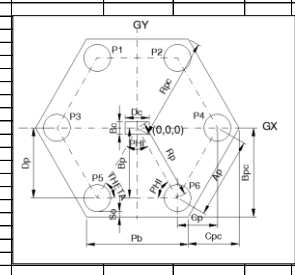


| TITLE : | | DESIGN OF PEDESTAL PILECAP | | |
|---|---|--|-------------------|--------------------------|
| SUB-TITLE : | | DESIGN OF FOOTING FOR FLEXURE, SHEAR AND LOAD TRANSFER | | |
| CODE OF PRACTICE : | | ACI-318M-14 | | |
| CODE TITLE : | | BUILDING CODE REQUIREMENT FOR STRUCTURAL CONCRETE | | |
| DESIGN TYPE : | | ULTIMATE STATE DESIGN | | |
| NOTE - 1) User to input data in cell marked as Blue. | | | | |
| 2) Design follows Limit State Method. | | | | |
| 3) Forces of one section has been considered for design | | | | |
| Step 1) User Input | | | | |
| PARAMETERS : | SYMBOL | USER INPUT | UNITS | Reference / Comments |
| Pilecap No | | | PC6 | |
| Column No | | | C6 | |
| characteristic compressive strength of concrete (Cylindrical Strength) | f_c | 20.00 | N/mm ² | input from user |
| characteristic strength of reinforcement | f_y | 420.00 | N/mm ² | input from user |
| Cover to Bottom reinforcement | C_c | 50.00 | mm | input from user |
| Diameter of Bottom reinforcement | d_{b1} | 25.40 | mm | input from user |
| Diameter of top reinforcement | d_{t2} | 15.40 | mm | input from user |
| Diameter of shear reinforcement along perpendicular direction | d_{s3} | 9.50 | mm | input from user |
| Diameter of shear reinforcement along parallel direction | d_{s4} | 9.50 | mm | input from user |
| Diameter of SFR | d_{s4} | 9.50 | mm | input from user |
| Minimum % steel at Bottom | p_{tmin} | 0.18 | % | input from user |
| Minimum % steel at Top | p_{cmin} | 0.18 | % | input from user |
| % SFR on each face | | 0.05 | % | input from user |
| Width of Column | B_c | 700 | mm | input from user |
| Depth of Column | D_c | 700 | mm | input from user |
| Density of Soil | γ_s | 18.00 | kN/cum | input from user |
| Foundation depth | D_f | 4.00 | m | input from user |
| Depth of Water table below Ground level | D_w | | m | |
| Pile capacity in Compression | | 2,000.00 | kN | input from user |
| Pile Capacity in Tension | | 500.00 | kN | input from user |
| Pile Capacity in Shear | | 200.00 | kN | input from user |
| Pile Capacity Reduction | | 0 | % | |
| Pile Overloading | | 5 | % | input from user |
| Pile Group Overloading | | 5 | % | input from user |
| Self Weight multiplying factor for load check (Maximum load on one pile) | | 1.00 | | input from user |
| Self Weight multiplying factor for load check (Maximum load on Pile Group) | | 1.00 | | input from user |
| Self Weight multiplying factor for load check (Uplift load on pile) | | 1.00 | | input from user |
| Self Weight multiplying factor for load check (Bottom reinf. Along Parallel Edge) | | 1.10 | | input from user |
| Self Weight multiplying factor for load check (Bottom reinf. Along perpendicular Edge) | | 1.10 | | input from user |
| Self Weight multiplying factor for load check (One way shear. Along parallel Edge) | | 1.10 | | input from user |
| Self Weight multiplying factor for load check (One way shear. Along perpendicular Edge) | | 1.10 | | input from user |
| Capacity Increase Factor for SBC check (Eq / Wind) | | 0 | % | input from user |
