| | | | | | |
|---|---|---|---|---|---|
| TITLE : | DESIGN OF PEDESTAL PILECAP | | | | |
| SUB -TITLE : | DESIGN OF FOOTING FOR FLEXURE,SHEAR AND LOAD TRANSFER | | | | |
| CODE OF PRACTICE : | ACI-318M-11 | | | | |
| 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 | | | PC23 | | |
| Column No | | | C23 | | |
| Cylindrical Strength strength of concrete | | f'c | 20.00 | $N/mm^2$ | *User Input* |
| characteristic strength of reinforcement | | fy | 420.00 | $N/mm^2$ | *User Input* |
| Cover to Bottom reinforcement | | Cc | 50.00 | mm | *User Input* |
| Diameter of Bottom reinforcement | | dia1 | 20.00 | mm | *User Input* |
| Diameter of top reinforcement | | dia2 | 20.00 | mm | *User Input* |
| Minimum % steel at Bottom | | ptmin | 0.12 | % | *User Input* |
| Minimum % steel at Top | | pcmin | 0.18 | % | *User Input* |
| % SFR on each face | | | 0.05 | % | *User Input* |
| Width of Column | | Bc | 600 | mm | *User Input* |
| Depth of Column | | Dc | 800 | mm | *User Input* |
| Density of Soil | | ys | 18.00 | kN/cum | *User Input* |
| Foundation depth | | Df | 4.00 | m | *User Input* |
| Depth of Water table below Ground level | | Dw | - | m | *User Input* |
| Pile capacity in Compression | | | 1,250.00 | kN | *User Input* |
| Pile Capacity in Tension | | | 150.00 | kN | *User Input* |
| Pile Capacity in Shear | | | 200.00 | kN | *User Input* |
| Pile Capacity Reduction | | | 0 | % | *User Input* |
| Pile Overloading | | | 10 | % | *User Input* |
| Pile Group Overloading | | | 10 | % | *User Input* |
| Capacity Increase Factor for SBC check (Eq / Wind) | | | 10 | % | *User Input* |
| Consider Capacity Design | | | No | | *User Input* |
| Factor for Capacity Design | | | 1.50 | | *User Input* |
| Consider Overburden pressure | | | Yes | | *User Input* |
| Diameter of Pile | | D | 750 | mm | *User Input* |
| Number of piles | | No of Piles | 3 | nos | *User Input* |
| Pile Spacing (multiplication of diameter of pile) | | Factor | 2.50 | xΦ | *User Input* |
| Pilecap offset | | Offset | 150 | mm | *User Input* |
| Depth of pilecap | | Depth | 750 | mm | *User Input* |
| Partial factor of safety for Moment | | Φ1 | 0.90 | constant | Clause 9.3.2.1 (Default) |
| Partial factor of safety for Shear | | Φ2 | 0.75 | constant | Clause 9.3.2.3 (Default) |
| Partial factor of safety for Bearing | | Φ2.1 | 0.65 | constant | Clause 9.3.2.4 (Default) |
| **Forces from Service load Combinations (maximum Load on one Pile)** | | | | | |
| Governing Load combination | | | Lateral | | *User Input* |
| Self Weight multiplying factor for load check (Maximum load on one pile) | | | 1.00 | | *User Input* |
| Axial Force | | Pcomb | 2,964.38 | kN | *User Input* |
| Moment along Major Direction | | Mx | -136.59 | kN-m | *User Input* |
| Moment along Minor Direction | | My | -6.44 | kN-m | *User Input* |
| **Forces from Service load Combinations (maximum Load on Pile Group)** | | | | | |
| Self Weight multiplying factor for load check (Maximum load on Pile Group) | | | 1.00 | | *User Input* |
| Axial Force | | Pcomb | 3,148.30 | kN | *User Input* |
| Moment along Major Direction | | Mx | -17.22 | kN-m | *User Input* |
| Moment along Minor Direction | | My | -6.14 | kN-m | *User Input* |

