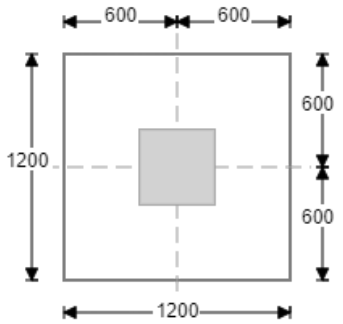
1.0 INPUT

1.1 Foundation

Analysis Options		**Pedestal and Pad**
Depth of the Foundation below GL	D_f	= **1200** mm
Depth of the Water Table below GL	D_{wt}	= **350** mm
Extend of Minimum Soil Cover	S_{cve}	= **Full**
Minimum Soil Cover above Pad	S_{cv}	= **900** mm

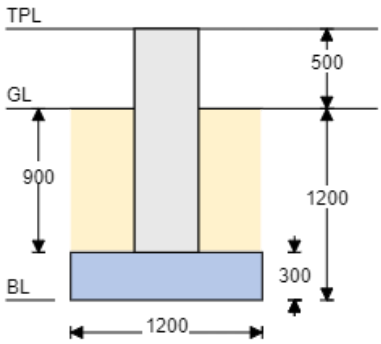


1.2 Pad

Length of the Pad (X - Dir)	L_f	= **1200** mm
Breadth of the Pad (Z - Dir)	B_f	= **1200** mm
Thickness of the Pad	T_f	= **300** mm

1.3 Pedestal

Type of Pedestal		**Pedestal**
Shape of Pedestal		**Square**
Length (X - Dir)	L_c	= **400** mm
Breadth (Z- Dir)	B_c	= **400** mm
Top of Pedestal above GL	TOG	= **500** mm
Eccentricity (X - Dir)	E_x	= **0** mm
Eccentricity (Z - Dir)	E_z	= **0** mm



1.4 Reinforcement

1.4.1 Cover

Clear Cover for Pedestal	C_{ped}	= **50** mm
Clear Cover for Pad	C_{pad}	= **50** mm

1.4.2 Pad - Bottom Reinforcement

Min % of Bottom Reinforcement	A_{bmin}	= **0.25** %
X - Direction		**12** @ **150** mm C/C
Z - Direction		**12** @ **150** mm C/C

1.4.3 Pad - Top Reinforcement

Min % of Top Reinforcement	A_{tmin}	= **0** %
X - Direction		**N/A**
Z - Direction		**N/A**

1.5 Pedestal

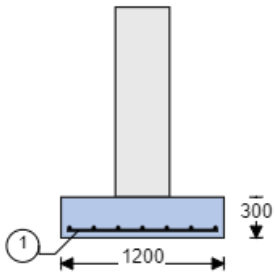
1.5.1 Main Reinforcement Details

Min % of Pedestal Reinforcement	A_{Pedmin}	= **0.4** %
Corner Bars		**# 4 - 16** mm
Depth Side Bars (Each face)		**# 1 - 16** mm

Width Side Bars (Each face)		**# 1 - 16** mm

1.5.2 Ties

Shear Reinforcement Details		**Ties - 10** @ **150** mm C/C
Additional Legs in X Direction	N_x	= **0**
Additional Legs in Z Direction	N_z	= **0**



X - Direction :

1 : 12D @ 150 mm C/C

1.6 Design Loads

1.6.1 SLS

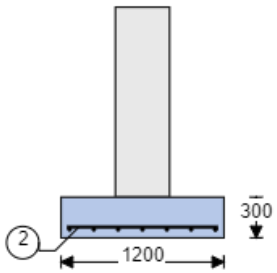
Load Factor for Self-Weight and Soil	F_{DS1}	= **1**
Axial Load	P_{S1}	= **100** kN
Horizontal Load (X - Dir)	F_{XS1}	= **0** kN
Horizontal Load (Z - Dir)	F_{ZS1}	= **0** kN
Moment about X Direction	M_{XS1}	= **0** kN.m
Moment about Z Direction	M_{ZS1}	= **0** kN.m

1.6.2 ULS

Load Factor for Self-Weight and Soil	F_{DU1}	= **1.4**
Axial Load	P_{U1}	= **150** kN
Horizontal Load (X - Dir)	F_{XU1}	= **0** kN
Horizontal Load (Z - Dir)	F_{ZU1}	= **0** kN
Moment about X Direction	M_{XU1}	= **0** kN.m
Moment about Z Direction	M_{ZU1}	= **0** kN.m