| Consider Capacity Design | | Yes | | input from user |
| Factor for Capacity Design | | 1.50 | | input from user |
| Consider Overburden pressure | | Yes | | input from user |
| Diameter of Pile | D | 600 | mm | input from user |
| Number of piles | | 8 | | input from user |
| Pile Spacing (multiplication of diameter of pile) | | 2.50 | ϕ | input from user |
| Pilecap offset | | 150 | mm | input from user |
| Depth of pilecap | | 2,050 | mm | input from user |
| Partial factor of safety for Moment | Φ_1 | 0.90 | constant | Clause 9.3.2.1 (Default) |
| Partial factor of safety for Shear | Φ_2 | 0.75 | constant | Clause 9.3.2.3 (Default) |
| Partial factor of safety for Bearing | $\Phi_{2.1}$ | 0.65 | constant | Clause 9.3.2.4 (Default) |
| Forces from Service load Combinations (maximum Load on one Pile) | | | | |
| Governing Load combination | | Lateral | | |
| Axial Force | P_{comb} | 1,761.07 | kN | from analysis results |
| Moment along Major Direction | M_x | -82.74 | kN-m | from analysis results |
| Moment along Minor Direction | M_y | -15.06 | kN-m | from analysis results |
| Forces from Service load Combinations (maximum Load on Pile Group) | | | | |
| Axial Force | P_{comb} | 1,774.25 | kN | from analysis results |
| Moment along Major Direction | M_x | -16.73 | kN-m | from analysis results |
| Moment along Minor Direction | M_y | -15.74 | kN-m | from analysis results |
| Forces from Service load Combinations (maximum Shear on one Pile) | | | | |
| Governing Load combination | | Lateral | | |
| Shear along Major Direction | V_x | 50.59 | kN | from analysis results |
| Shear along Minor Direction | V_y | -6.14 | kN | from analysis results |
| Forces from Service load Combinations (Uplift on one pile) | | | | |
| Governing Load combination | | Lateral | | |
| Axial Force | P_{comb} | 3,155.60 | kN | from analysis results |
| Moment along Major Direction | M_x | -14.26 | kN-m | from analysis results |
| Moment along Minor Direction | M_y | -9.94 | kN-m | from analysis results |
| Forces from Limit load Combinations (Bottom reinforcement Along parallel Edge) | | | | |
| Axial Force | P_u | 4,063.08 | kN | from analysis results |
| Moment along Major Direction | M_{ux} | -20.41 | kN-m | from analysis results |
| Moment along Minor Direction | M_{uy} | -1.60 | kN-m | from analysis results |
| Forces from Limit load Combinations (Bottom reinforcement Along Perpendicular Edge) | | | | |
| Axial Force | P_u | 4,063.08 | kN | from analysis results |
| Moment along Major Direction | M_{ux} | -20.41 | kN-m | from analysis results |
| Moment along Minor Direction | M_{uy} | -1.60 | kN-m | from analysis results |
| Forces from Limit load Combinations (One way shear-Along Parallel Edge) | | | | |
| Axial Force | P_u | 4,063.08 | kN | from analysis results |
| Moment along Major Direction | M_{ux} | -20.41 | kN-m | from analysis results |
| Moment along Minor Direction | M_{uy} | -1.60 | kN-m | from analysis results |
| Forces from Limit load Combinations (One way shear-Along Perpendicular Edge) | | | | |
