
181	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	N/A	N/A

Footing No.	Group ID	Foundation Geometry		
-	-	Length	Width	Thickness
182	2	1.000m	1.000m	0.300m

Footing No.	Footing Reinforcement				Pedestal Reinforcement	
-	Bottom Reinforcement(M_z)	Bottom Reinforcement(M_x)	Top Reinforcement(M_z)	Top Reinforcement(M_x)	Main Steel	Trans Steel
182	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	N/A	N/A

Footing No.	Group ID	Foundation Geometry		
-	-	Length	Width	Thickness
183	3	1.000m	1.000m	0.300m

Footing No.	Footing Reinforcement				Pedestal Reinforcement	
-	Bottom Reinforcement(M_z)	Bottom Reinforcement(M_x)	Top Reinforcement(M_z)	Top Reinforcement(M_x)	Main Steel	Trans Steel
183	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	N/A	N/A

Footing No.	Group ID	Foundation Geometry		
-	-	Length	Width	Thickness
184	4	1.000m	1.000m	0.300m

Footing No.	Footing Reinforcement				Pedestal Reinforcement	
-	Bottom Reinforcement(M_z)	Bottom Reinforcement(M_x)	Top Reinforcement(M_z)	Top Reinforcement(M_x)	Main Steel	Trans Steel
184	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	N/A	N/A

Footing No.	Group ID	Foundation Geometry		
-	-	Length	Width	Thickness
185	5	1.000m	1.000m	0.300m

Footing No.	Footing Reinforcement				Pedestal Reinforcement	
-	Bottom Reinforcement(M_z)	Bottom Reinforcement(M_x)	Top Reinforcement(M_z)	Top Reinforcement(M_x)	Main Steel	Trans Steel
185	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	N/A	N/A

Footing No.	Group ID	Foundation Geometry		
-	-	Length	Width	Thickness
186	6	1.000m	1.000m	0.300m

Footing No.	Footing Reinforcement				Pedestal Reinforcement	
-	Bottom Reinforcement(M_z)	Bottom Reinforcement(M_x)	Top Reinforcement(M_z)	Top Reinforcement(M_x)	Main Steel	Trans Steel
186	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	N/A	N/A

Footing No.	Group ID	Foundation Geometry		
-	-	Length	Width	Thickness
187	7	1.000m	1.000m	0.300m

Footing No.	Footing Reinforcement				Pedestal Reinforcement	
-	Bottom Reinforcement(M_z)	Bottom Reinforcement(M_x)	Top Reinforcement(M_z)	Top Reinforcement(M_x)	Main Steel	Trans Steel
187	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	N/A	N/A

Footing No.	Group ID	Foundation Geometry		
-	-	Length	Width	Thickness

188	8	1.000m	1.000m	0.300m

Footing No.	Footing Reinforcement				Pedestal Reinforcement	
-	Bottom Reinforcement(M_z)	Bottom Reinforcement(M_x)	Top Reinforcement(M_z)	Top Reinforcement(M_x)	Main Steel	Trans Steel
188	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	N/A	N/A

Footing No.	Group ID	Foundation Geometry		
-	-	Length	Width	Thickness
189	9	1.000m	1.000m	0.300m

Footing No.	Footing Reinforcement				Pedestal Reinforcement	
-	Bottom Reinforcement(M_z)	Bottom Reinforcement(M_x)	Top Reinforcement(M_z)	Top Reinforcement(M_x)	Main Steel	Trans Steel
189	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	N/A	N/A

Footing No.	Group ID	Foundation Geometry		
-	-	Length	Width	Thickness
190	10	1.000m	1.000m	0.300m

Footing No.	Footing Reinforcement				Pedestal Reinforcement	
-	Bottom Reinforcement(M_z)	Bottom Reinforcement(M_x)	Top Reinforcement(M_z)	Top Reinforcement(M_x)	Main Steel	Trans Steel
190	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	N/A	N/A

Footing No.	Group ID	Foundation Geometry		
-	-	Length	Width	Thickness
191	11	1.000m	1.000m	0.300m

Footing No.	Footing Reinforcement				Pedestal Reinforcement	
-	Bottom Reinforcement(M_z)	Bottom Reinforcement(M_x)	Top Reinforcement(M_z)	Top Reinforcement(M_x)	Main Steel	Trans Steel
191	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	N/A	N/A

Footing No.	Group ID	Foundation Geometry		
-	-	Length	Width	Thickness
192	12	1.000m	1.000m	0.300m

Footing No.	Footing Reinforcement				Pedestal Reinforcement	
-	Bottom Reinforcement(M_z)	Bottom Reinforcement(M_x)	Top Reinforcement(M_z)	Top Reinforcement(M_x)	Main Steel	Trans Steel
192	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	N/A	N/A

Footing No.	Group ID	Foundation Geometry		
-	-	Length	Width	Thickness
193	13	1.000m	1.000m	0.300m

Footing No.	Footing Reinforcement				Pedestal Reinforcement	
-	Bottom Reinforcement(M_z)	Bottom Reinforcement(M_x)	Top Reinforcement(M_z)	Top Reinforcement(M_x)	Main Steel	Trans Steel
193	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	N/A	N/A

