

Isolated Footing Design (IS 456-2000)

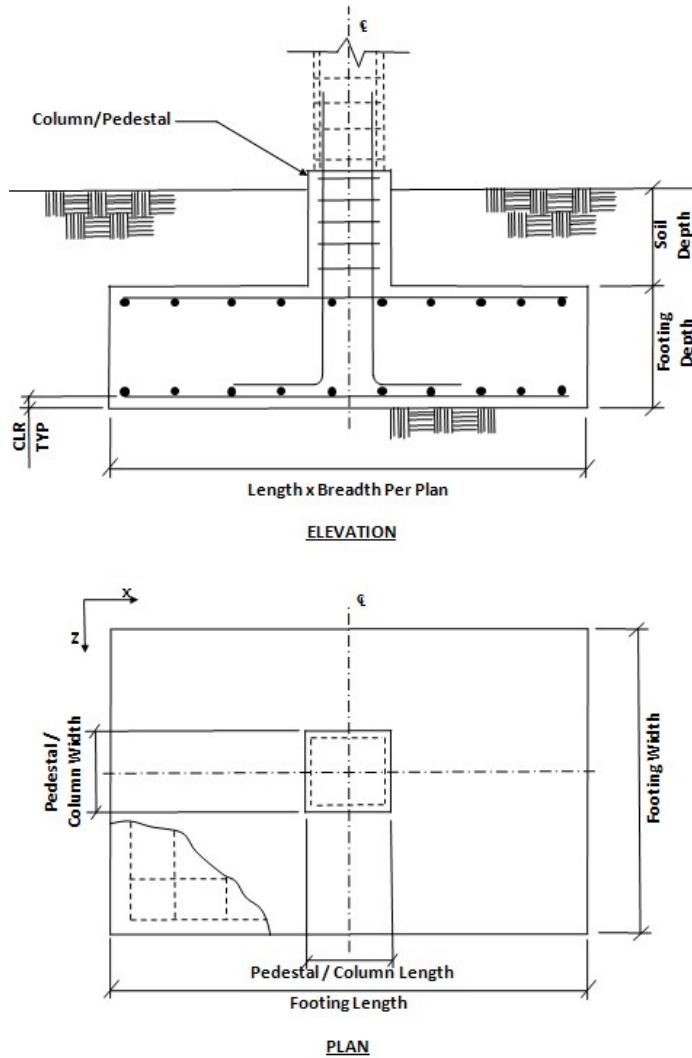
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Footing No.	Group ID	Foundation Geometry		
		Length	Width	Thickness
1	1	2.337 m	2.337 m	0.306 m
2	2	2.692 m	2.692 m	0.306 m
3	3	2.743 m	2.743 m	0.306 m
4	4	2.692 m	2.692 m	0.306 m
5	5	2.337 m	2.337 m	0.306 m
31	6	2.692 m	2.692 m	0.306 m
32	7	3.200 m	3.200 m	0.408 m
33	8	3.200 m	3.200 m	0.408 m
34	9	3.200 m	3.200 m	0.408 m

35	10	2.692 m	2.692 m	0.306 m
61	11	2.743 m	2.743 m	0.306 m
62	12	3.200 m	3.200 m	0.408 m
63	13	3.251 m	3.251 m	0.408 m
64	14	3.200 m	3.200 m	0.408 m
65	15	2.743 m	2.743 m	0.306 m
91	16	2.692 m	2.692 m	0.306 m
92	17	3.200 m	3.200 m	0.408 m
93	18	3.200 m	3.200 m	0.408 m
94	19	3.200 m	3.200 m	0.408 m
95	20	2.692 m	2.692 m	0.306 m
121	21	2.337 m	2.337 m	0.306 m
122	22	2.692 m	2.692 m	0.306 m
123	23	2.743 m	2.743 m	0.306 m
124	24	2.692 m	2.692 m	0.306 m
125	25	2.337 m	2.337 m	0.306 m