| Axial Force | P_u | 4,063.08 | kN | from analysis results |
| Moment along Major Direction | M_{ux} | -20.41 | kN-m | from analysis results |
| Moment along Minor Direction | M_{uy} | -1.60 | kN-m | from analysis results |
| Forces from Limit load Combinations (Load Transfer Check) | | | | |
| Axial Force | P_u | 4,063.08 | kN | from analysis results |
| Moment along Major Direction | M_{ux} | -20.41 | kN-m | from analysis results |
| Moment along Minor Direction | M_{uy} | -1.60 | kN-m | from analysis results |
| Detailing of Bottom/Top reinforcement | | | | |
| Spacing of reinforcement at Bottom Along parallel edge | | 120 | mm | input from user |
| Reinforcement diameter at Bottom along parallel edge | | 28.70 | mm | input from user |
| Number of reinforcement at Bottom Along perpendicular edge | | 115 | | input from user |
| Reinforcement diameter at Bottom along perpendicular edge | | 25.40 | mm | input from user |
| Number of reinforcement at Top Along parallel edge | | 135 | | input from user |
| Reinforcement diameter at Top Along parallel edge | | 25.40 | mm | input from user |
| Number of reinforcement at Top Along perpendicular edge | | 135 | | input from user |
| Reinforcement diameter at Top Along perpendicular edge | | 25.40 | mm | input from user |
| Shear Reinforcement | | | | |
| Along Parallel edge | | | | |
| Legs | | | | |
| Spacing | | | 100 | mm |
| Along Perpendicular edge | | | | |
| Legs | | | | |
| Spacing | | | 105 | mm |
| SFR provided | | | | |
| Number of SFR | | 8 | | nds |
| characteristic yield strength of reinforcement for shear | f_{yt} | 420.00 | N/mm ² | clause 11.4.2 |
| Effective depth for bottom Reinforcement | d_{ef1} | 1,990.00 | mm | |
| Step 2) Pile and Pile group capacities | | | | |
| Pile Capacity | | | 2,000 | kN |
| Pile Group Capacity | | | 17,600 | kN |
| Pile Group Capacity in shear | | | 200 | kN |
| Pile capacity in tension | | | 500 | kN |
| c/c distance of pile, 'Ap' | | | 1500 | mm |
| Step 3) Pilecap configuration and geometry (refer sketch-01) | | | | |
| | $(360/\text{No of Piles}) \times \pi / 180$ | Φ | 1.047 | Radian |
| | $(180 - (360/\text{No of Piles})) / 2 \times \pi / 180$ | Θ | 1.047 | Radian |
| | $D \times \text{Pile spacing}$ | A_p | 1,500.00 | mm |
| | $(A_p / 2) \times \tan(\Theta)$ | B_p | 1,299.04 | mm |
| | $\text{SQRT}((A_p / 2)^2 + (B_p^2))$ | R_p | 1,500.00 | mm |
| | $A_p \times \cos(\Phi)$ | C_p | 750.00 | mm |
| | $A_p \times \sin(\Phi)$ | D_p | 1,299.04 | mm |
| | $(B_p \times \text{Offset} + (D / 2)) / B_p \times A_p$ | P_b | 2,020 | mm |
| | $B_p \times \text{Offset} + D / 2$ | B_{pc} | 1,749.04 | mm |
| | $\text{SQRT}((P_b / 2)^2 + (B_{pc}^2))$ | R_{pc} | 2,019.62 | mm |
| | $P_b \times \cos(\Phi)$ | C_{pc} | 1,009.81 | mm |
| | $P_b \times \sin(\Phi)$ | D_{pc} | 1,749.04 | mm |



9.3.2.1 — Tension-controlled sections
Strength reduction factor ϕ 0.90

9.3.2.3 — Shear and torsion 0.75

9.3.2.4 — Bearing on concrete (except for post-tensioned anchorage zones and strut-and-tie models) 0.65