Footing No.	Group ID	Foundation Geometry		
-	-	Length	Width	Thickness
194	14	1.000m	1.000m	0.300m

Footing No.	Footing Reinforcement				Pedestal Reinforcement	
-	Bottom Reinforcement(M_z)	Bottom Reinforcement(M_x)	Top Reinforcement(M_z)	Top Reinforcement(M_x)	Main Steel	Trans Steel
194	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	N/A	N/A

Footing No.	Group ID	Foundation Geometry		
-	-	Length	Width	Thickness
195	15	1.000m	1.000m	0.300m

Footing No.	Footing Reinforcement				Pedestal Reinforcement	
-	Bottom Reinforcement(M_z)	Bottom Reinforcement(M_x)	Top Reinforcement(M_z)	Top Reinforcement(M_x)	Main Steel	Trans Steel
195	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	N/A	N/A

Footing No.	Group ID	Foundation Geometry		
-	-	Length	Width	Thickness
196	16	1.000m	1.000m	0.300m

Footing No.	Footing Reinforcement				Pedestal Reinforcement	
-	Bottom Reinforcement(M_z)	Bottom Reinforcement(M_x)	Top Reinforcement(M_z)	Top Reinforcement(M_x)	Main Steel	Trans Steel
196	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	N/A	N/A

Footing No.	Group ID	Foundation Geometry		
-	-	Length	Width	Thickness
197	17	1.000m	1.000m	0.300m

Footing No.	Footing Reinforcement				Pedestal Reinforcement	
-	Bottom Reinforcement(M_z)	Bottom Reinforcement(M_x)	Top Reinforcement(M_z)	Top Reinforcement(M_x)	Main Steel	Trans Steel
197	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	N/A	N/A

Footing No.	Group ID	Foundation Geometry		
-	-	Length	Width	Thickness
198	18	1.000m	1.000m	0.300m

Footing No.	Footing Reinforcement				Pedestal Reinforcement	
-	Bottom Reinforcement(M_z)	Bottom Reinforcement(M_x)	Top Reinforcement(M_z)	Top Reinforcement(M_x)	Main Steel	Trans Steel
198	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	N/A	N/A

Footing No.	Group ID	Foundation Geometry		
-	-	Length	Width	Thickness
199	19	1.000m	1.000m	0.300m

Footing No.	Footing Reinforcement				Pedestal Reinforcement	
-	Bottom Reinforcement(M_z)	Bottom Reinforcement(M_x)	Top Reinforcement(M_z)	Top Reinforcement(M_x)	Main Steel	Trans Steel
199	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	N/A	N/A

Footing No.	Group ID	Foundation Geometry		
-	-	Length	Width	Thickness
200	20	1.000m	1.000m	0.300m

Footing No.	Footing Reinforcement				Pedestal Reinforcement	
-	Bottom Reinforcement(M_z)	Bottom Reinforcement(M_x)	Top Reinforcement(M_z)	Top Reinforcement(M_x)	Main Steel	Trans Steel
200	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	N/A	N/A

Footing No.	Group ID	Foundation Geometry		
-	-	Length	Width	Thickness
201	21	1.000m	1.000m	0.300m

Footing No.	Footing Reinforcement				Pedestal Reinforcement	
-	Bottom Reinforcement(M_z)	Bottom Reinforcement(M_x)	Top Reinforcement(M_z)	Top Reinforcement(M_x)	Main Steel	Trans Steel
201	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	N/A	N/A

Footing No.	Group ID	Foundation Geometry		
-	-	Length	Width	Thickness
202	22	1.000m	1.000m	0.300m

Footing No.	Footing Reinforcement				Pedestal Reinforcement	
-	Bottom Reinforcement(M_z)	Bottom Reinforcement(M_x)	Top Reinforcement(M_z)	Top Reinforcement(M_x)	Main Steel	Trans Steel
202	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	N/A	N/A

Footing No.	Group ID	Foundation Geometry		
-	-	Length	Width	Thickness
203	23	1.000m	1.000m	0.300m

Footing No.	Footing Reinforcement				Pedestal Reinforcement	
-	Bottom Reinforcement(M_z)	Bottom Reinforcement(M_x)	Top Reinforcement(M_z)	Top Reinforcement(M_x)	Main Steel	Trans Steel

203	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	N/A	N/A

Footing No.	Group ID	Foundation Geometry		
-	-	Length	Width	Thickness
204	24	1.000m	1.000m	0.300m

Footing No.	Footing Reinforcement				Pedestal Reinforcement	
-	Bottom Reinforcement(M_z)	Bottom Reinforcement(M_x)	Top Reinforcement(M_z)	Top Reinforcement(M_x)	Main Steel	Trans Steel
204	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	N/A	N/A

Footing No.	Group ID	Foundation Geometry		
-	-	Length	Width	Thickness
205	25	1.000m	1.000m	0.300m

Footing No.	Footing Reinforcement				Pedestal Reinforcement	
-	Bottom Reinforcement(M_z)	Bottom Reinforcement(M_x)	Top Reinforcement(M_z)	Top Reinforcement(M_x)	Main Steel	Trans Steel
205	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	N/A	N/A