Footing No.	Footing Reinforcement				Pedestal Reinforcement		
	-	Bottom Reinforcement(M_z)	Bottom Reinforcement(M_x)	Top Reinforcement(M_z)	Top Reinforcement(M_x)	Main Steel	Trans Steel
1		$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 6 @ 0 \text{ m c/c}$	16 - $\emptyset 6$	$\emptyset 6 @ 0 \text{ m}$
2		$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 10 @ 0 \text{ m c/c}$	$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 6 @ 0 \text{ m c/c}$	20 - $\emptyset 6$	$\emptyset 6 @ 0 \text{ m}$
3		$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 10 @ 0 \text{ m c/c}$	$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 6 @ 0 \text{ m c/c}$	12 - $\emptyset 8$	$\emptyset 6 @ 0 \text{ m}$
4		$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 10 @ 0 \text{ m c/c}$	$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 6 @ 0 \text{ m c/c}$	20 - $\emptyset 6$	$\emptyset 6 @ 0 \text{ m}$
5		$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 6 @ 0 \text{ m c/c}$	16 - $\emptyset 6$	$\emptyset 6 @ 0 \text{ m}$
31		$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 6 @ 0 \text{ m c/c}$	12 - $\emptyset 8$	$\emptyset 6 @ 0 \text{ m}$
32		$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 6 @ 0 \text{ m c/c}$	28 - $\emptyset 6$	$\emptyset 6 @ 0 \text{ m}$
33		$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 6 @ 0 \text{ m c/c}$	16 - $\emptyset 8$	$\emptyset 6 @ 0 \text{ m}$
34		$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 6 @ 0 \text{ m c/c}$	28 - $\emptyset 6$	$\emptyset 6 @ 0 \text{ m}$
35		$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 6 @ 0 \text{ m c/c}$	12 - $\emptyset 8$	$\emptyset 6 @ 0 \text{ m}$
61		$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 10 @ 0 \text{ m c/c}$	$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 6 @ 0 \text{ m c/c}$	12 - $\emptyset 8$	$\emptyset 6 @ 0 \text{ m}$
62		$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 6 @ 0 \text{ m c/c}$	16 - $\emptyset 8$	$\emptyset 6 @ 0 \text{ m}$
63		$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 10 @ 0 \text{ m c/c}$	$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 6 @ 0 \text{ m c/c}$	32 - $\emptyset 6$	$\emptyset 6 @ 0 \text{ m}$
64		$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 6 @ 0 \text{ m c/c}$	16 - $\emptyset 8$	$\emptyset 6 @ 0 \text{ m}$
65		$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 10 @ 0 \text{ m c/c}$	$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 6 @ 0 \text{ m c/c}$	12 - $\emptyset 8$	$\emptyset 6 @ 0 \text{ m}$
91		$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 6 @ 0 \text{ m c/c}$	12 - $\emptyset 8$	$\emptyset 6 @ 0 \text{ m}$
92		$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 6 @ 0 \text{ m c/c}$	28 - $\emptyset 6$	$\emptyset 6 @ 0 \text{ m}$
93		$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 6 @ 0 \text{ m c/c}$	16 - $\emptyset 8$	$\emptyset 6 @ 0 \text{ m}$
94		$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 6 @ 0 \text{ m c/c}$	28 - $\emptyset 6$	$\emptyset 6 @ 0 \text{ m}$
95		$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 6 @ 0 \text{ m c/c}$	12 - $\emptyset 8$	$\emptyset 6 @ 0 \text{ m}$
121		$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 6 @ 0 \text{ m c/c}$	16 - $\emptyset 6$	$\emptyset 6 @ 0 \text{ m}$
122		$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 10 @ 0 \text{ m c/c}$	$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 6 @ 0 \text{ m c/c}$	20 - $\emptyset 6$	$\emptyset 6 @ 0 \text{ m}$
123		$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 10 @ 0 \text{ m c/c}$	$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 6 @ 0 \text{ m c/c}$	12 - $\emptyset 8$	$\emptyset 6 @ 0 \text{ m}$
124		$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 10 @ 0 \text{ m c/c}$	$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 6 @ 0 \text{ m c/c}$	20 - $\emptyset 6$	$\emptyset 6 @ 0 \text{ m}$
125		$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 8 @ 0 \text{ m c/c}$	$\emptyset 6 @ 0 \text{ m c/c}$	16 - $\emptyset 6$	$\emptyset 6 @ 0 \text{ m}$

Isolated Footing 1



Input Values

Footing Geometry

Design Type : Calculate Dimension
 Footing Thickness (Ft) : 12.000 in
 Footing Length - X (Fl) : 40.000 in
 Footing Width - Z (Fw) : 40.000 in
 Eccentricity along X (Oxd) : 0.000 in
 Eccentricity along Z (Ozd) : 0.000 in

Column Dimensions

Column Shape : Rectangular
 Column Length - X (Pl) : 0.450 m
 Column Width - Z (Pw) : 0.400 m

Pedestal

Include Pedestal? Yes
 Pedestal Shape : Rectangular
 Pedestal Height (Ph) : 0.015 m
 Pedestal Length - X (Pl) : 0.450 m
 Pedestal Width - Z (Pw) : 0.400 m

Design Parameters

Concrete and Rebar Properties

Unit Weight of Concrete : 150.000 lb/ft³
 Strength of Concrete : 4.000 ksi
 Yield Strength of Steel : 60.000 ksi
 Minimum Bar Size : Ø6
 Maximum Bar Size : Ø32
 Minimum Bar Spacing : 2.000 in
 Maximum Bar Spacing : 18.000 in
 Pedestal Clear Cover (P, CL) : 3.000 in
 Footing Clear Cover (F, CL) : 3.000 in

Soil Properties

Soil Type : UnDrained
 Unit Weight : 112.000 lb/ft³
 Soil Bearing Capacity : 4.000 kip/ft²
 Soil Surcharge : 0.000 kip/in²
 Depth of Soil above Footing : 0.000 in
 Undrained Shear Strength : 0.000 kip/in²
 Min Percentage of Slab : 0.000

Sliding and Overturning

Coefficient of Friction : 0.500
 Factor of Safety Against Sliding : 1.500
 Factor of Safety Against Overturning : 1.500

Load Combination/s- Service Stress Level	
Load Combination Number	Load Combination Title
1	DEAD
2	LIVE
3	COMBINATION LOAD CASE 3
101	1.000 x DL+1.000 x DL+1.000 x DL
102	0.800 x DL+0.800 x DL+0.800 x DL
Load Combination/s- Strength Level	

Load Combination Number	Load Combination Title
1	DEAD
2	LIVE
3	COMBINATION LOAD CASE 3

Applied Loads - Service Stress Level					
LC	Axial (kN)	Shear X (kN)	Shear Z (kN)	Moment X (kNm)	Moment Z (kNm)
1	343.039	-1.982	-1.854	-1.843	1.966
2	38.969	-0.459	-0.432	-0.430	0.456
3	573.013	-3.661	-3.428	-3.410	3.634
101	955.021	-6.102	-5.714	-5.683	6.057
102	764.017	-4.882	-4.571	-4.546	4.845

Applied Loads - Strength Level					
LC	Axial (kN)	Shear X (kN)	Shear Z (kN)	Moment X (kNm)	Moment Z (kNm)
1	343.039	-1.982	-1.854	-1.843	1.966
2	38.969	-0.459	-0.432	-0.430	0.456
3	573.013	-3.661	-3.428	-3.410	3.634

Design Calculations

Footing Size

Initial Length (L_o) = 1.016 m

Initial Width (W_o) = 1.016 m

Uplift force due to buoyancy = 0.000 kN

Effect due to adhesion = 0.000 kN

Area from initial length and width, $A_o = L_o \times W_o = 1.032 \text{ m}^2$

Min. area required from bearing pressure, $A_{\min} = P / q_{\max} = 5.026 \text{ m}^2$

Note: A_{\min} is an initial estimation.

