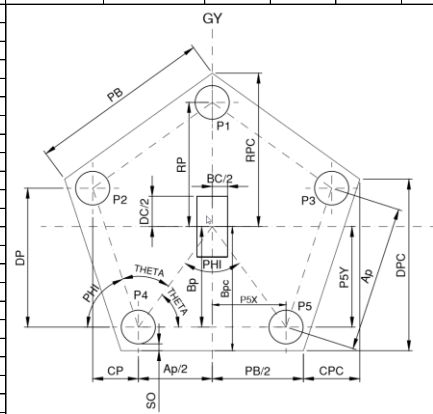




<b>Shear Reinforcement</b>									
Along Parallel edge									
Legs									5 nos
Spacing									100 mm
Along Perpendicular edge									
Legs									5 nos
Spacing									105 mm
SFR provided									
Number of SFR									6 nos
characteristic yield strength of reinforcement for shear				fyt	420.00	N/mm <sup>2</sup>	clause 11.4.2	11.4.2 — The values of $f_y$ and $f_{yk}$ used in design of shear reinforcement shall not exceed 420 MPa	
Effective depth for bottom Reinforcement				deff1	1,815.00	mm			
<b>Step 2) Pile and Pile group capacities</b>									
Pile Capacity				Ppile axial	2,000	kN			
Pile Group Capacity				Pgroup	10500	kN			
Pile Group Capacity in shear				Ppile shear	200	kN			
Pile capacity in tension				Ppile tension	500	kN			
c/c distance of pile, 'Ap'					1500	mm			
<b>Step 3) Pilecap configuration and geometry (refer sketch-01)</b>									
				(360/No of Piles)* Pi(l)/180	Phi	1.257	Radian		
				(180-(360/No of Piles))/2*Pi(l)/180	Theta	0.942	Radian		
				(Ap/2)* TAN(Theta)	Bp	1,032.29	mm		
				SQRT((Ap/2)^2+Bp^2)	Rp	1275.98	mm		
				Ap* COS(Phi)	Cp	463.53	mm		
				Ap* SIN(Phi)	Dp	1,426.58	mm		
				(Bp+Offset+ (D/2))/Bp*Ap	Pb	2,153.89	mm		
				Bp+ Offset+ D/2	Bpc	1482.29	mm		
				SQRT((Pb/2)^2+Bpc^2)	Rpc	1832.21	mm		
				Pb* COS(Phi)	Cpc	665.59	mm		
				Pb* SIN(Phi)	Dpc	2048.47	mm		
Area of pilecap				Area of pilecap	7981698	sqmm			
<b>Position of Piles</b>									
	Px	Py							
P1	0	1276							
P2	1,213.53	394							
P3	1,213.53	394							
P4	750.00	1032							
P5	750.00	1032							
<b>Step 4) Check for maximum load on one pile</b>									
<b>Forces On Piles</b>									
Weight of pilecap + Overburden weight of soil					660.70	kN			
Total Weight on Pile					1,860.01	kN	P	PMx	PMY
Load transfer to pile P1					345.08	kN	372.00	-26.92	0
Load transfer to pile P2					370.50	kN	372.00	-8.32	6.81
Load transfer to pile P3					356.87	kN	372.00	-8.32	-6.81
Load transfer to pile P4					397.99	kN	372.00	21.78	4.21
Load transfer to pile P5					389.57	kN	372.00	21.78	-4.21
Ptotal									
Maximum load on one pile					397.99	kN			
Allowable load on pile					2,100	kN			
Check						OK			
<b>Step 5) Check for maximum load on pile group</b>									
Weight of pilecap + Overburden weight of soil					660.700	kN			
Total Weight on Pile					1,842.48	kN			
Maximum load on pile group					1,842.48	kN			
Allowabl load on pile group					10,500	kN			
Check						OK			
<b>Step 6) Check for maximum shear on pile group</b>									
Maximum shear on pile group					44.04	kN			
Shear Capacity of pile group					1,000	kN			
Check									
<b>Step 7) Check for uplift on one pile</b>									
No uplift in any pile									
<b>Step 8) Design for Bending</b>									
Weight of pilecap + Overburden weight of soil					991.05	kN			
Total Weight on Pile					4,918.78	kN			
<b>Forces On Piles</b>									
Load transfer to pile P1					3,000.00	kN	983.76	-3.45	0.00
Load transfer to pile P2					3,000.00	kN	983.76	-1.07	1.60
Load transfer to pile P3					3,000.00	kN	983.76	-1.07	-1.60
Load transfer to pile P4					3,000.00	kN	983.76	2.79	0.99
Load transfer to pile P5					3,000.00	kN	983.76	2.79	-0.99
Max Load on pile					3,000.00	kN			
<b>Bottom reinforcement Along Parallel Edge</b>									