11.4.2 — The values of f_y and f_{yt} used in design of shear reinforcement shall not exceed 420 MPa

| Area of pilecap | | Position of Piles | | Area of pilecap | | 10597152 | | sqmm | |
|--|-----------|-------------------|-----------|--|---------|---|--|---|--|
| P1 | 750 | 1299 | | | | | | | |
| P2 | 750 | 1299 | | | | | | | |
| P3 | 1500 | 0 | | | | | | | |
| P4 | 1500 | 0 | | | | | | | |
| P5 | 750 | 1299 | | | | | | | |
| P6 | 750 | 1299 | | | | | | | |
| Step 4) Check for maximum load on one pile | | | | | | | | | |
| Forces On Piles | | | | | | | | | |
| Weight of pilecap + Overburden weight of soil | | | | Soil Wt + Pilecap Wt | | | | | |
| Total Weight on Pile | | | | Pcomb + Soil Wt + Pilecap Wt | | Total | | 2,658.94 kN | |
| Forces On Piles | | | | P | | PMx | | PMy | |
| Load transfer to pile P1 | | | | (P+ PMx* Pmy) of P1 | | 455.25 kN | | 443.16 | |
| Load transfer to pile P2 | | | | (P+ PMx* Pmy) of P2 | | 436.84 kN | | 443.16 | |
| Load transfer to pile P3 | | | | (P+ PMx* Pmy) of P3 | | 461.54 kN | | 443.16 | |
| Load transfer to pile P4 | | | | (P+ PMx* Pmy) of P4 | | 424.77 kN | | 443.16 | |
| Load transfer to pile P5 | | | | (P+ PMx* Pmy) of P5 | | 449.45 kN | | 443.16 | |
| Load transfer to pile P6 | | | | (P+ PMx* Pmy) of P6 | | 431.06 kN | | 443.16 | |
| Total | | | | 467.94 kN | | P = | | Total/ No of Piles | |
| Maximum load on one pile | | | | 2,190 kN | | PMx = | | Axial Load on Pile due to moment Mx = (Mx/6*Ap) | |
| Allowable load on pile | | | | OK | | Pmy = | | Axial Load on Pile due to moment My = (My/4*Bp) | |
| Check | | | | Max load on one pile < All. load on one Pile | | | | | |
| Step 5) Check for maximum load on pile group | | | | | | | | | |
| Weight of pilecap + Overburden weight of soil | | | | Soil Wt + Pilecap Wt | | | | | |
| Total Weight on Pile | | | | Pcomb + Soil Wt + Pilecap Wt | | Total | | 2,672.12 kN | |
| Maximum load on pile group | | | | 12,600 kN | | Pgroup | | OK | |
| Allowabl load on pile group | | | | Max load on pilegroup < All. load on Pilegroup | | | | | |
| Check | | | | OK | | | | | |
| Step 6) Check for maximum shear on pile group | | | | | | | | | |
| Maximum shear on pile group | | | | Sqrt (Vx*2 + Vy*2) | | | | | |
| Shear Capacity of pile group | | | | Ppile shear | | 1,200 kN | | OK | |
| Check | | | | Max shear on pilegroup < All. shear on Pilegroup | | | | | |
| Step 7) Check for uplift on one pile | | | | | | | | | |
| No uplift in any pile | | | | | | | | | |
| Step 8)Design for Bending | | | | | | | | | |
| Weight of pilecap + Overburden weight of soil | | | | Soil Wt + Pilecap Wt | | | | | |
| Total Weight on Pile | | | | Pcomb + Soil Wt + Pilecap Wt | | Total | | 1,077.44 kN | |
| Forces On Piles | | | | P | | PMx | | PMy | |
| Load transfer to pile P1 | | | | (P+ PMx* Pmy) of P1 | | 3,000.00 kN | | 856.75 | |
| Load transfer to pile P2 | | | | (P+ PMx* Pmy) of P2 | | 3,000.00 kN | | 856.75 | |
| Load transfer to pile P3 | | | | (P+ PMx* Pmy) of P3 | | 3,000.00 kN | | 856.75 | |
| Load transfer to pile P4 | | | | (P+ PMx* Pmy) of P4 | | 3,000.00 kN | | 856.75 | |
