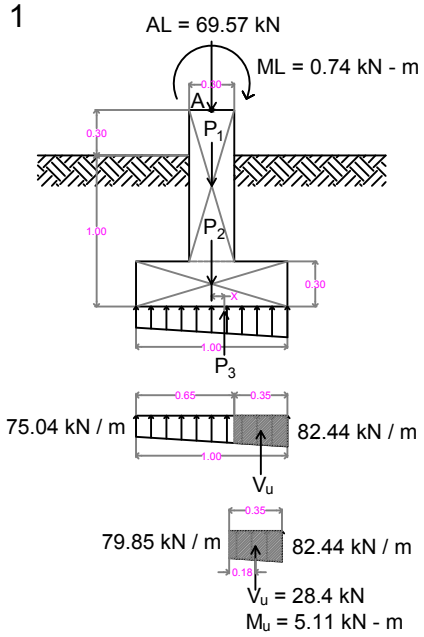
# Design of Foundation 1

| Design Data : | | | | |
|---|---|---|---|---|
| Axial Load (AL ) | = | 69.57 | kN | (from SAP) |
| Moment Load (ML ) | = | 0.74 | kN - m | (from SAP) |
| Allowable Soil Pressure ($q_s$) | = | 144 | kPa | |
| Weight of Soil ( $\delta_s$ ) | = | 15.6 | $kN/m^3$ | |
| Yeild Stress of Steel ($f_y$) | = | 275 | Mpa | |
| Comp. Strength of Conc. (fc') | = | 20.7 | Mpa | |
| Weight of Conc. ( $\delta c$ ) | = | 23.5 | $kN/m^3$ | |
| Column Dimension (B) | = | 0.30 | m | |
| Rebar Diameter (ø) | = | 16 | mm | |
| Rebar Area (A) | = | 201 | $mm^2$ | |
| Height of Soil( H ) | = | 1.0 | m | |
| Footing Width (w) | = | 1.0 | m | |
| Footing Thickness (t) | = | 0.3 | m | |




| Forces | | | | |
|---|---|---|---|---|
| AL = | (from SAP) | = | 69.57 | kN |
| $P_1$ = | 23.5 * 1.0 * 0.3 * 0.3 | = | 2.12 | kN |
| $P_2$ = | 23.5 * 1.0 * 1.0 * 0.3 | = | 7.05 | kN |
| | | | | |
| Summation of Forces along Y - axis | | | | |
| $P_3$ = | 69.57 + 2.12 + 7.05 | = | 78.74 | kN |

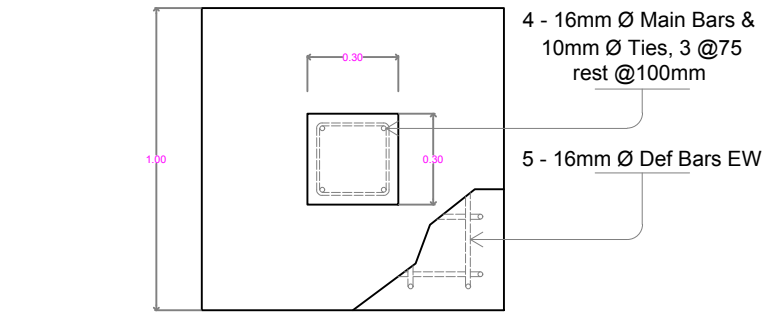
| Summation of Moment at point A | | | | |
|---|---|---|---|---|
| x = | 0.74 / 78.74 | = | 0.01 | m |

| Effective Bearing Capacity: | | | | |
|---|---|---|---|---|
| $q_{emax}$ = | ( $P_3$ / L ) * ( 1 + 6X / L ) | = | 82.44 | kN / m |
| $q_{emin}$ = | ( $P_3$ / L ) * ( 1 - 6X / L ) | = | 75.04 | kN / m |