Effective depth of pilecap				Deff	1,795.00	mm			
Effective width of pile cap				Beff	900	mm			
offset from column face				Dfcol	0.86	m			
Bending moment due to pile load				Bmux	2590.58	kN-m			
% reinf. Required for Bending moment				Ptreq	0.24	%			
% minimum reinforcement				Pt min	0.18	%			
Area of reinf. Required				Ast Req (BM)	4,374	sqmm/m			
Area of reinforcement provided				Ast prv	4,406.15	sqmm/m			
<b>Top reinforcement Along Parallel Edge</b>									
Area of reinf. Required				Ast req	3375.00	sqmm/m			
Area of reinforcement provided				Ast provided	3378.05	sqmm/m			
Check						OK			
<b>Bottom reinforcement Along Perpendicular Edge</b>									
Weight of pilecap + Overburden weight of soil					991.05	kN			
Total Weight on Pile					4,918.78	kN			
<b>Forces On Piles</b>									
Load transfer to pile P1					3,000.00	kN	983.76	-3.45	0.00
Load transfer to pile P2					3,000.00	kN	983.76	-1.07	1.60
Load transfer to pile P3					3,000.00	kN	983.76	-1.07	-1.60
Load transfer to pile P4					3,000.00	kN	983.76	2.79	0.99
Load transfer to pile P5					3,000.00	kN	983.76	2.79	-0.99
Max Load on pile					3,000.00	kN			



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Effective depth of pilecap					Deff	1,815	mm						
Effective width of pile cap					Beff	900	mm						
offset from column face					DfCol	0.93	m						
Bending moment due to pile load					Bmux	2777.93	kN-m						
% reinf. Required for Bending moment					Ptreq	0.26	%						
% minimum reinforcement					Pt min	0.18	%						
Area of reinf. Required					Ast Req (BM)	4645.84	sqmm/m						
Area of reinforcement provided					Ast prv	4825.79	sqmm/m						
<b>Top reinforcement Along Perpendicular Edge</b>													
Area of reinf. Required					Ast req	3375	sqmm/m						
Area of reinforcement provided					Ast provided	3378	sqmm/m						
					Check	OK							
<b>Step 9)Design for Shear</b>													
Weight of pilecap + Overburden weight of soil						991.05	kN						
Total Weight on Pile						4,918.78	kN						
Forces On Piles								P	PMx	PMY			
Load transfer to pile P1						3,000.00	kN	983.76	-3.45	0.00			
Load transfer to pile P2						3,000.00	kN	983.76	-1.07	1.60			
Load transfer to pile P3						3,000.00	kN	983.76	-1.07	-1.60			
Load transfer to pile P4						3,000.00	kN	983.76	2.79	0.99			
Load transfer to pile P5						3,000.00	kN	983.76	2.79	-0.99			
<b>Along Parallel Edge</b>													
Section location from column center						1,247.50	mm						
Data For Pile													
Pile No	Load (kN)		Covered(mm)	% covered	Shear(kN)								
P1	3,000.00	1	0	0.00	0.00								
P2	3,000.00	2	333.9745084	55.66	1330.13								
P3	3,000.00	2	333.9745084	55.66	1330.13								
P4	3,000.00	1	0	0.00	0.00								
P5	3,000.00	1	0	0.00	0.00								
Design Shear Force						Vu	1330.13	kN					
Effective depth of pilecap						Deff	1,795	mm					
Slope for edge P1-P3							0.72654						
Slope for edge P5-P3							3.0777						
Effective width of pile cap						Beff	1,883.21	mm					
Reinforcement required						pt	0.0024						
						Vu*d/Mu	0.92						
design shear strength of concrete						φVc	1,910.89	kN	clause 11.2.2.1				
Check							OK						
						Vs	-	kN					
						Vs perm	-	kN	clause 11.4.7.9				
							-						
<b>11.2.2.1</b> $V_c = (0.16\lambda\sqrt{f'_c} + 17\rho_w \frac{V_u d}{M_u}) b_w d$ $= 0.29\lambda\sqrt{f'_c} b_w d$													