| Load transfer to pile P5 | | | | (P+ PMx* Pmy) of P5 | | 3,000.00 kN | | 856.75 | |
| Load transfer to pile P6 | | | | (P+ PMx* Pmy) of P6 | | 3,000.00 kN | | 856.75 | |
| Max Load on pile | | | | 3,000.00 kN | | P | | Total/ No of Piles | |
| Bottom reinforcement Along Parallel Edge | | | | Depth-Cover-20-20/2 | | Deff | | 1,990 mm | |
| Effective depth of pilecap | | | | Pile dia+ 2*Offset | | Beff | | 900 mm | |
| Effective width of pile cap | | | | Dfcol | | 141 mm | | PMx = | |
| offset from column face | | | | (Apw/2-20/2)/1000 | | Dfcol | | Pmy = | |
| Bending moment due to pile load | | | | P * Dfcol | | Bmux | | 3450.00 kN-m | |
| % reinf. Required for bending moment | | | | (0.85*fc/fy*(1-SQR(1-(2*(Bmux*10^6/(Beff*Deff^2)))/(0.9*0.85*fc)))*100 | | Ptreq | | 0.26 % | |
| % minimum reinforcement | | | | Pt min | | 0.18 % | | 8.6.1.1 | |
| Area of reinf. Required | | | | Pt *Deff *1000 | | Ast Req (BM) | | 5,268 sqmm/m | |
| Area of reinforcement provided | | | | Ast prv | | 5,311 sqmm/m | | OK | |
| Check | | | | Ast provided > Ast req | | | | | |
| Top reinforcement Along Parallel Edge | | | | Ast req | | 3690 sqmm/m | | OK | |
| Area of reinf. Required | | | | Ast provided | | 3789 sqmm/m | | OK | |
| Area of reinforcement provided | | | | Ast provided > Ast req | | OK | | OK | |
| Check | | | | OK | | | | | |
| Bottom reinforcement Along Perpendicular Edge | | | | | | | | | |
| Weight of pilecap + Overburden weight of soil | | | | Soil Wt + Pilecap Wt | | | | | |
| Total Weight on Pile | | | | Pcomb + Soil Wt + Pilecap Wt | | Total | | 1,077.44 kN | |
| Forces On Piles | | | | P | | PMx | | PMy | |
| Load transfer to pile P1 | | | | (P+ PMx* Pmy) of P1 | | 3,000.00 kN | | 856.75 | |
| Load transfer to pile P2 | | | | (P+ PMx* Pmy) of P2 | | 3,000.00 kN | | 856.75 | |
| Load transfer to pile P3 | | | | (P+ PMx* Pmy) of P3 | | 3,000.00 kN | | 856.75 | |
| Load transfer to pile P4 | | | | (P+ PMx* Pmy) of P4 | | 3,000.00 kN | | 856.75 | |
| Load transfer to pile P5 | | | | (P+ PMx* Pmy) of P5 | | 3,000.00 kN | | 856.75 | |
| Load transfer to pile P6 | | | | (P+ PMx* Pmy) of P6 | | 3,000.00 kN | | 856.75 | |
| Max Load on pile | | | | 3,000.00 kN | | P | | Total/ No of Piles | |
| Effective depth of pilecap | | | | Depth-Cover-20-20/2 | | Deff | | 1,990 mm | |
| Effective width of pile cap | | | | Pile dia+ 2*Offset | | Beff | | 900 mm | |
| offset from column face | | | | (Apw/2-20/2)/1000 | | Dfcol | | 0.95 m | |
| Bending moment due to pile load | | | | P * Dfcol | | Bmux | | 2847.11 kN-m | |
| % reinf. Required for bending moment | | | | (0.85*fc/fy*(1-SQR(1-(2*(Bmux*10^6/(Beff*Deff^2)))/(0.9*0.85*fc)))*100 | | Ptreq | | 0.22 % | |
| % minimum reinforcement | | | | Pt min | | 0.18 % | | 8.6.1.1 | |
| Area of reinf. Required | | | | Pt *Deff *1000 | | Ast Req (BM) | | 4,362 sqmm/m | |
| Area of reinforcement provided | | | | Ast prv | | 4406 sqmm/m | | OK | |
| Check | | | | Ast provided > Ast req | | | | | |
| Top reinforcement Along Perpendicular Edge | | | | Ast req | | 3690 sqmm/m | | OK | |