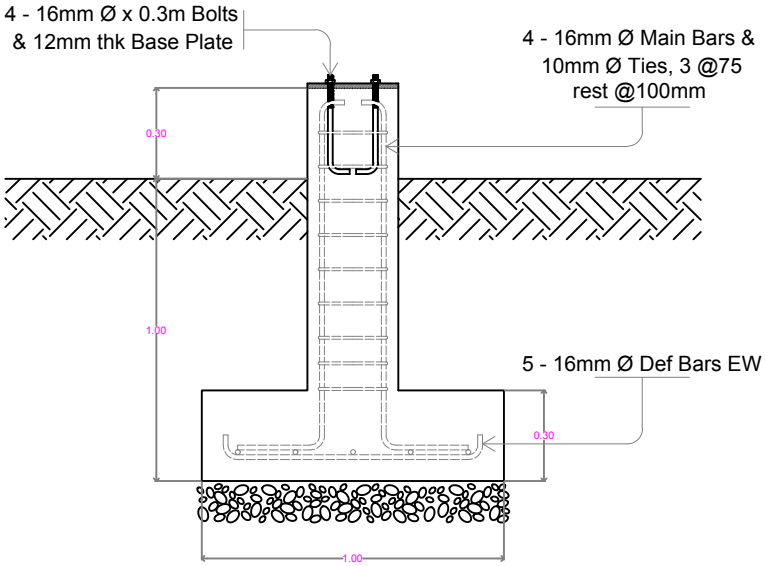
| One - way Shear: | | | | |
|---|---|---|---|---|
| d = | 300 - 75 - 0.5*16 | = | 217 | mm |
| $V_{u\ Actual}$ = | volume of pressure prism | | | |
| $V_{u\ Actual}$ = | 1/2* (79.85+82.44)*0.35 | = | 28.40 | kN |
| $V_c$ = | $1/6*(fc')^{1/2}*L*d$ | = | 164.55 | kN |
| $V_{u\ Allow.}$ = | 0.85*$V_c$ | = | 139.87 | kN |
| $V_{u\ Allow.}$ > | $V_{u\ Actual}$ | | | OK! |

| Two - way Punching Shear: | | | | |
|---|---|---|---|---|
| $V_{u\ Actual}$ = | 1/2* (79.85+82.44)*0.35 | = | 28.40 | kN |
| $V_c$ = | $1/3*(fc')^{1/2}*B_o*d$ | | | |
| $V_c$ = | $1/3*(fc')^{1/2}*((4*(B+d))*d$ | = | 680.57 | kN |
| $V_{u\ Allow.}$ = | 0.85*$V_c$ | = | 578.49 | kN |
| $V_{u\ Allow.}$ > | $V_{u\ Actual}$ | | | OK! |

| Actual Moment at the face of Column: | | | | |
|---|---|---|---|---|
| $M_{u\ Actual}$ = | $V_{u\ Actual}$ * 0.18 | = | 5.11 | kN - m |
| | | | | |
| Moment Capacity at the face of Column: | | | | |
| $\rho_{min}$ = | 0.0051 | | | |
| $\rho_{bal}$ = | 0.0373 | | | |
| $\rho_{max}$ = | 0.0280 | | | |
| use : $\rho_{min}$ | | | | |
| $\rho$ = | 0.0051 | | | |
| $\omega$ = | 0.0676 | | | |
| $M_{\mu\ cap}$ = | $\phi f_c' bd^2 \omega(1-0.59\omega)$ | | | |
| $M_{\mu\ cap}$ = | 17.09 | | | kN - m |
| $M_{\mu\ cap}$ > | $M_{u\ Actual}$ | | | OK! |




PLAN
SCALE 1 : 25




ELEVATION
SCALE 1 : 25

| Bottom Reinforcement: | | | |
|---|---|---|---|
| $A_s$ = | ρbd | | |
| $A_s$ = | 1076.11 | | $mm^2$ |
| $A_{16mm\phi}$ = | 201 | | $mm^2$ |
| n = | 5 | | |
| | | | |
| Top Reinforcement (Temp Bars): | | | |
| $A_{s\ Temp\ Bar}$ = | 0.002bd | | |
| $A_{s\ Temp\ Bar}$ = | 130.20 | | $mm^2$ |
| $A_{12mm\phi}$ = | 113 | | $mm^2$ |
| n = | 1 | | No top reinforcement |