							-						
							-						
<b>11.4.7.9</b> $0.66\sqrt{f'_c} b_w d$													
<b>Shear Reinforcement Calculations</b>													
Area of shear reinforcement required						Asv req	-	sqmm/m					
Provided Shear reinforcement						Asv prv	-	sqmm/m					
Shear capacity by Shear reinforcement						Vscap	-	kN					
Check (φ * (Vc + Vs) > Vu)							-						
<b>Along Perpendicular Edge</b>													
Weight of pilecap + Overburden weight of soil						991.05	kN						
Total Weight on Pile						5,829.45	kN						
Forces On Piles								P	PMx	PMY			
Load transfer to pile P1						3,000.00	kN	1165.89	-220.88	0.00			
Load transfer to pile P2						3,000.00	kN	1165.89	-68.26	5.16			
Load transfer to pile P3						3,000.00	kN	1165.89	-68.26	-5.16			
Load transfer to pile P4						3,000.00	kN	1165.89	178.70	3.19			
Load transfer to pile P5						3,000.00	kN	1165.89	178.70	-3.19			
Section location from column center						1,257.5	mm						
Pile No	Load (kN)		Covered(mm)	% covered	Shear(kN)								
P1	3,000.00	2	282	46.92	1592.38								
P2	3,000.00	1	0	0.00	0.00								
P3	3,000.00	1	0	0.00	0.00								
P4	3,000.00	2	525	87.54	373.93								
P5	3,000.00	2	525	87.54	373.93								
Design Shear Force						Vu	1592.38	kN					
Effective depth of pilecap						Deff	1,815	mm					
shear due to P1+P2+P3							1,592	kN					
Slope for edge P1+P2+P3							1.376	mm					
Effective width of pile cap for P1+P2+P3						Beff1	1,582.03	mm					
shear due to P4+P5							747.86	kN					
Effective width of pile cap						Beff2	2,300	mm					
Reinforcement required						pt	0.0026	ratio					
						Vu*d/Mu	1.00						
						φVc1	1,634.66	kN	clause 11.2.2.1				
						φVc2	2,376.47	kN					
							OK						
						Vs1	-						
						Vs2	-						
						Vs	-	kN					
						Vs perm	-	kN	clause 11.4.7.9				
							-						
							-						
<b>11.2.2.1</b> $V_c = (0.16\lambda\sqrt{f'_c} + 17\rho_w \frac{V_u d}{M_u}) b_w d$ $= 0.29\lambda\sqrt{f'_c} b_w d$													
							-						
							-						
<b>11.4.7.9</b> $0.66\sqrt{f'_c} b_w d$													
<b>Shear Reinforcement Calculations</b>													
Area of shear reinforcement required						Asv req	-	sqmm					
Provided Shear reinforcement						Asv prv	-	sqmm					
Shear capacity by Shear reinforcement						Vscap	-	kN					
Check (φ * (Vc + Vs) > Vu)							-						
<b>Step 10)Design of Face reinforcement</b>													
Area of side face reinf. Required						Asfr Req	468.75	sqmm					
Area of side face reinf. Provided						Asfr pro	425	sqmm					

Step 11) Design For Column Load Transfer										10.14 — Bearing strength	
Area of pilecap base			Area of Pilecap	A1	7.98	sqm	Clause 10.14			10.14.1 — Design bearing strength of concrete shall not exceed $\phi(0.85f_c A_1)$ , except when the supporting surface is wider on all sides than the loaded area, then the design bearing strength of the loaded area shall be permitted to be multiplied by $\sqrt{A_2/A_1}$ but by not more than 2.	
Area of column			Bc x Dc	A2	0.49	sqm	Clause 10.14				
Modification Factor			Sqrt(A1/A2) <= 2		2		Clause 10.14				
Concrete Bearing capacity			$\Phi_c \times 0.85 \times \text{Modification Factor} \times A_2 \times F_{ck} \times 1000$		10829	kN	Clause 10.14				
Check							OK				
Area Of Dowels							-	sqmm			