**9.3.2.1** — Tension-controlled sections
Strength reduction factor $\phi$ .....0.90

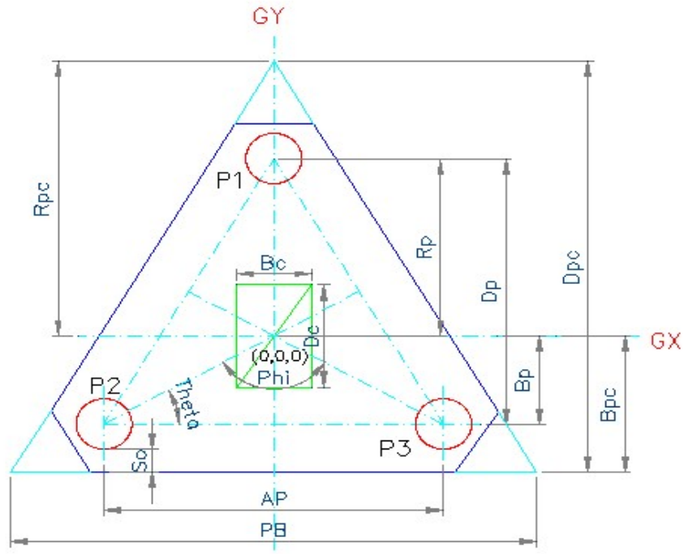
**9.3.2.3** — Shear and torsion .....0.75

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

| | | | | | |
|---|---|---|---|---|---|
| **Forces from Service load Combinations (maximum Shear on one Pile)** | | | | | |
| Governing Load combination | | Lateral | | *User Input* | |
| Shear along Major Direction | Vx | 2.61 | kN | *User Input* | |
| Shear along Minor Direction | Vy | 65.45 | kN | *User Input* | |
| **Forces from Service load Combinations (Uplift on one pile)** | | | | | |
| Governing Load combination | | Lateral | | *User Input* | |
| Self Weight multiplying factor for load check (Uplift load on pile) | | 1.00 | | *User Input* | |
| Axial Force | Pcomb | - | kN | *User Input* | |
| Moment along Major Direction | Mx | - | kN-m | *User Input* | |
| Moment along Minor Direction | My | - | kN-m | *User Input* | |
| **Forces from Limit load Combinations (Bottom reinforcement Along parallel Edge)** | | | | | |
| Self Weight multiplying factor for load check (Bottom reinf. Along Parallel Edge) | | 1.20 | | *User Input* | |
| Axial Force | Pu | 4,054.19 | kN | *User Input* | |
| Moment along Major Direction | Mux | -23.23 | kN-m | *User Input* | |
| Moment along Minor Direction | Muy | -8.19 | kN-m | *User Input* | |
| **Forces from Limit load Combinations (Bottom reinforcement Along Perpendicular Edge)** | | | | | |
| Self Weight multiplying factor for load check (Bottom reinf. Along perpendicular Edge) | | 1.20 | | *User Input* | |
| Axial Force | Pu | 3,609.75 | kN | *User Input* | |
| Moment along Major Direction | Mux | -341.99 | kN-m | *User Input* | |
| Moment along Minor Direction | Muy | -9.12 | kN-m | *User Input* | |
| **Forces from Limit load Combinations (One way shear-Along Parallel Edge)** | | | | | |
| Self Weight multiplying factor for load check (One way shear. Along parallel Edge) | | 1.20 | | *User Input* | |
| Axial Force | Pu | 4,054.19 | kN | *User Input* | |
| Moment along Major Direction | Mux | -23.23 | kN-m | *User Input* | |
| Moment along Minor Direction | Muy | -8.19 | kN-m | *User Input* | |
| **Forces from Limit load Combinations (One way shear-Along Perpendicular Edge)** | | | | | |
| Self Weight multiplying factor for load check (Onnway shaer. Along perpendicular Edge) | | 1.20 | | *User Input* | |
| Axial Force | Pu | 3,609.75 | kN | *User Input* | |
| Self Weight multiplying factor for load check (Onnway shaer. Along perpendicular Edge) | | 1.20 | | *User Input* | |
| Axial Force | Pu | 3,609.75 | kN | *User Input* | |
| Moment along Major Direction | Mux | -341.99 | kN-m | *User Input* | |
| Moment along Minor Direction | Muy | -9.12 | kN-m | *User Input* | |
| **Forces from Limit load Combinations (Load Transfer Check)** | | | | | |
| Axial Force | Pu | 4,054.19 | kN | *User Input* | |
| **Detailing of Bottom/Top reinforcement** | | | | | |
| Spacing of reinforcement at Bottom Along parallel edge | | 130 | | *User Input* | |
| Reinforcement diameter at Bottom along parallel edge | | 25.40 | mm | *User Input* | |
| Number of reinforcement at Bottom Along perpendicular edge | | 115 | | *User Input* | |
| Reinforcement diameter at Bottom along perpendicular edge | | 25.40 | mm | *User Input* | |
| Number of reinforcement at Top Along parallel edge | | 145 | | *User Input* | |
| Reinforcement diameter at Top Along parallel edge | | 15.90 | mm | *User Input* | |
| Number of reinforcement at Top Along perpendicular edge | | 145 | nos | *User Input* | |
| Reinforcement diameter at Top Along perpendicular edge | | 15.90 | mm | *User Input* | |
| **Shear Reinforcement** | | | | | |
| Along Parallel edge | | | | | |
| Diameter of shear reinf. | dia3 | 15.90 | mm | *User Input* | |
| Legs | | 5 | mm | *User Input* | |
| Spacing | | 100 | mm | *User Input* | |
| Along Perpendicular edge | | | | | |
| Diameter of shear reinf. | dia3 | 15.90 | mm | *User Input* | |
| Legs | | 8 | mm | *User Input* | |
| Spacing | | 105 | mm | *User Input* | |
| SFR provided | | | | | |
| Diameter of SFR | dia4 | 9.50 | mm | *User Input* | |
| Number of SFR | | 3 | nos | *User Input* | |