Footing No.	Group ID	Foundation Geometry		
-	-	Length	Width	Thickness
206	26	1.000m	1.000m	0.300m

Footing No.	Footing Reinforcement				Pedestal Reinforcement	
-	Bottom Reinforcement(M_z)	Bottom Reinforcement(M_x)	Top Reinforcement(M_z)	Top Reinforcement(M_x)	Main Steel	Trans Steel
206	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	N/A	N/A

Footing No.	Group ID	Foundation Geometry		
-	-	Length	Width	Thickness
207	27	1.000m	1.000m	0.300m

Footing No.	Footing Reinforcement				Pedestal Reinforcement	
-	Bottom Reinforcement(M_z)	Bottom Reinforcement(M_x)	Top Reinforcement(M_z)	Top Reinforcement(M_x)	Main Steel	Trans Steel
207	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	N/A	N/A

Footing No.	Group ID	Foundation Geometry		
-	-	Length	Width	Thickness
208	28	1.000m	1.000m	0.300m

Footing No.	Footing Reinforcement				Pedestal Reinforcement	
-	Bottom Reinforcement(M_z)	Bottom Reinforcement(M_x)	Top Reinforcement(M_z)	Top Reinforcement(M_x)	Main Steel	Trans Steel
208	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	N/A	N/A

Footing No.	Group ID	Foundation Geometry		
-	-	Length	Width	Thickness
209	29	1.000m	1.000m	0.300m

Footing No.	Footing Reinforcement				Pedestal Reinforcement	
-	Bottom Reinforcement(M_z)	Bottom Reinforcement(M_x)	Top Reinforcement(M_z)	Top Reinforcement(M_x)	Main Steel	Trans Steel
209	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	N/A	N/A

Footing No.	Group ID	Foundation Geometry		
-	-	Length	Width	Thickness
210	30	1.000m	1.000m	0.300m

Footing No.	Footing Reinforcement				Pedestal Reinforcement	
-	Bottom Reinforcement(M_z)	Bottom Reinforcement(M_x)	Top Reinforcement(M_z)	Top Reinforcement(M_x)	Main Steel	Trans Steel
210	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	N/A	N/A

Footing No.	Group ID	Foundation Geometry		
-	-	Length	Width	Thickness
211	31	1.000m	1.000m	0.300m

Footing No.	Footing Reinforcement				Pedestal Reinforcement	
-	Bottom Reinforcement(M_z)	Bottom Reinforcement(M_x)	Top Reinforcement(M_z)	Top Reinforcement(M_x)	Main Steel	Trans Steel
211	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	N/A	N/A

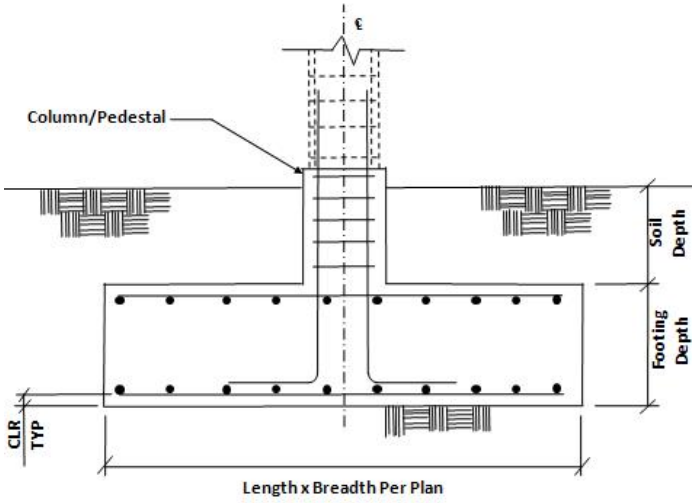
Footing No.	Group ID	Foundation Geometry		
-	-	Length	Width	Thickness
213	32	1.000m	1.000m	0.300m

Footing No.	Footing Reinforcement				Pedestal Reinforcement	
-	Bottom Reinforcement(M_z)	Bottom Reinforcement(M_x)	Top Reinforcement(M_z)	Top Reinforcement(M_x)	Main Steel	Trans Steel
213	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	N/A	N/A

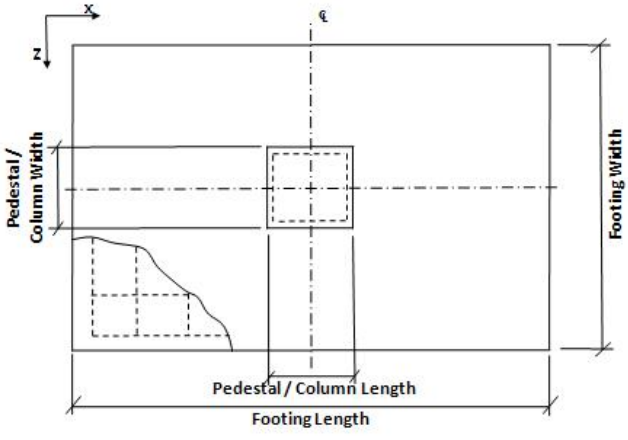
Footing No.	Group ID	Foundation Geometry		
-	-	Length	Width	Thickness
282	33	1.000m	1.000m	0.300m