P = Critical Factored Axial Load (without self weight/buoyancy/soil).

q_{\max} = Respective Factored Bearing Capacity.

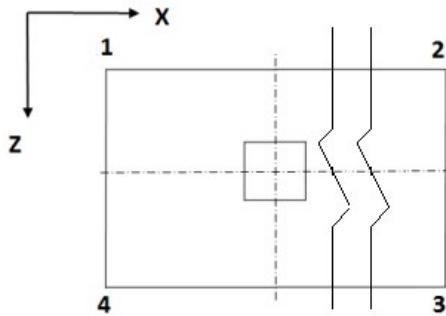
Final Footing Size

Length (L_2) = 2.337 m Governing Load Case : # 101

Width (W_2) = 2.337 m Governing Load Case : # 101

Depth (D_2) = 0.306 m Governing Load Case : # 101

Area (A_2) = 5.461 m^2

Pressures at Four Corner

Load Case	Pressure at corner 1 (q_1) (kN/m ²)	Pressure at corner 2 (q_2) (kN/m ²)	Pressure at corner 3 (q_3) (kN/m ²)	Pressure at corner 4 (q_4) (kN/m ²)	Area of footing in uplift (A_u) (m ²)
101	189.3845	181.8519	174.7877	182.3203	0.000
101	189.3845	181.8519	174.7877	182.3203	0.000
101	189.3845	181.8519	174.7877	182.3203	0.000
101	189.3845	181.8519	174.7877	182.3203	0.000

If A_u is zero, there is no uplift and no pressure adjustment is necessary. Otherwise, to account for uplift, areas of negative pressure will be set to zero and the pressure will be redistributed to remaining corners.

Summary of adjusted Pressures at Four Corner

Load Case	Pressure at corner 1 (q_1) (kN/m ²)	Pressure at corner 2 (q_2) (kN/m ²)	Pressure at corner 3 (q_3) (kN/m ²)	Pressure at corner 4 (q_4) (kN/m ²)
101	189.3845	181.8519	174.7877	182.3203
101	189.3845	181.8519	174.7877	182.3203
101	189.3845	181.8519	174.7877	182.3203
101	189.3845	181.8519	174.7877	182.3203

Details of Out-of-Contact Area
(If Any)

Governing load case = N/A

Plan area of footing = 5.461 sq.m

Area not in contact with soil = 0.000 sq.m

% of total area not in contact = 0.000%

Check For Stability Against Overturning And Sliding

-	Factor of safety against sliding	Factor of safety against overturning		
Load Case	Along X-	Along Z-	About X-	About Z-

No.	Direction	Direction	Direction	Direction
1	96.450	103.102	183.315	171.761
2	85.263	90.675	161.000	151.581
3	83.617	89.298	158.729	148.860
101	81.471	87.006	154.656	145.040
102	82.276	87.865	156.183	146.472

Critical Load Case And The Governing Factor Of Safety For Overturning and Sliding X Direction

Critical Load Case for Sliding along X-Direction : 101

Governing Disturbing Force : -6.102 kN

Governing Restoring Force : 497.153 kN

Minimum Sliding Ratio for the Critical Load Case : 81.471

Critical Load Case for Overturning about X-Direction : 101

Governing Overturning Moment : -7.512 kNm

Governing Resisting Moment : 1161.725 kNm

Minimum Overturning Ratio for the Critical Load Case : 154.656

Critical Load Case And The Governing Factor Of Safety For Overturning and Sliding Z Direction

Critical Load Case for Sliding along Z-Direction : 101

Governing Disturbing Force : -5.714 kN

Governing Restoring Force : 497.153 kN

Minimum Sliding Ratio for the Critical Load Case : 87.006

Critical Load Case for Overturning about Z-Direction : 101

Governing Overturning Moment : 8.010 kNm

Governing Resisting Moment : 1161.725 kNm

Minimum Overturning Ratio for the Critical Load Case : 145.040

Moment CalculationCheck Trial Depth against moment (w.r.t. X Axis)**Critical Load Case = #3**

Effective Depth = $D - (cc + 0.5 \times d_b) = 0.226 \text{ m}$

Governing moment (M_u) = 116.658 kNm

As Per IS 456 2000 ANNEX G G-1.1C

Limiting Factor1 (K_{umax}) = $\frac{700}{(1100 + 0.87 \times f_y)} = 0.479483$

Limiting Factor2 (R_{umax}) = $0.36 \times f_{ck} \times k_{umax} \times (1 - 0.42 \times k_{umax}) = 3801.834636 \text{ kN/m}^2$

Limit Moment Of Resistance (M_{umax}) = $R_{umax} \times B \times d_e^2 = 452.152562 \text{ kNm}$

 $M_u \leq M_{umax}$ hence, safe

Check Trial Depth against moment (w.r.t. Z Axis)**Critical Load Case = #3**

$$\text{Effective Depth} = D - (c_c + 0.5 \times d_b) = 0.226 \text{ m}$$

$$\text{Governing moment } (M_u) = 110.835 \text{ kNm}$$

As Per IS 456 2000 ANNEX G G-1.1C

$$\text{Limiting Factor1 } (K_{umax}) = \frac{700}{(1100 + 0.87 \times f_y)} = 0.479483$$

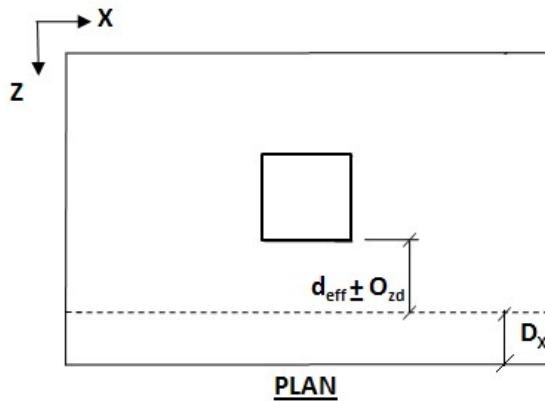
$$\text{Limiting Factor2 } (R_{umax}) = 0.36 \times f_{ck} \times K_{umax} \times (1 - 0.42 \times K_{umax}) = 3801.834636 \text{ kN/m}^2$$

$$\text{Limit Moment Of Resistance } (M_{umax}) = R_{umax} \times B \times d_e^2 = 452.152562 \text{ kNm}$$