| | | | | | | |
|---|---|---|---|---|---|---|
| characterstic yield strength of reinforcement for shear | | fyt | 420.00 | $N/mm^2$ | clause 11.4.2 | **11.4.2** — The values of $f_y$ and $f_{yt}$ used in design of shear reinforcement shall not exceed 420 MPa |
| **Step 2) Pile and Pile group capacities** | | | | | | |
| Pile Capacity | | Ppile axial | 1,375 | kN | | |
| Pile Group Capacity | | Pgroup | 4125 | kN | | |
| Pile Group Capacity in shear | | Ppile shear | 200 | kN | | |
| Pile capacity in tension | | Ppile tension | 150 | kN | | |
| **Step 3) Pilecap confirguration and geometry (refer sketch-01)** | | | | | | |
| C/C distance Between pile | D x factor | Ap | 1875 | mm | | |
| | 360/(No of Piles)*PI()/180 | Phi | 2.094 | Radian | | |
| | (180-(360/(No of Piles)))/2*PI()/180 | Theta | 0.524 | Radian | | |
| | Ap/2*TAN(Theta) | Bp | 541.27 | mm | | |
| Pile-cap Base | (Bp+Offset+(D/2))/Bp*Ap | PB | 3,693.65 | mm | | |
| | SQRT((Ap/2)^2+Bp^2) | Rp | 1082.53 | mm | | |
| | Ap/2*TAN(2*Theta) | Dp | 1,623.80 | mm | | |
| | Offset+Bp+D/2 | Bpc | 1,066.27 | mm | | |
| | SQRT((PB/2)^2+Bpc^2) | Rpc | 2132.53 | mm | | |
| | PB*SIN(Phi) | Dpc | 3198.80 | mm | | |
| | Area of pilecap | | 5430228 | sqmm | | |

| Position of Piles | Px | Py |
|---|---|---|
| P1 | 0 | 1083 |
| P2 | 937.5 | 541 |
| P3 | 937.5 | 541 |




SKETCH-01

| | | | | | |
|---|---|---|---|---|---|
| **Step 4) Check for maximum load on one pile** | | | | | |
| **Forces On Piles** | | | | | |
| Weight of pilecap + Overburden weight of soil | Soil Wt. + Pile-cap Wt. | | 391.405 | kN | |
| Total Weight on Pile | Pcomb + Soil Wt. + Pile-cap Wt. | Ptotal | 3,355.79 | kN | |
| Load transfer to pile P1 | Ptotal/(No of Piles)-(Mx/(Dp/1000)) | | 1,202.71 | kN | |
| Load transfer to pile P2 | Ptotal/(No of piles)+(Mx/(Dp*2/1000))-(My/(Ap/1000)) | | 1079.97 | kN | |
| Load transfer to pile P3 | Ptotal/(No of piles)+(Mx/(Dp*2/1000))+(My/(Ap/1000)) | | 1073.10 | kN | |
| Ptotal | | | | | |
| Maximum load on one pile | Max(P1,P2,P3) | | 1,202.71 | kN | |
| Allowable load on pile | | Ppile axial | 1,375 | kN | |
| Check | | | OK | | |
| **Step 5) Check for maximum load on pile group** | | | | | |
| Weight of pilecap + Overburden weight of soil | Soil Wt. + Pile-cap Wt. | | 391.405 | kN | |
| Total Weight on Pile | Pcomb + Soil Wt. + Pile-cap Wt. | | 3,539.71 | kN | |
| Maximum load on pile group | | | 3,539.71 | kN | |
| Allowabl load on pile group | | Pgroup | 4,125 | kN | |
| Check | | | OK | | |
| **Step 6) Check for maximum shear on pile group** | | | | | |
| Maximum shear on pile group | SQRT(Vx^2+Vy^2) | | 65.50 | kN | |
| Shear Capacity of pile group | Shear capacity x no of Pies | Ppile shear | 600 | kN | |
| Check | | | ` | | |
| **Step 7) Check for uplift on one pile** | | | | | |
| Weight of pilecap + Overburden weight of soil | Soil Wt. + Pile-cap Wt. | | - | kN | |
| Total Weight on Pile | Pcomb + Soil Wt. + Pile-cap Wt. | Ptotal | - | kN | |
| Load transfer to pile P1 | Ptotal/(No of Piles)-(Mx/(Dp/1000)) | | - | kN | |
| Load transfer to pile P2 | Ptotal/(No of piles)+(Mx/(Dp*2/1000))-(My/(Ap/1000)) | | 0.00 | kN | |
| Load transfer to pile P3 | Ptotal/(No of piles)+(Mx/(Dp*2/1000))+(My/(Ap/1000)) | | 0.00 | kN | |