1.7 Soil Properties

Allowable Net Bearing Pressure	SBC	= **150** kN/m³
Density of Soil	γ_{soil}	= **18.5** kN/m²
Density of Ground Water	γ_w	= **9.81** kN/m²
Angle of Internal Friction	Φ	= **30** deg
Coefficient of Friction	μ	= **0.35**



Z - Direction :

2 : 12D @ 150 mm C/C

1.8 Concrete

Density of Concrete	γ_{conc}	= **24** kN/m²
Unit Weight of Steel	γ_{steel}	= **78.5** kN/m²
Concrete Grade @ 28 days	f_{cu}	= **25** N/mm²
Main Reinforcement Grade	f_y	= **500** N/mm²
Shear Reinforcement Grade	f_{yv}	= **500** N/mm²
Modulus Elasticity of Steel	E_s	= **200** kN/mm²

1.9 Partial Safety Factors

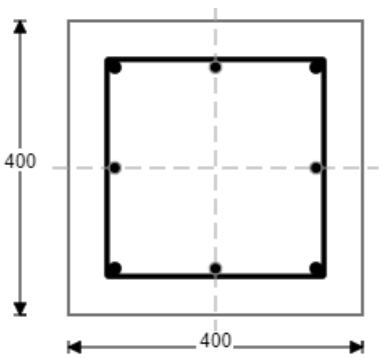
Concrete in Flexure/Compression	γ_{mc}	= **1.5**
Concrete in Shear	γ_{mcs}	= **1.25**
Reinforcement	γ_{ms}	= **1.15**

1.10 Factor of Safety

F.O.S against Sliding	γ_{Slide}	= **1.5**
F.O.S against Overturning	γ_{Over}	= **1.5**
F.O.S against Uplift	γ_{UP}	= **1.2**

1.11 Crack Width

Check for Crack Width	**Yes**



Rebars :

(C) : #4 - 16 mm (W) : #1 - 16 mm

(D) : #1 - 16 mm Ties : 10 mm @ 150 C/ C

Allowable Crack Width	W_c	= **0.2** mm

2.0 OUTPUT

2.1 Weight Calculation

Ref: BS8110 - Part 1

Self Weight of Pad	Swf	= **10.37** kN
Self Weight of Pedestals	Swpd	= **5.38** kN
Minimum Soil Overburden	SIMnWt	= **21.31** kN
Maximum Soil Overburden	SIMxWt	= **21.31** kN
Water Weight above Pad	Wrfp	= **6.91** kN
Deduction Weight of Suspended Soil	SIDnWt	= **6.91** kN
Buoyancy Deduction Load	Bfuf	= **12.01** kN
Total Weight under Min. Soil Condition	M_{nCWt}	= Swf + Swpd + Wrfp + SIMnWt - SIDnWt - Bfuf = **25.05** kN
Total Weight under Max. Soil Condition	M_{xCWt}	= Swf + Swpd + SIMxWt = **37.06** kN

2.2 Stability Calculations SLS Combination

Sliding Force	S_{ldFor1}	= sqrt(F_{XS1}^2 + F_{ZS1}^2) = **0** kN
Overturning Moment X Direction	$O_{vrMomX1}$	= M_{xs1} + F_{ZS1} * (H_{pd} + T_f) + P_{s1} * E_z = **0** kN.m
Overturning Moment Z Direction	$O_{vrMomZ1}$	= M_{zs1} - F_{XS1} * (H_{pd} + T_f) - P_{s1} * E_z = **0** kN.m
Minimum Vertical Force	M_{nVf1}	= F_{DS1} * M_{nCWt} + P_{s1} = **125** kN
Minimum Weight Net Moment X Direction	$M_{nNetMomX1}$	= **0** kN.m
Minimum Weight Net Moment Z Direction	$M_{nNetMomZ1}$	= **0** kN.m
Maximum Vertical Force	M_{xVf1}	= F_{DS1} * M_{xCWt} + P_{s1} = **137.1** kN
Maximum Weight Net Moment X Direction	$M_{xNetMomX1}$	= **0** kN.m
Maximum Weight Net Moment Z Direction	$M_{xNetMomZ1}$	= **0** kN.m

2.3 Factor of Safety of SLS Combination

F.O.S. against Uplift	F_{OSUPL1}	= **100**
F.O.S. against Sliding	F_{OSSLD1}	= M_{nVf1} * μ / S_{ldFor1} = **100**
F.O.S. against Overturning X Direction	F_{OSOvX1}	= 0.5 * M_{nVf1} * B_f / $O_{vrMomX1}$ = **100**
F.O.S. against Overturning Z Direction	F_{OSOvZ1}	= 0.5 * M_{nVf1} * L_f / $O_{vrMomZ1}$ = **100**