$M_u \leq M_{umax}$ hence, safe

Shear CalculationCheck Trial Depth for one way shear (Along X Axis)

(Shear Plane Parallel to X Axis)

**Critical Load Case = #3**

$$D_x = 0.226 \text{ m}$$

$$\text{Shear Force}(S) = 184.653 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 350.264584 \text{ kN/m}^2$$

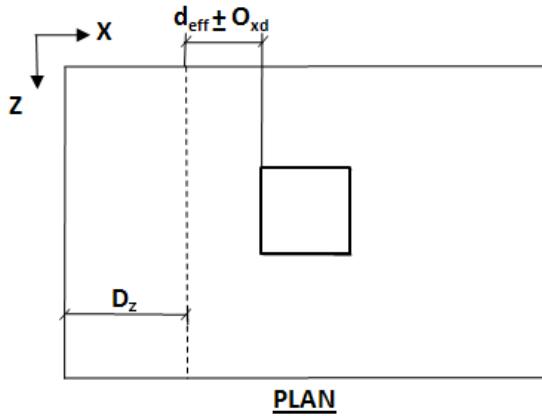
$$\text{Percentage Of Steel}(P_t) = 0.2699$$

As Per IS 456 2000 Clause 40 Table 19

$$\text{Shear Strength Of Concrete}(T_c) = 379.496 \text{ kN/m}^2$$

$T_v < T_c$ hence, safe

Check Trial Depth for one way shear (Along Z Axis)
(Shear Plane Parallel to Z Axis)



Critical Load Case = #3

$$D_Z = 0.226 \text{ m}$$

$$\text{Shear Force}(S) = 178.640 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 338.857823 \text{ kN/m}^2$$

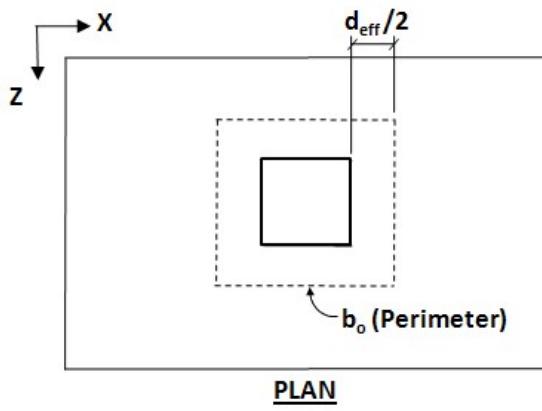
$$\text{Percentage Of Steel}(P_t) = 0.2847$$

As Per IS 456 2000 Clause 40 Table 19

$$\text{Shear Strength Of Concrete}(T_c) = 388.431 \text{ kN/m}^2$$

$T_v < T_c$ hence, safe

Check Trial Depth for two way shear



Critical Load Case = #3

$$\text{Shear Force}(S) = 528.661 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 900.461 \text{ kN/m}^2$$

As Per IS 456 2000 Clause 31.6.3.1

$$K_s = \min[0.5 + \beta, 1] = 1.000$$

$$\text{Shear Strength}(T_c) = 0.25 \times \sqrt{f_{ck}} = 1312.8936 \text{ kN/m}^2$$

$$K_s \times T_c = 1312.8936 \text{ kN/m}^2$$

$T_v \leq K_s \times T_c$ hence, safe

Reinforcement Calculation

Calculation of Maximum Bar Size

Along X Axis

Bar diameter corresponding to max bar size (d_b) = 20 mm

As Per IS 456 2000 Clause 26.2.1

$$\text{Development Length}(l_d) = \frac{d_b \times 0.87 \times f_y}{4 \times \gamma_{bd}} = 0.765 \text{ m}$$

$$\text{Allowable Length}(l_{db}) = \left[\frac{(B - b)}{2} - cc \right] = 0.867 \text{ m}$$

$l_{db} \geq l_d$ hence, safe

Along Z Axis

Bar diameter corresponding to max bar size(d_b) = 20 mm

As Per IS 456 2000 Clause 26.2.1

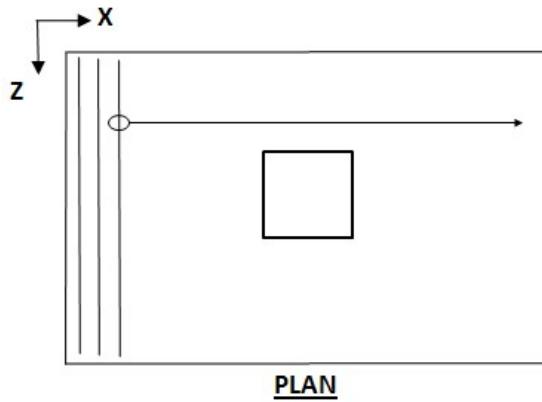
$$\text{Development Length}(l_d) = \frac{d_b \times 0.87 \times f_y}{4 \times \gamma_{bd}} = 0.765 \text{ m}$$

$$\text{Allowable Length}(l_{db}) = \left[\frac{(H - h)}{2} - cc \right] = 0.892 \text{ m}$$

$l_{db} \geq l_d$ hence, safe

Bottom Reinforcement Design

Along Z Axis



For moment w.r.t. X Axis (M_x)

As Per IS 456 2000 Clause 26.5.2.1

Critical Load Case = #3

Minimum Area of Steel ($A_{st,min}$) = 857.512 mm²

Calculated Area of Steel (A_{st}) = 1500.887 mm²

Provided Area of Steel ($A_{st,Provided}$) = 1500.887 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.048 m