| | | | | | |
|---|---|---|---|---|---|
| Maximum tensile load on pile group | | | - | kN | |
| Allowabl load on pile group | | Ppile tension | 150 | kN | |
| Check | | | OK | | |
| | | | | | |
| **Step 8)Design for Bending** | | | | | |
| Weight of pilecap + Overburden weight of soil | Soil Wt. + Pile-cap Wt. | | 469.69 | kN | |
| Total Weight on Pile | Pcomb + Soil Wt. + Pile-cap Wt. | Ptotal | 4,523.88 | kN | |
| Forces On Piles | | | | | |
| Load transfer to pile P1 | Ptotal/(No of Piles)-(Mux/(Dp/1000)) | | 1,522.26 | kN | |
| Load transfer to pile P2 | Ptotal/(No of piles)+(Mux/(Dp*2/1000))-(Muy/(Ap/1000)) | | 1,505.17 | kN | |
| Load transfer to pile P3 | Ptotal/(No of piles)+(Mux/(Dp*2/1000))+(Muy/(Ap/1000)) | | 1,496.44 | kN | |
| | | | | | |
| **Bottom reinforcement Along Parallel Edge** | | | | | |
| Effective depth of pilecap | Depth - cover - 20- 20/2 | Deff | 670.00 | mm | |
| Effective width of pile cap | Pile dia + 2 x Offset | Beff | 1,050 | mm | |
| offset from column face | (Ap/2-Bc/2)/1000 | DfCol | 0.64 | m | |
| Bending moment due to pile load | | Bmux | 959.55 | kN-m | |
| % reinf. Required for Bending moment | | Ptreq | 0.58 | % | |
| % minimum reinforcement | | Pt min | 0.18 | % | |
| Area of reinf. Required | | Ast Req (BM) | 3,887 | sqmm/m | |
| Area of reinforcement provided | | Ast prv | 3,897.75 | sqmm/m | |
| | | | | | |
| **Top reinforcement Along Parallel Edge** | | | | | |
| Area of reinf. Required | | Ast req | 1350 | sqmm/m | |
| Area of reinforcement provided | | Ast provided | 1369 | sqmm/m | |
| | | Check | OK | | |
| | | | | | |
| **Bottom reinforcement Along Perpendicular Edge** | | | | | |
| Weight of pilecap + Overburden weight of soil | Soil Wt. + Pile-cap Wt. | | 469.69 | kN | |
| Total Weight on Pile | Pcomb + Soil Wt. + Pile-cap Wt. | Ptotal | 4,079.44 | kN | |
| Forces On Piles | | | | | |
| Load transfer to pile P1 | Ptotal/(No of Piles)-(Mux/(Dp/1000)) | | 1,570.42 | kN | |
| Load transfer to pile P2 | Ptotal/(No of piles)+(Mux/(Dp*2/1000))-(Muy/(Ap/1000)) | | 1,259.37 | kN | |
| Load transfer to pile P3 | Ptotal/(No of piles)+(Mux/(Dp*2/1000))+(Muy/(Ap/1000)) | | 1,249.64 | kN | |
| | | | | | |
| | | | | | |
| Effective depth of pilecap | Depth - cover - 20/2 | Deff | 690 | mm | |
| Effective width of pile cap | Pile dia + 2 x Offset | Beff | 1,050 | mm | |
| offset from column face | | DfCol | 0.68 | m | |
| Bending moment due to pile load | | Bmux | 1071.86 | kN-m | |
| % reinf. Required for Bending moment | | Ptreq | 0.61 | % | |
| % minimum reinforcement | | Pt min | 0.18 | % | Clause 7.12.2.1 |
| Area of reinf. Required | | Ast Req (BM) | 4,235 | sqmm/m | |
| Area of reinforcement provided | | Ast prv | 4406 | sqmm/m | |
| | | | | | |
| **Top reinforcement Along Perpendicular Edge** | | | | | |
| Area of reinf. Required | | Ast req | 1350 | sqmm/m | |
| Area of reinforcement provided | | Ast provided | 1369 | sqmm/m | |
| | | Check | OK | | |
| | | | | | |
| **Step 9)Design for Shear** | | | | | |
| Weight of pilecap + Overburden weight of soil | Soil Wt. + Pile-cap Wt. | | 469.69 | kN | |
| Total Weight on Pile | Pcomb + Soil Wt. + Pile-cap Wt. | Ptotal | 4,523.88 | kN | |
| Forces On Piles | | | | | |
| Load transfer to pile P1 | Ptotal/(No of Piles)-(Mux/(Dp/1000)) | | 1,522.26 | kN | |