2.4 Base Pressure Calculation

Maximum Bearing Pressure	M_{xBrPr1}	= **95.2** kN/m²
Percentage of Compression Area	$P_{erBaAr1}$	= **100** %

2.5 Crack Width

Ref: BS8110 - Part 2

2.5.1 X Direction

Cracking Moment @ Bottom	M_{cr}	= **5.706** kN.m
Width of Crack @ Bottom	W_{cr}	= **0** mm

2.5.2 Z Direction

Cracking Moment @ Bottom	M_{cr}	= **5.706** kN.m
Width of Crack @ Bottom	W_{cr}	= **0** mm

2.6 Strength Calculations ULS Combination

2.6.1 Area of Reinforcement Calculation X Direction

2.6.2 Bottom Reinforcement

Ultimate Design Moment /m	M_{xBot}	= **8.54** kN.m	
Required Area of Reinforcement	A_{sxBot}	= **390** mm^2	

2.6.3 One way Shear Check in X Direction

2.6.4 Positive Shear

Design Shear Force (d Distance)	V_{xp}	= **16.66** kN	
Design Shear Stress	v	= V_{xp} / (b * d) = **0.068** N/mm^2	
Percentage of Reinforcement	P_t	= **0.309** %	
Concrete Shear Stress	v_c	= **0.483** N/mm^2	*Table 3.8*

2.7 Area of Reinforcement Calculation Z Direction

2.7.1 Bottom Reinforcement

Ultimate Design Moment /m	M_{zBot}	= **8.54** kN.m	
Required Area of Reinforcement	A_{szBot}	= **390** mm^2	

2.7.2 One way Shear Check in Z Direction

2.7.3 Positive Shear

Design Shear Force (d Distance)	V_{zp}	= **17.94** kN	
Design Shear Stress	v	= V_{zp} / (b * d) = **0.077** N/mm^2	
Percentage of Reinforcement	P_t	= **0.325** %	
Concrete Shear Stress	v_c	= **0.498** N/mm^2	

2.8 Punching Shear Check

2.8.1 Column Face

Design Shear Stress	v	= **0.359** N/mm^2	
Maximum Shear Stress	v_{max}	= **4** N/mm^2	*Cl. 3.7.6.4*

2.8.2 1.5 d from Column Face

Design Shear Stress	v	= **0.02** N/mm^2	
Percentage of Reinforcement	P_t	= **0.264** %	
Concrete Shear Stress	v_c	= **0.462** N/mm^2	

2.8.3 Pedestal Design *Cl. 3.8.2*

2.8.4 Main Reinforcement

Design Axial Load	P	= **157.5** kN	
Design Moment in X Direction	M_x	= **0** kN.m	
Design Moment in Z Direction	M_z	= **0** kN.m	
Required Area of Reinforcement	A_s	= **640** mm^2	

3.0 SUMMARY

3.1 Bearing Pressure Check

Load	Soil Pressure (kN/m²)	Contact (%)
SLS	95.2 [172.2]	100

3.2 Stability Check

Load	Sliding	Overturning-X	Overturning-Z	Uplift
SLS	100 [1.5]	100 [1.5]	100 [1.5]	100 [1.2]

3.3 Crack Check (mm)

Load	Bottom - X Dir	Bottom - Z Dir	Top - X Dir	Top - Z Dir
SLS	0 [0.2]	0 [0.2]	0 [0.2]	0 [0.2]

3.4 Pad Reinforcement Check (mm^2/m)

Load	Bottom - X Dir	Bottom - Z Dir	Top - X Dir	Top - Z Dir
ULS	390 [754]	390 [754]	0 [0]	0 [0]

3.5 Pad Shear Check (N/mm²)

Load	Bottom - X Dir	Bottom - Z Dir	Top - X Dir	Top - Z Dir
ULS	0.068 [0.483]	0.077 [0.498]	0 [0]	0 [0]

3.6 Punching Shear Check

Load	Pedestal	Punching Shear (N/mm²)	Tension Face	Punching Distance (mm)
ULS	P1	0.359 [4]	Bottom	0
ULS	P1	0.02 [0.462]	Bottom	357

3.7 Pedestal Reinforcement Check

Load	Pedestal	Vertical rein. (mm^2)	Spacing (mm)
ULS	P1	640 [1608.4]	-