Selected spacing (S) = 0.075 m

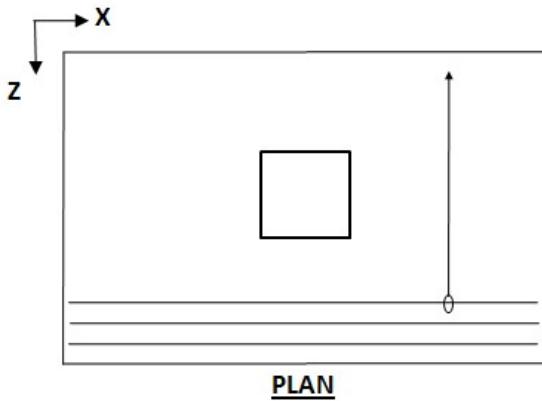
$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0.075 m o.c.

Along X Axis



For moment w.r.t. Z Axis (M_z)

As Per IS 456 2000 Clause 26.5.2.1

Critical Load Case = #3

Minimum Area of Steel ($A_{st,min}$) = 857.512 mm²

Calculated Area of Steel (A_{st}) = 1422.663 mm²

Provided Area of Steel ($A_{st,Provided}$) = 1422.663 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.078 m

$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

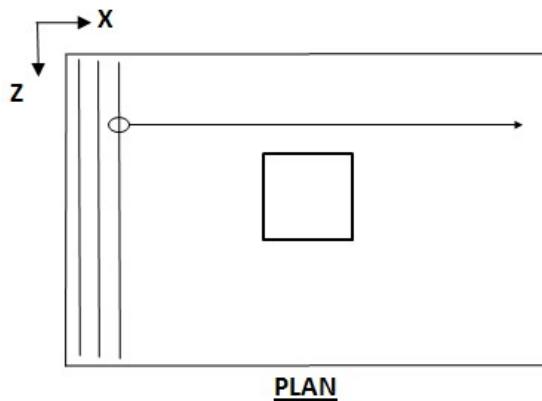
The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0.075 m o.c.

[Top Reinforcement Design](#)

[Along Z Axis](#)



Minimum Area of Steel ($A_{st,min}$) = 857.512 mm²

Calculated Area of Steel (A_{st}) = 854.708 mm²

Provided Area of Steel ($A_{st,Provided}$) = 857.512 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Governing Moment = 8.744 kNm

Selected bar Size (d_b) = Ø6

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.073 m

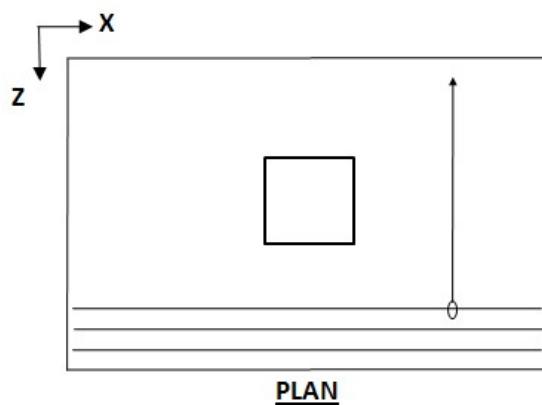
$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø6 @ 0 m o.c.

Along X Axis



Minimum Area of Steel ($A_{st,min}$) = 857.512 mm²

Calculated Area of Steel (A_{st}) = 1422.663 mm²

Provided Area of Steel ($A_{st,Provided}$) = 1422.663 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Governing Moment = 8.298 kNm

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.078 m

$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0 m o.c.

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 796.824 kN

Critical Applied Moment Along X Direction: 15.936 kNm

Critical Applied Moment Along Z Direction: 15.936 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.182 m

Position Of Neutral Axis Along Z Direction: 0.182 m

Pedestal Moment Capacity Along X Direction: 110.801 kNm

Pedestal Moment Capacity Along Z Direction: 125.969 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 577.848 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m
Position Of Neutral Axis Along Z Direction: 0.137 m
Pedestal Moment Capacity Along X Direction: 93.412 kNm
Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²
Pedestal Main/Compression Reinforcement: 16 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 783.137 kN
Critical Applied Moment Along X Direction: 15.662 kNm
Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m
Position Of Neutral Axis Along Z Direction: 0.180 m
Pedestal Moment Capacity Along X Direction: 110.061 kNm
Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²
Pedestal Main/Compression Reinforcement: 12 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN
Critical Applied Moment Along X Direction: 21.591 kNm
Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m
Position Of Neutral Axis Along Z Direction: 0.235 m
Pedestal Moment Capacity Along X Direction: 116.443 kNm
Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²
Pedestal Main/Compression Reinforcement: 28 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1108.293 kN

Critical Applied Moment Along X Direction: 22.165 kNm

Critical Applied Moment Along Z Direction: 22.165 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.224 kNm

Pedestal Moment Capacity Along Z Direction: 133.768 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 803.721 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1079.582 kN

Critical Applied Moment Along X Direction: 21.591 kNm

Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m

Position Of Neutral Axis Along Z Direction: 0.235 m

Pedestal Moment Capacity Along X Direction: 116.443 kNm

Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²

Pedestal Main/Compression Reinforcement: 28 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m

Position Of Neutral Axis Along Z Direction: 0.180 m

Pedestal Moment Capacity Along X Direction: 110.061 kNm

Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 802.558 kN

Critical Applied Moment Along X Direction: 16.051 kNm

Critical Applied Moment Along Z Direction: 16.051 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.183 m

Position Of Neutral Axis Along Z Direction: 0.183 m

Pedestal Moment Capacity Along X Direction: 111.028 kNm

Pedestal Moment Capacity Along Z Direction: 126.226 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 590.780 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1106.751 kN

Critical Applied Moment Along X Direction: 22.135 kNm

Critical Applied Moment Along Z Direction: 22.135 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.240 kNm