**7.12.2.1** — Area of shrinkage and temperature reinforcement shall provide at least the following ratios of reinforcement area to gross concrete area, but not less than 0.0014:

(a) Slabs where Grade 280 or 350 deformed bars are used .....0.0020

(b) Slabs where Grade 420 deformed bars or welded wire reinforcement are used.....0.0018

(c) Slabs where reinforcement with yield stress exceeding 420 MPa measured at a yield strain of 0.35 percent is used ..... $\frac{0.0018 \times 420}{f_y}$

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Load transfer to pile P2 | | | Ptotal/(No of piles)+(Mux/(Dp*2/1000))-(Muy/(Ap/1000)) | | | 1,505.17 | kN | |
| Load transfer to pile P3 | | | Ptotal/(No of piles)+(Mux/(Dp*2/1000))+(Muy/(Ap/1000)) | | | 1,496.44 | kN | |
| | | | | | | | | |
| **Along Parallel Edge** | | | | | | | | |
| Section location from column center | | | | | | 635.00 | mm | |
| Data For Pile | | | | | | | | |

| Pile No | Load (kN) | | Covered(mm) | % covered | Shear(kN) |
|---|---|---|---|---|---|
| P1 | 1,522.26 | 1 | 0 | 0 | 0 |
| P2 | 1,505.17 | 2 | 72.5 | 9.67 | 1359.67 |
| P3 | 1,496.44 | 2 | 72.5 | 9.67 | 1351.78 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Design Shear Force | | Vu | 1359.67 | kN | | |
| Effective depth of pilecap | Depth - cover - 20- 20/2 | Deff | 670 | mm | | |
| Effective width of pile cap | | Beff | 2,098.95 | mm | | |
| Reinforcement required | | pt | 0.0058 | | | |
| | | Vu*d/Mu | 0.95 | | | |
| design shear strength of concrete | | ϕVc | 853.45 | kN | clause 11.2.2.1 | |
| Check | | | Shear Reinforcement Required | | | |
| | | Vs | 675 | kN | | |
| | | Vs perm | 4150.83 | kN | clause 11.4.7.9 | |
| | | | OK | | | |
| **Shear Reinforcement Calculations** | | | | | | |
| Area of shear reinforcement required | | Asv req | 2398.59 | sqmm/m | | |
| Provided Shear reinforcement | | Asv prv | 9928 | sqmm/m | | |
| Shear capacity by Shear reinforcment | | Vscap | 2793.7 | kN | | |
| Check (ϕ * (Vc + Vs) > Vu) | | Vu< ϕVc+Vs Capacity | Hence Ok | | | |
| | | | | | | |
| **Along Perpendicular Edge** | | | | | | |
| Weight of pilecap + Overburden weight of soil | Soil Wt. + Pile-cap Wt. | | 469.69 | kN | | |
| Total Weight on Pile | Pcomb + Soil Wt. + Pile-cap Wt. | Ptotal | 4,079.44 | kN | | |
| Forces On Piles | | | | | | |
| Load transfer to pile P1 | Ptotal/(No of Piles)-(Mux/(Dp/1000)) | | 1,570.42 | kN | | |
| Load transfer to pile P2 | Ptotal/(No of piles)+(Mux/(Dp*2/1000))-(Muy/(Ap/1000)) | | 1,259.37 | kN | | |
| Load transfer to pile P3 | Ptotal/(No of piles)+(Mux/(Dp*2/1000))+(Muy/(Ap/1000)) | | 1,249.64 | kN | | |
| | | | | | | |
| Section location from column center | | | 745.0 | mm | | |