Footing No.	Footing Reinforcement				Pedestal Reinforcement	
-	Bottom Reinforcement(M_z)	Bottom Reinforcement(M_x)	Top Reinforcement(M_z)	Top Reinforcement(M_x)	Main Steel	Trans Steel
282	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	#12 @ 21 cm c/c	N/A	N/A

Isolated Footing 181



ELEVATION



PLAN

Input Values

Footing Geomtery

Design Type :	Calculate Dimension
Footing Thickness (Ft) :	300.000mm
Footing Length - X (Fl) :	1000.000mm
Footing Width - Z (Fw) :	1000.000mm
Eccentricity along X (Oxd) :	0.000mm
Eccentricity along Z (Ozd) :	0.000mm

Column Dimensions

Column Shape :	Rectangular
Column Length - X (D_{col}) :	0.250m
Column Width - Z (B_{col}) :	0.250m

Pedestal

Include Pedestal?	No
Pedestal Shape :	N/A
Pedestal Height (Ph) :	N/A
Pedestal Length - X (Pl) :	N/A
Pedestal Width - Z (Pw) :	N/A

Design Parameters

Concrete and Rebar Properties

Unit Weight of Concrete :	24.000kN/m3
Strength of Concrete :	21.000N/mm2
Yield Strength of Steel :	420.000N/mm2
Minimum Bar Size :	#12
Maximum Bar Size :	#20
Pedestal Minimum Bar Size :	8
Pedestal Maximum Bar Size :	9
Minimum Bar Spacing :	50.000mm
Maximum Bar Spacing :	450.000mm
Pedestal Clear Cover (P, CL) :	75.000mm
Footing Clear Cover (F, CL) :	75.000mm

Soil Properties

Soil Type :	Drained
Unit Weight :	19.000kN/m3
Soil Bearing Capacity :	143.200kN/m2
Soil Bearing Capacity Type:	Gross Bearing Capacity
Soil Surcharge :	0.000kN/m2
Depth of Soil above Footing :	1.000m
Cohesion :	0.000kN/m2

Sliding and Overturning

Coefficient of Friction : 0.500
Factor of Safety Against Sliding : 1.500
Factor of Safety Against Overturning : 1.500

Design Calculations

Footing Size

Initial Length (L_o) = 1.000m

Initial Width (W_o) = 1.000m

Load Combination/ s- Service Stress Level				
Load Combination Number	Load Combination Title	Load Combination Factor	Soil Bearing Factor	Self Weight Factor
22	CM + CV	1.00	1.00	1.00
23	CM + 0,75 CV + 0.75 (0.7)(SX + 0,3 SZ)/R	1.00	1.00	1.00
24	CM + 0,75 CV - 0.75 (0.7)(SX - 0,3 SZ)/R	1.00	1.00	1.00
25	CM + 0,75 CV + 0.75 (0.7)(SX - 0,3 SZ)/R	1.00	1.00	1.00
26	CM + 0,75 CV - 0.75 (0.7)(SX + 0,3 SZ)/R	1.00	1.00	1.00
27	CM + 0,75 CV + 0.75 (0.7)(0,3 SX + SZ)/R	1.00	1.00	1.00
28	CM + 0,75 CV - 0.75 (0.7)(0.3 SX - SZ)/R	1.00	1.00	1.00
29	CM + 0,75 CV + 0.75 (0.7)(0.3 SX - SZ)/R	1.00	1.00	1.00
30	CM + 0,75 CV - 0.75 (0.7)(0.3 SX + SZ)/R	1.00	1.00	1.00
31	0.6 CM + 0.700 (SX + 0.3 SZ)/R	1.00	1.00	1.00
32	0.6 CM - 0.700 (SX - 0.3 SZ)/R	1.00	1.00	1.00
33	0.6 CM + 0.700 (SX - 0.3 SZ)/R	1.00	1.00	1.00
34	0.6 CM - 0.700 (SX + 0.3 SZ)/R	1.00	1.00	1.00
35	0.6 CM + 0.700 (0.3 SX + SZ)/R	1.00	1.00	1.00
36	0.6 CM - 0.700 (0.3 SX - SZ)/R	1.00	1.00	1.00
37	0.6 CM - 0.700 (0.3 SX + SZ)/R	1.00	1.00	1.00
38	0.6 CM + 0.700 (0.3 SX - SZ)/R	1.00	1.00	1.00