Pedestal Moment Capacity Along Z Direction: 133.790 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 802.604 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1137.123 kN

Critical Applied Moment Along X Direction: 22.742 kNm

Critical Applied Moment Along Z Direction: 22.742 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.244 m

Position Of Neutral Axis Along Z Direction: 0.244 m

Pedestal Moment Capacity Along X Direction: 117.002 kNm

Pedestal Moment Capacity Along Z Direction: 133.264 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 824.628 mm²

Pedestal Main/Compression Reinforcement: 32 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1106.751 kN

Critical Applied Moment Along X Direction: 22.135 kNm

Critical Applied Moment Along Z Direction: 22.135 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.240 kNm

Pedestal Moment Capacity Along Z Direction: 133.790 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 802.604 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 802.558 kN

Critical Applied Moment Along X Direction: 16.051 kNm

Critical Applied Moment Along Z Direction: 16.051 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.183 m

Position Of Neutral Axis Along Z Direction: 0.183 m

Pedestal Moment Capacity Along X Direction: 111.028 kNm

Pedestal Moment Capacity Along Z Direction: 126.226 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 590.780 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m
Position Of Neutral Axis Along Z Direction: 0.180 m
Pedestal Moment Capacity Along X Direction: 110.061 kNm
Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²
Pedestal Main/Compression Reinforcement: 12 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN
Critical Applied Moment Along X Direction: 21.591 kNm
Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m
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Pedestal Moment Capacity Along X Direction: 116.443 kNm
Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
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Required Main Reinforcement: 782.901 mm²
Pedestal Main/Compression Reinforcement: 28 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1108.293 kN
Critical Applied Moment Along X Direction: 22.165 kNm
Critical Applied Moment Along Z Direction: 22.165 kNm

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Minimum longitudinal pedestal reinforcement is calculated based on
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Required Main Reinforcement: 803.721 mm²
Pedestal Main/Compression Reinforcement: 16 - Ø8
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Pedestal Reinforcement Design

Critical load Case : 3

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Required Main Reinforcement: 567.922 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

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Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

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Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
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Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

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Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 796.824 kN

Critical Applied Moment Along X Direction: 15.936 kNm

Critical Applied Moment Along Z Direction: 15.936 kNm

Pedestal design is performed in accordance with IS 456 Section 39

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Required Main Reinforcement: 577.848 mm²

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Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

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Critical Applied Moment Along X Direction: 11.460 kNm

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Pedestal design is performed in accordance with IS 456 Section 39

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Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

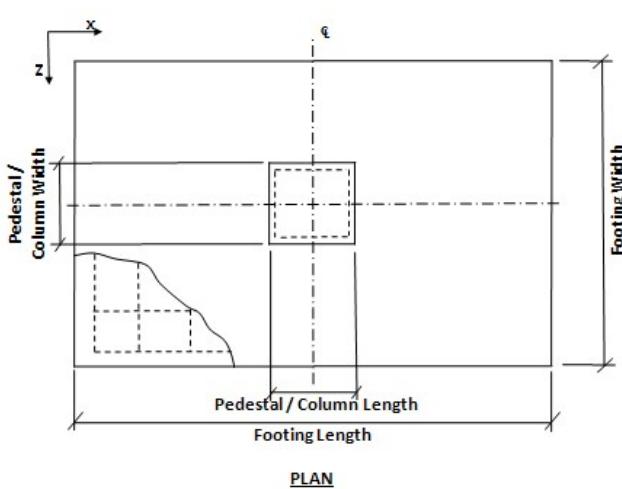
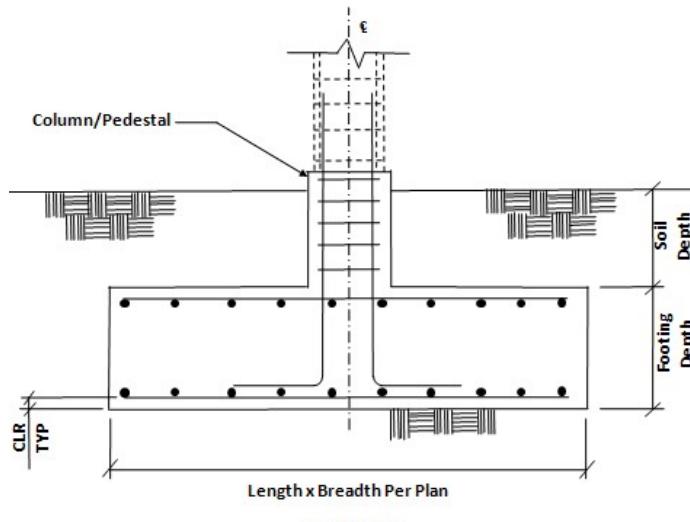
Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Isolated Footing 2



Input Values

Footing Geomtry

Design Type : Calculate Dimension
 Footing Thickness (Ft) : 12.000 in
 Footing Length - X (Fl) : 40.000 in
 Footing Width - Z (Fw) : 40.000 in
 Eccentricity along X (Oxd) : 0.000 in
 Eccentricity along Z (Ozd) : 0.000 in

Column Dimensions

Column Shape : Rectangular
 Column Length - X (Pl) : 0.450 m
 Column Width - Z (Pw) : 0.400 m

Pedestal

Include Pedestal? Yes
 Pedestal Shape : Rectangular
 Pedestal Height (Ph) : 0.015 m
 Pedestal Length - X (Pl) : 0.450 m
 Pedestal Width - Z (Pw) : 0.400 m

Design Parameters

Concrete and Rebar Properties

Unit Weight of Concrete : 150.000 lb/ft³
 Strength of Concrete : 4.000 ksi
 Yield Strength of Steel : 60.000 ksi
 Minimum Bar Size : Ø6
 Maximum Bar Size : Ø32
 Minimum Bar Spacing : 2.000 in
 Maximum Bar Spacing : 18.000 in
 Pedestal Clear Cover (P, CL) : 3.000 in
 Footing Clear Cover (F, CL) : 3.000 in