| Pile No | Load (kN) | | Covered(mm) | % covered | Shear(kN) |
|---|---|---|---|---|---|
| P1 | 1,570.42 | 2 | 37.47 | 5.00 | 1491.97 |
| P2 | 1,259.37 | 2 | 578.73 | 77.16 | 287.58 |
| P3 | 1,249.64 | 2 | 578.73 | 77.16 | 285.36 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Design Shear Force | | | 1491.97 | kN | | |
| Effective depth of pilecap | Depth - cover - 20/2 | Deff | 690 | mm | | |
| Effective width of pile cap | | Beff | 1,602.18 | mm | | |
| Reinforcement required | | pt | 0.0061 | | | |
| | | Vu*d/Mu | 0.96 | | | |
| | | ϕVc | 676.366187 | kN | clause 11.2.2.1 | |
| | | | Shear Reinforcement Required | | | |
| | | Vs | 1,087 | kN | | |
| | | Vs perm | 3263.02 | kN | clause 11.4.7.9 | |
| | | | OK | | | |
| **Shear Reinforcement Calculations** | | | | | | |
| Area of shear reinforcement required | | Asv req | 3752.48 | Sqmm | | |
| Provided Shear reinforcement | | Asv prv | 15128.115 | Sqmm | | |
| Shear capacity by Shear reinforcment | | Vscap | 4384.12773 | kN | | |
| Check (ϕ * (Vc + Vs) > Vu) | | Vu< ϕVc+Vs Capacity | Hence Ok | | | |

**11.2.2.1** — For members subject to shear and flexure only,

$$V_c = \left(0.16\lambda\sqrt{f_c'} + 17\rho_w \frac{V_u d}{M_u}\right) b_w d \qquad (11\text{-}5)$$

but not greater than $0.29\lambda\sqrt{f_c'}\, b_w d$. When computing $V_c$ by Eq. (11-5), $V_u d / M_u$ shall not be taken greater than 1.0, where $M_u$ occurs simultaneously with $V_u$ at section considered.

**11.4.7.9** $0.66\sqrt{f_c'}\, b_w d$

**11.2.2.1** — For members subject to shear and flexure only,

$$V_c = \left(0.16\lambda\sqrt{f_c'} + 17\rho_w \frac{V_u d}{M_u}\right) b_w d \qquad (11\text{-}5)$$

but not greater than $0.29\lambda\sqrt{f_c'}\, b_w d$. When computing $V_c$ by Eq. (11-5), $V_u d / M_u$ shall not be taken greater than 1.0, where $M_u$ occurs simultaneously with $V_u$ at section considered.

**11.4.7.9** $0.66\sqrt{f_c'}\, b_w d$

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Step 10)Design of Face reinforcement** | | | | | | | |
| Area of side face reinf. Required | | | Asfr Req | 187.5 | Sqmm | | |
| Area of side face reinf. Provided | | | Asfr pro | 213 | Sqmm | | |
| | | | | | | | |
| **Step 11)Design For Column Load Transfer** | | | | | | | |
| Maximu Axial load on column | | Axial Load | P | 4,054.19 | kN | | |
| Area of column | | Bc x Dc | A2 | 0.48 | sqm | *Clause 10.14* | |
| Area of pilecap base | | Area of Pilecap | A1 | 5.43 | sqm | *Clause 10.14* | |
| Pilecap Base area | | Base Area | | 5.43 | sqm | | |
| Modification Factor | | Modification Factor | | SquareRoot(A1/A2) < = 2 | | | |
| | | SquareRoot(A1/A2) | | 3.36 | | | |
| | | Thus, Modification Factor | | 2 | | *Clause 10.14* | |
| $\Phi_1$Pnb | | $\Phi_1$ x 0.85 x Modification Factor x A2 x Fck x 1000 | | | | | |
| | | 0.65x0.85x0.48x2x20x1000 | | | | | |
| Concrete Bearing capacity | | | $\Phi_1$Pnb | 10608 | kN | *Clause 10.14* | |
| Check | | | | Hence Safe | | | |
| Area Of Dowels | | | | - | sqmm | | |

## 10.14 — Bearing strength

**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.