Load Combination Number	Load Combination Title	Load Combination Factor	Soil Bearing Factor	Self Weight Factor
5	1.2 CM + 1.600 CV	1.00	1.00	1.00
6	1.2 CM + CV + (SX/R + 0,30 SZ/R)	1.00	1.00	1.00
7	1.2 CM + CV - (SX/R - 0,30 SZ/R)	1.00	1.00	1.00
8	1.2 CM + CV + (SX/R - 0,30 SZ/R)	1.00	1.00	1.00
9	1.2 CM + CV - (SX/R + 0,30 SZ/R)	1.00	1.00	1.00
10	1.2 CM + CV + (0.3 SX/R + SZ/R)	1.00	1.00	1.00
11	1.2 CM + CV - (0.3 SX/R - SZ/R)	1.00	1.00	1.00
12	1.2 CM + CV + (0.3 SX/R - SZ/R)	1.00	1.00	1.00
13	1.2 CM + CV - (0.3 SX/R + SZ/R)	1.00	1.00	1.00
14	0.9 CM + (SX/R + 0,30 SZ/R)	1.00	1.00	1.00
15	0.9 CM - (SX/R - 0,30 SZ/R)	1.00	1.00	1.00
16	0.9 CM + (SX/R - 0,30 SZ/R)	1.00	1.00	1.00
17	0.9 CM - (SX/R + 0,30 SZ/R)	1.00	1.00	1.00
18	0.9 CM + (0.3 SX/R + SZ/R)	1.00	1.00	1.00

19	0.9 CM - (0.3 SX/R - SZ/R)	1.00	1.00	1.00
20	0.9 CM + (0.3 SX/R - SZ/R)	1.00	1.00	1.00
21	0.9 CM - (0.3 SX/R + SZ/R)	1.00	1.00	1.00

Applied Loads - Service Stress Level

LC	Axial (kN)	Shear X (kN)	Shear Z (kN)	Moment X (kNm)	Moment Z (kNm)
22	25.746	-2.463	-3.437	-0.953	0.805
23	22.771	-0.903	-2.996	-0.523	-0.520
24	26.341	-3.821	-3.434	-0.825	1.980
25	23.744	-1.104	-3.603	-1.130	-0.366
26	27.313	-4.022	-4.041	-1.432	2.134
27	22.702	-1.652	-2.326	0.194	0.146
28	23.950	-2.563	-2.570	-0.009	0.923
29	26.134	-2.362	-4.468	-1.946	0.691
30	27.202	-3.235	-4.599	-2.037	1.439
31	10.725	0.604	-1.560	-0.023	-1.283
32	15.485	-3.287	-2.144	-0.425	2.050
33	12.031	0.334	-2.375	-0.837	-1.076
34	16.791	-3.557	-2.959	-1.240	2.257
35	10.873	-0.442	-0.818	0.781	-0.359
36	12.307	-1.614	-0.994	0.660	0.645
37	16.643	-2.511	-3.700	-2.044	1.333
38	15.209	-1.338	-3.524	-1.923	0.329

Applied Loads - Strength Level

LC	Axial (kN)	Shear X (kN)	Shear Z (kN)	Moment X (kNm)	Moment Z (kNm)
5	32.022	-2.957	-3.993	-1.103	0.964
6	26.014	0.006	-3.193	-0.296	-1.552
7	32.788	-5.532	-4.025	-0.869	3.191
8	27.876	-0.379	-4.355	-1.457	-1.256
9	34.650	-5.917	-5.186	-2.030	3.487
10	26.225	-1.482	-2.139	0.848	-0.238
11	28.269	-3.153	-2.390	0.675	1.194
12	32.395	-2.757	-5.989	-3.001	0.742
13	34.439	-4.429	-6.240	-3.174	2.173
14	16.319	0.747	-2.392	-0.080	-1.789
15	23.093	-4.791	-3.223	-0.652	2.954
16	18.181	0.362	-3.554	-1.241	-1.493
17	24.955	-5.176	-4.385	-1.814	3.250
18	16.530	-0.741	-1.338	1.064	-0.475
19	18.574	-2.412	-1.589	0.891	0.956
20	22.700	-2.017	-5.188	-2.785	0.505
21	24.744	-3.688	-5.439	-2.957	1.936

Reduction of force due to buoyancy = 0.000kN

Effect due to adhesion = 0.000kN

Area from initial length and width, $A_o = L_o \times W_o = 1.000m^2$

Min. area required from bearing pressure, $A_{min} = P / q_{max} = 0.328m^2$

Note: A_{min} is an initial estimation.

P = Critical Factored Axial Load(without self weight/ buoyancy/ soil).
q_{max} = Respective Factored Bearing Capacity.

Final Footing Size

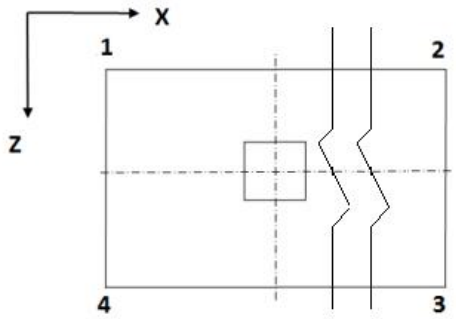
Length (L_2) =	1.000	m	Governing Load Case :	# 0
Width (W_2) =	1.000	m	Governing Load Case :	# 0
Depth (D_2) =	0.300	m	Governing Load Case :	# 13

Depth is governed by Ultimate Load Case

(Service check is performed with footing thickness requirements from concrete check)

Area (A_2) =	1.000	m^2
Final Soil Height =	0.700	m
Footing Self Weight =	7.200	kN
Soil Weight On Top Of Footing =	12.468	kN

Pressures at Four Corners



Load Case	Pressure at corner 1 (q_1) (kN/ m2)	Pressure at corner 2 (q_2) (kN/ m2)	Pressure at corner 3 (q_3) (kN/ m2)	Pressure at corner 4 (q_4) (kN/ m2)	Area of footing in uplift (A_u) (m^2)
26	**82.8909**	42.8017	11.0718	51.1610	0.000
29	73.9218	**57.1243**	17.6823	34.4797	0.000
31	24.5494	42.1239	**36.2369**	18.6624	0.000
24	75.8966	38.3847	16.1207	**53.6326**	0.000

If A_u is zero, there is no uplift and no pressure adjustment is necessary. Otherwise, to account for uplift, areas of negative pressure will be set to zero and the pressure will be redistributed to remaining corners.