Soil Properties

Soil Type : UnDrained
 Unit Weight : 112.000 lb/ft³
 Soil Bearing Capacity : 4.000 kip/ft²
 Soil Surcharge : 0.000 kip/in²
 Depth of Soil above Footing : 0.000 in
 Undrained Shear Strength : 0.000 kip/in²
 Min Percentage of Slab : 0.000

Sliding and Overturning

Coefficient of Friction : 0.500
 Factor of Safety Against Sliding : 1.500
 Factor of Safety Against Overturning : 1.500

Load Combination/s- Service Stress Level	
Load Combination Number	Load Combination Title
1	DEAD
2	LIVE
3	COMBINATION LOAD CASE 3
101	1.000 x DL+1.000 x DL+1.000 x DL

102	0.800 x DL+0.800 x DL+0.800 x DL
Load Combination/s- Strength Level	
Load Combination Number	Load Combination Title
1	DEAD
2	LIVE
3	COMBINATION LOAD CASE 3

Applied Loads - Service Stress Level					
LC	Axial (kN)	Shear X (kN)	Shear Z (kN)	Moment X (kNm)	Moment Z (kNm)
1	448.716	-0.215	-2.379	-2.365	0.234
2	68.982	-0.073	-0.781	-0.777	0.078
3	776.547	-0.433	-4.740	-4.713	0.467
101	1294.245	-0.721	-7.900	-7.855	0.778
102	1035.396	-0.577	-6.320	-6.284	0.623

Applied Loads - Strength Level					
LC	Axial (kN)	Shear X (kN)	Shear Z (kN)	Moment X (kNm)	Moment Z (kNm)
1	448.716	-0.215	-2.379	-2.365	0.234
2	68.982	-0.073	-0.781	-0.777	0.078
3	776.547	-0.433	-4.740	-4.713	0.467

Design Calculations

Footing Size

Initial Length (L_o) = 1.016 m

Initial Width (W_o) = 1.016 m

Uplift force due to buoyancy = 0.000 kN

Effect due to adhesion = 0.000 kN

Area from initial length and width, $A_o = L_o \times W_o = 1.032 \text{ m}^2$

Min. area required from bearing pressure, $A_{\min} = P / q_{\max} = 6.797 \text{ m}^2$

Note: A_{\min} is an initial estimation.

P = Critical Factored Axial Load (without self weight/buoyancy/soil).

q_{\max} = Respective Factored Bearing Capacity.

Final Footing Size

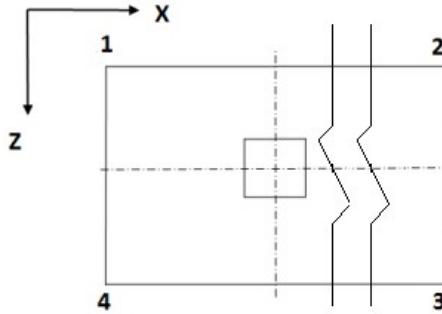
Length (L_2) = 2.692 m Governing Load Case : # 101

Width (W_2) = 2.692 m Governing Load Case : # 101

Depth (D_2) = 0.306 m Governing Load Case : # 101

$$\text{Area } (A_2) = 7.249 \text{ m}^2$$

Pressures at Four Corner



Load Case	Pressure at corner 1 (q_1) (kN/m ²)	Pressure at corner 2 (q_2) (kN/m ²)	Pressure at corner 3 (q_3) (kN/m ²)	Pressure at corner 4 (q_4) (kN/m ²)	Area of footing in uplift (A_u) (m ²)
101	189.2342	188.6138	182.2296	182.8500	0.000
101	189.2342	188.6138	182.2296	182.8500	0.000
101	189.2342	188.6138	182.2296	182.8500	0.000
101	189.2342	188.6138	182.2296	182.8500	0.000

If A_u is zero, there is no uplift and no pressure adjustment is necessary. Otherwise, to account for uplift, areas of negative pressure will be set to zero and the pressure will be redistributed to remaining corners.

Summary of adjusted Pressures at Four Corner

Load Case	Pressure at corner 1 (q_1) (kN/m ²)	Pressure at corner 2 (q_2) (kN/m ²)	Pressure at corner 3 (q_3) (kN/m ²)	Pressure at corner 4 (q_4) (kN/m ²)
101	189.2342	188.6138	182.2296	182.8500
101	189.2342	188.6138	182.2296	182.8500
101	189.2342	188.6138	182.2296	182.8500
101	189.2342	188.6138	182.2296	182.8500

Details of Out-of-Contact Area (If Any)

Governing load case = N/A

Plan area of footing = 7.249 sq.m

Area not in contact with soil = 0.000 sq.m

% of total area not in contact = 0.000%

Check For Stability Against Overturning And Sliding

-	Factor of safety against sliding		Factor of safety against overturning	
Load Case No.	Along X-Direction	Along Z-Direction	About X-Direction	About Z-Direction
1	1165.124	105.271	215.685	2229.557
2	824.985	77.504	158.697	1610.403
3	958.005	87.409	179.060	1842.455
101	933.899	85.209	174.555	1796.095
102	942.938	86.034	176.244	1813.481

Critical Load Case And The Governing Factor Of Safety For Overturning and Sliding X Direction

Critical Load Case for Sliding along X-Direction : 2

Governing Disturbing Force : -0.073 kN

Governing Restoring Force : 60.556 kN

Minimum Sliding Ratio for the Critical Load Case : 824.985

Critical Load Case for Overturning about X-Direction : 2

Governing Overturning Moment : -1.027 kNm

Governing Resisting Moment : 163.037 kNm

Minimum Overturning Ratio for the Critical Load Case : 158.697

Critical Load Case And The Governing Factor Of Safety For Overturning and Sliding Z Direction