| Area of reinf. Required | | | | Ast provided | | 3789 sqmm/m | | OK | |
| Area of reinforcement provided | | | | Ast provided > Ast req | | OK | | OK | |
| Check | | | | OK | | | | | |
| Step 9)Design for Shear | | | | | | | | | |
| Weight of pilecap + Overburden weight of soil | | | | Soil Wt + Pilecap Wt | | | | | |
| Total Weight on Pile | | | | Pcomb + Soil Wt + Pilecap Wt | | Total | | 1,077.44 kN | |
| Forces On Piles | | | | P | | PMx | | PMy | |
| Load transfer to pile P1 | | | | (P+ PMx* Pmy) of P1 | | 3,000.00 kN | | 856.75 | |
| Load transfer to pile P2 | | | | (P+ PMx* Pmy) of P2 | | 3,000.00 kN | | 856.75 | |
| Load transfer to pile P3 | | | | (P+ PMx* Pmy) of P3 | | 3,000.00 kN | | 856.75 | |
| Load transfer to pile P4 | | | | (P+ PMx* Pmy) of P4 | | 3,000.00 kN | | 856.75 | |
| Load transfer to pile P5 | | | | (P+ PMx* Pmy) of P5 | | 3,000.00 kN | | 856.75 | |
| Load transfer to pile P6 | | | | (P+ PMx* Pmy) of P6 | | 3,000.00 kN | | 856.75 | |
| Along Parallel Edge | | | | 1,345.00 mm | | P = | | Total/ No of Piles | |
| Section location from column center | | | | 1,345.00 mm | | PMx = | | Axial Load on Pile due to moment Mx = (Mx/6*Ap) | |
| Data For Pile | | | | Pmy = | | Axial Load on Pile due to moment My = (My/4*Bp) | | | |
| Pile No | Load (kN) | Covered(mm) | % covered | Shear(kN) | | | | | |
| P1 | 3,000.00 | 1 | 0.00 | 0.00 | | | | | |
| P2 | 3,000.00 | 1 | 0.00 | 0.00 | | | | | |
| P3 | 3,000.00 | 2 | 145 | 149.17 | 2275.00 | | | | |
| P4 | 3,000.00 | 2 | 145 | 24.17 | 2275.00 | | | | |
| P5 | 3,000.00 | 1 | 0.00 | 0.00 | 0.00 | | | | |
| P6 | 3,000.00 | 1 | 0.00 | 0.00 | 0.00 | | | | |
| * Covered & % Covered calculation- Refer 4piles validation sheet | | | | | | | | | |
| Design Shear Force | | | | Vu | | 2275.00 kN | | OK | |
| Effective depth of pilecap | | | | Depth-Cover-20-20/2 | | Deff | | 1,990 mm | |
| Stape for edge P1-P3 | | | | 1,7295 mm | | Beff | | 2,336 mm | |
| Effective width of pile cap | | | | 1,0026 mm | | Vt | | 11.2.2.1 | |
| Reinforcement required | | | | Ast req/ (1000*Deff) | | 1.00 | | 11.2.2.1 | |
| design shear strength of concrete | | | | Vu < phi*Vc | | 2,652.70 kN | | clause 11.2.2.1 | |
| Check | | | | Vu < phi*Vc/phi | | kN | | 11.4.7.9 | |
| Check | | | | Vs > Vs perm | | kN | | 11.4.7.9 | |
| Shear Reinforcement Calculations | | | | | | | | | |
| Area of shear reinforcement required | | | | (Vs*1000/(Deff*(fy))*1000 | | Ast req | | sqmm/m | |
| Provided Shear reinforcement | | | | Ast prv | | sqmm/m | | OK | |
| Shear capacity by Shear reinforcement | | | | [phi * (Vc + Vs)] > Vu | | kN | | OK | |
| Check | | | | OK | | | | | |
| Along Perpendicular Edge | | | | | | | | | |
| Weight of pilecap + Overburden weight of soil | | | | Soil Wt + Pilecap Wt | | | | | |
| Total Weight on Pile | | | | Pcomb + Soil Wt + Pilecap Wt | | Total | | 1,077.44 kN | |
| Forces On Piles | | | | P | | PMx | | PMy | |
| Load transfer to pile P1 | | | | (P+ PMx* Pmy) of P1 | | 3,000.00 kN | | 856.75 | |
| Load transfer to pile P2 | | | | (P+ PMx* Pmy) of P2 | | 3,000.00 kN | | 856.75 | |