Summary of Adjusted Pressures at 4 corners Four Corners

Load Case	Pressure at corner 1 (q_1) (kN/ m2)	Pressure at corner 2 (q_2) (kN/ m2)	Pressure at corner 3 (q_3) (kN/ m2)	Pressure at corner 4 (q_4) (kN/ m2)
26	**82.8909**	42.8017	11.0718	51.1610
29	73.9218	**57.1243**	17.6823	34.4797
31	24.5494	42.1239	**36.2369**	18.6624

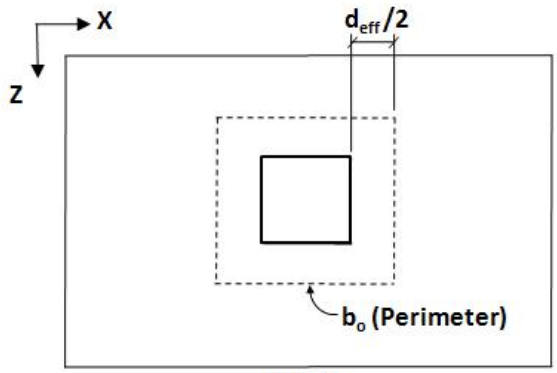
24	75.8966	38.3847	16.1207	**53.6326**

Compression Development Length Check

Development length skipped as column reinforcement is not specified in input (Column Dimnesion Task Pane)

Shear Calculation

Punching Shear Check



PLAN

Total Footing Depth, D =	0.300m	
Calculated Effective Depth, d_{eff} =	D - C_{cover} - 0.5 * d_b =	0.219m
For rectangular column, β_c =	B_{col} / D_{col} =	1.000

Effective depth, d_{eff}, increased until 0.75XV_c $\geq$ Punching Shear Force

Punching Shear Force, Vu = 42.370kN, Load Case # 9

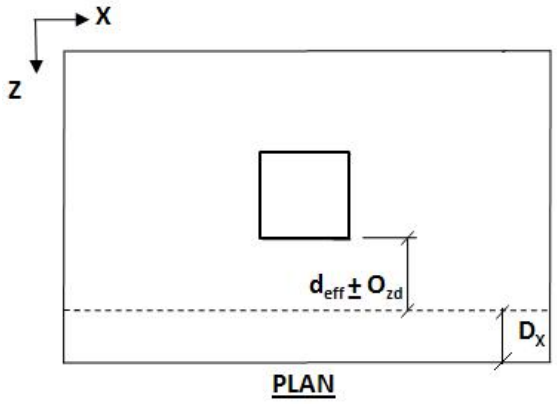
From ACI Cl.11.11.2, b_o for column=	$2 \times (B_{col} + D_{col} + 2 \times d_{eff})$ =	1.876m
Equation 11-31, V_{c1} =	$\left(2 + \frac{4}{\beta_c}\right) \times b_o \times d_{eff} \times \sqrt{1000 \times F_c'}$ =	937.988kN
Equation 11-32, V_{c2} =	$\left(2 + 40 \times \frac{d_{eff}}{b_o}\right) \times b_o \times d_{eff} \times \sqrt{1000 \times F_c'}$ =	1042.654kN
Equation 11-33, V_{c3} =	$4 \times b_o \times d_{eff} \times \sqrt{1000 \times F_c'}$ =	625.326kN
Punching shear strength, V_c =	0.75 X minimum of (V_{c1}, V_{c2}, V_{c3}) =	468.994kN

0.75 X V_c > V_u hence, OK

One-Way Shear Check

Along X Direction

(Shear Plane Parallel to Global X Axis)



From ACI Cl.11.2.1.1, V_c = $2 \times L \times d_{eff} \times \sqrt{1000 \times F_c'}$ = 166.665kN

Distance along X to design for shear, D_x = $0.5 \times (W - B_{col}) - d_{eff} + O_{zd}$ = 0.156m

Check that 0.75 X V_c > V_{ux} where V_{ux} is the shear force for the critical load cases at a distance d_{eff} from the face of the column caused by bending about the X axis.

From above calculations, 0.75 X V_c = 124.998 kN

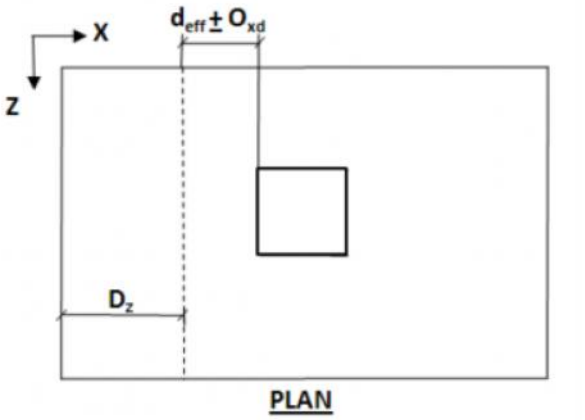
Critical load case for V_{ux} is # 13 $V_{ux} = V_{ux}|_{x=D_x}$ = 12.427 kN

0.75 X V_c > V_{ux} hence, OK

One-Way Shear Check

Along Z Direction

(Shear Plane Parallel to Global Z Axis)



From ACI Cl.11.2.1.1, V_c =

$2 \times W \times d_{eff} \times \sqrt{1000 \times F_c'}$ = 166.665 kN

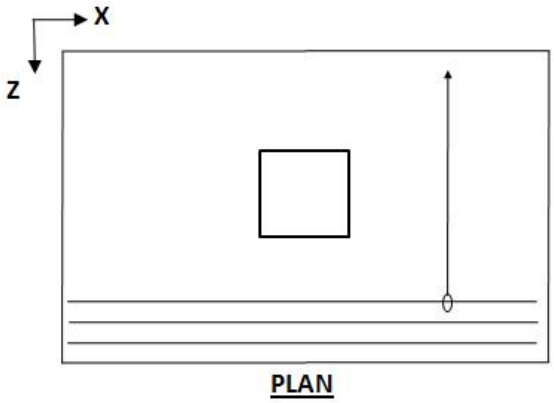
Distance along X to design for shear, D_z = $0.5 \times (L - B_{col}) - d_{eff} + O_{xd}$ = 0.156 m

Check that **0.75 X V_c > V_{uz}** where V_{uz} is the shear force for the critical load cases at a distance d_{eff} from the face of the column caused by bending about the Z axis.

From above calculations,	$0.75 \times V_c =$	124.998	kN
Critical load case for V_{uz} is # 9	$V_{uz} = V_{uz}\|_{z=D_z} =$	12.631	kN
	$0.75 \times V_c > V_{uz}$ hence, OK		

Design for Flexure about Z Axis

(For Reinforcement Parallel to X Axis)



PLAN

Calculate the flexural reinforcement along the X direction of the footing. Find the area of steel required, A, as per Section 3.8 of Reinforced Concrete Design (5th ed.) by Salmon and Wang (Ref. 1)

Critical Load Case # 9

The strength values of steel and concrete used in the formulae are in ksi

Bars parallel to X Direction are placed at bottom

Effective Depth d_{eff}=		0.219	m
Factor β_1 from ACI Cl.10.2.7.3 =		0.850	
From ACI Cl. 10.3.2, ρ_{bal} =	$0.85 \times \beta_1 \times F_c' \times \frac{87}{[f_y \times (87 + F_y)]} =$	0.02125	
From ACI Cl. 10.3.3, ρ_{max} =	$0.75 \times \rho_{bal} =$	0.01594	
From ACI Cl. 7.12.2, ρ_{min} =		0.00180	
From Ref. 1, Eq. 3.8.4a, constant m =	$\frac{F_y}{(0.85 \times F_c')} =$	23.529	

Calculate reinforcement ratio ρ for critical load case

Design for flexure about Z axis is performed at the face of the column at a distance, D_x =	$0.5 \times L - 0.5 \times D_{col} + O_{xd} =$	0.375	m
Ultimate moment,	$M_u\|_{z=D_z} =$	5.484	kNm
Nominal moment capacity, M_n =	$\frac{M_u}{\Phi} =$	6.093	kNm
(Based on effective depth) Required ρ =	$\frac{1}{m} \times \left[1 - \sqrt{1 - 2 \times m \times \frac{M_n}{(F_y \times W \times d_{eff}^2)}}\right] =$	0.00030	

(Based on gross depth) ρ x d_{eff} / Depth =			0.00022
	Since	$\rho < \rho_{min}$	ρ_{min} Governs
Area of Steel Required, A_s =		$\rho \times W \times d_{eff}$ =	540.001 mm2

Selected bar Size = # 12

Minimum spacing allowed (S_{min}) = = 5.000cm

Selected spacing (S) = 20.950cm

S_{min} <= S <= S_{max} and selected bar size < selected maximum bar size...

The reinforcement is accepted.

According to ACI 318 Clause No- 10.6.4

Max spacing for Cracking Consideration = 18.777cm

Warning: Calculated spacing is more than maximum spacing cosidering cracking condition. Modify spacing manually if cracking consideration is necessary.

Based on spacing reinforcement increment; provided reinforcement is

12 @ 20.500cm o.c.