| Load transfer to pile P3 | | | | (P+ PMx* Pmy) of P3 | | 3,000.00 kN | | 856.75 | |
| Load transfer to pile P4 | | | | (P+ PMx* Pmy) of P4 | | 3,000.00 kN | | 856.75 | |
| Load transfer to pile P5 | | | | (P+ PMx* Pmy) of P5 | | 3,000.00 kN | | 856.75 | |
| Load transfer to pile P6 | | | | (P+ PMx* Pmy) of P6 | | 3,000.00 kN | | 856.75 | |
| Section location from column center | | | | 1,355.00 mm | | P = | | Total/ No of Piles | |
| Pile No | Load (kN) | Covered(mm) | % covered | Shear(kN) | | | | | |
| P1 | 3,000.00 | 2 | 336 | 55.99 | 1320.19 | | | | |
| P2 | 3,000.00 | 2 | 336 | 55.99 | 1320.19 | | | | |
| P3 | 3,000.00 | 1 | 0.00 | 0.00 | 0.00 | | | | |
| P4 | 3,000.00 | 1 | 0.00 | 0.00 | 0.00 | | | | |
| P5 | 3,000.00 | 2 | 336 | 55.99 | 1320.19 | | | | |
| P6 | 3,000.00 | 2 | 336 | 55.99 | 1320.19 | | | | |
| * Covered & % Covered calculation- Refer 4piles validation sheet | | | | | | | | | |

| | | | | | | | |
|--|--|---|--------------------|----------|-------|-----------------|---|
| Design Shear Force | | | Vu | 2640.38 | kN | | |
| Effective depth of pilecap | | Depth-Cover-20-20/2 | Deff | 1.978 | m | | |
| Shear due to P1+P2+P3 | | | | 2.640 | kN | | |
| Slope for edge P1+P2+P3 | | Cpc/ Dpc | | 0.577 | | | |
| Effective width of pile cap for P1+P2 | | | | 2.497.71 | mm | | |
| Reinforcement required | | Ast req/ (1000*Deff) | pt | 0.0022 | ratio | | |
| | | | Vu*d/Mu | 1.00 | | | |
| | | | ΦVc | 2.779.70 | kN | clause 11.2.2.1 | 11.2.2.1 $V_c = (0.16\lambda/\sqrt{f'_c} + 1) \rho_w \frac{V_{ed}}{W_{pl}} b_w d$ $= 0.294 \sqrt{f'_c} b_w d$ |
| | | {shear due to P1+P2+P3} < ΦVc | Vs | - | | | |
| | | {shear due to P1+P2+P3} - ΦVc / φ | Vs.perm | - | kN | clause 11.4.7.9 | 11.4.7.9 $0.66 \sqrt{f'_c} b_w d$ |
| Check | | Vs > Vs perm | | - | | | |
| Shear Reinforcement Calculations | | | | | | | |
| Area of shear reinforcement required | | (Vs*1000/(Deff*Vt1))*1000 | Asv req | - | Sqmm | | |
| Provided Shear reinforcement | | | Asv prv | - | Sqmm | | |
| Shear capacity by Shear reinforcement | | Asv prv* Deff* fyt | Vscap | - | kN | | |
| Check | | {φ * (Vc + Vs)} > Vu | | - | | | |
| Step 10 Design of Face reinforcement | | | | | | | |
| Beff considered for SFR | | | Beff SFR | 500 | mm | | |
| Area of side face reinf. Required | | SFR% x D x Beff sfr | Asfr Req | 512.0 | Sqmm | | |
| Area of side face reinf. Provided | | | Asfr pro | 567.05 | Sqmm | | |
| Step 11 Design For Column Load Transfer | | | | | | | 10.14 – Bearing strength |
| Area of pilecap base | | Area of Pilecap | A1 | 10.90 | sqm | Clause 10.14 | 10.14.1 – Design bearing strength of concrete shall not exceed $0.86 f'_c A_1$, 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 $\lambda_{ed} A_1$, but by not more than 2. |
| Area of column | | Bc x Dc | A2 | 0.40 | sqm | Clause 10.14 | |
| Modification Factor | | Sqrt(A1/A2) <= 2 | | 2 | | Clause 10.14 | |
| Concrete Bearing capacity | | Φ _c x 0.85 x Modification Factor x A2 x Fck x 1000 | Φ _c Pnb | 10829 | kN | Clause 10.14 | |
| Check | | Φ _c Pnb > Pu | | SAFE | | | |
| Area Of Dowels | | | | - | sqmm | | |