Required development length for bars =	$\frac{0.87 \times d_b \times f_y}{4 \times \beta \times \sqrt{f_c}}$ =	=0.305	m
Available development length for bars, D_L =	$0.5 \times (L - D_{col}) \cdot - C_{cover}$ =	0.300	m
Try bar size # 12	Area of one bar =	113.097	mm2
Number of bars required, N_{bar} =	$\frac{A_s}{A_{bar}}$ =	5	

Because the number of bars is rounded up, make sure new reinforcement ratio < ρ_{max}

Total reinforcement area, A_{s_total} =	N_{bar} X (Area of one bar) =	565.483	mm2
d_{eff} =	D - C_{cover} - 0.5 X (dia. of one bar) =	0.219	m
Reinforcement ratio, ρ =	$\frac{A_{s\_total}}{(d_{eff} \times W)}$ =	0.00258	

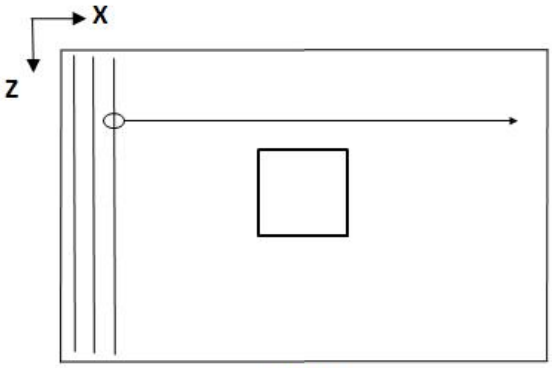
From ACI Cl.7.6.1, minimum req'd clear distance between bars

C_d = max (Diameter of one bar, 1.0" (25.4mm), Min. User Spacing) = 5.000cm

Check to see if width is sufficient to accomodate bars

Design for Flexure about X axis

(For Reinforcement Parallel to Z Axis)



PLAN

Calculate the flexural reinforcement along the Z direction of the footing. Find the area of steel required, A, as per Section 3.8 of Reinforced Concrete Design (5th ed.) by Salmon and Wang (Ref. 1)

Critical Load Case # 13

The strength values of steel and concrete used in the formulae are in ksi

Bars parallel to X Direction are placed at bottom

Effective Depth d_{eff}=		0.207	m
Factor β_1 from ACI Cl.10.2.7.3 =		0.850	
From ACI Cl. 10.3.2, ρ_{bal} =	$0.85 \times \beta_1 \times F_c' \times \frac{87}{[f_y \times (87 + F_y)]}$ =	0.02125	
From ACI Cl. 10.3.3, ρ_{max} =	$0.75 \times \rho_{bal}$ =	0.01594	
From ACI Cl.7.12.2, ρ_{min} =		0.00180	
From Ref. 1, Eq. 3.8.4a, constant m =	$\frac{F_y}{(0.85 \times F_c')}$ =	23.529	

Calculate reinforcement ratio ρ for critical load case

Design for flexure about X axis is performed at the face of the column at a distance, D_z =	$0.5 \times L + 0.5 \times B_{col} + O_{zd}$ =	0.375	m
Ultimate moment,	$M_u\|_{x=D_x}$ =	5.400	kNm
Nominal moment capacity, M_n =	$\frac{M_u}{\Phi}$ =	6.000	kNm
(Based on effective depth) Required ρ =	$\frac{1}{m} \times \left[1 - \sqrt{1 - 2 \times m \times \frac{M_n}{(F_y \times W \times d_{eff}^2)}}\right]$ =	0.00033	
(Based on gross depth) ρ x d_{eff} / Depth =		0.00023	
Since	$\rho \leq \rho_{min}$	ρ_{min} Governs	
Area of Steel Required, A_s =	$\rho \times W \times d_{eff}$ =	540.001	mm2

Selected Bar Size = #12

Minimum spacing allowed (S_{min}) = 5.000cm

Selected spacing (S) = 20.950cm

S_{min} <= S <= S_{max} and selected bar size < selected maximum bar size...

The reinforcement is accepted.

According to ACI 318 Clause No- 10.6.4

Max spacing for Cracking Consideration = 18.777cm

Warning:Calculated spacing is more than maximum spacing cosidering cracking condition. Modify spacing manually if cracking consideration is necessary.

Based on spacing reinforcement increment; provided reinforcement is

12 @ 20.500cm o.c.

Required development length for bars =	$\frac{0.87 \times d_b \times f_y}{4 \times \beta \times \sqrt{f_c}}$ =	0.305	m
Available development length for bars, D_L =	$0.5 \times (L - D_{col}) \cdot - C_{cover}$ =	0.300	m
Try bar size # 12	Area of one bar =	113.097	mm2
Number of bars required, N_{bar} =	$\frac{A_s}{A_{bar}}$ =	5	

Because the number of bars is rounded up, make sure new reinforcement ratio < ρ_{max}

Total reinforcement area, A_{s_total} =	N_{bar} X (Area of one bar) =	565.483	mm2
d_{eff} =	D - C_{cover} - 1.5 X (dia. of one bar) =	0.207	m
Reinforcement ratio, ρ =	$\frac{A_{s\_total}}{(d_{eff} \times W)}$ =	0.00273	

From ACI Cl.7.6.1, minimum req'd clear distance between bars

C_d = max (Diameter of one bar, 1.0" (25.4mm), Min. User Spacing) = 5.000cm

Check to see if width is sufficient to accomodate bars

Isolated Footing 182