Critical Load Case for Sliding along Z-Direction : 2

Governing Disturbing Force : -0.781 kN

Governing Restoring Force : 60.556 kN

Minimum Sliding Ratio for the Critical Load Case : 77.504

Critical Load Case for Overturning about Z-Direction : 2

Governing Overturning Moment : 0.101 kNm

Governing Resisting Moment : 163.037 kNm

Minimum Overturning Ratio for the Critical Load Case : 1610.403

Moment CalculationCheck Trial Depth against moment (w.r.t. X Axis)**Critical Load Case = #3**

Effective Depth = $D - (cc + 0.5 \times d_b) = 0.226 \text{ m}$

Governing moment (M_u) = 191.882 kNm

As Per IS 456 2000 ANNEX G G-1.1C

Limiting Factor1 (K_{umax}) = $\frac{700}{(1100 + 0.87 \times f_y)} = 0.479483$

Limiting Factor2 (R_{umax}) = $0.36 \times f_{ck} \times k_{umax} \times (1 - 0.42 \times k_{umax}) = 3801.834636 \text{ kN/m}^2$

Limit Moment Of Resistance (M_{umax}) = $R_{umax} \times B \times d_e^2 = 520.958387 \text{ kNm}$

$M_u \leq M_{umax}$ hence, safe

Check Trial Depth against moment (w.r.t. Z Axis)

Critical Load Case = #3

$$\text{Effective Depth} = D - (cc + 0.5 \times d_b) = 0.226 \text{ m}$$

$$\text{Governing moment } (M_u) = 181.510 \text{ kNm}$$

As Per IS 456 2000 ANNEX G G-1.1C

$$\text{Limiting Factor1 } (K_{umax}) = \frac{700}{(1100 + 0.87 \times f_y)} = 0.479483$$

$$\text{Limiting Factor2 } (R_{umax}) = \frac{0.36 \times f_{ck} \times k_{umax} \times (1 - 0.42 \times k_{umax})}{k_{umax}} = 3801.834636 \text{ kN/m}^2$$

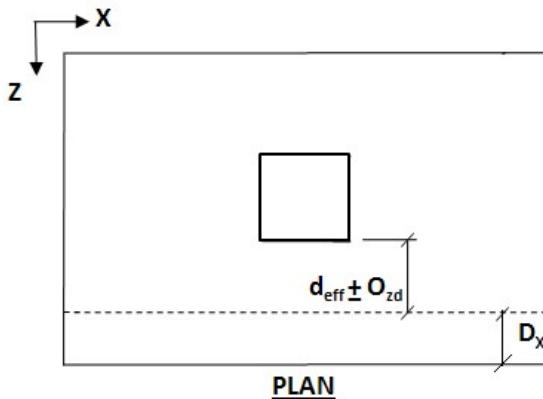
$$\text{Limit Moment Of Resistance } (M_{umax}) = \frac{R_{umax} \times B \times d_e^2}{4} = 520.958387 \text{ kNm}$$

$M_u \leq M_{umax}$ hence, safe

Shear Calculation

Check Trial Depth for one way shear (Along X Axis)

(Shear Plane Parallel to X Axis)



Critical Load Case = #3

$$D_X = 0.226 \text{ m}$$

$$\text{Shear Force}(S) = 268.645 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 442.283255 \text{ kN/m}^2$$

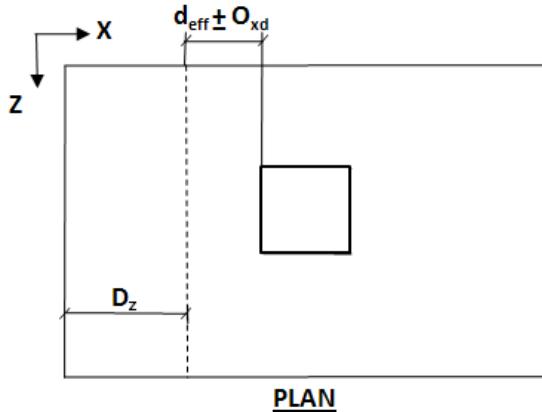
$$\text{Percentage Of Steel}(P_t) = 0.3910$$

As Per IS 456 2000 Clause 40 Table 19

$$\text{Shear Strength Of Concrete}(T_c) = 444.984 \text{ kN/m}^2$$

$T_v < T_c$ hence, safe

Check Trial Depth for one way shear (Along Z Axis)
(Shear Plane Parallel to Z Axis)



Critical Load Case = #3

$$D_z = 0.226 \text{ m}$$

$$\text{Shear Force}(S) = 258.610 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 425.762139 \text{ kN/m}^2$$

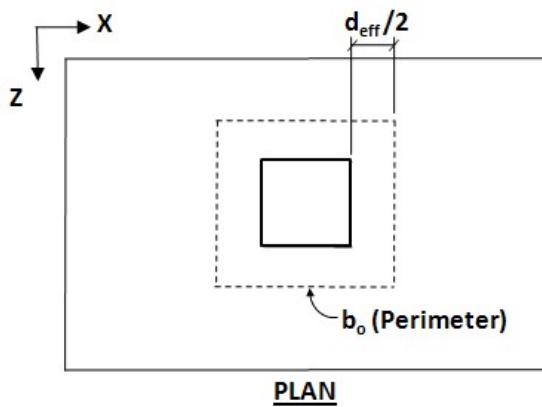
$$\text{Percentage Of Steel}(P_t) = 0.4149$$

As Per IS 456 2000 Clause 40 Table 19

$$\text{Shear Strength Of Concrete}(T_c) = 456.269 \text{ kN/m}^2$$

$T_v < T_c$ hence, safe

Check Trial Depth for two way shear



Critical Load Case = #3

$$\text{Shear Force}(S) = 731.270 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 1245.562 \text{ kN/m}^2$$

As Per IS 456 2000 Clause 31.6.3.1

$$K_s = \min[(0.5 + \beta), 1] = 1.000$$

$$\text{Shear Strength}(T_c) = 0.25 \times \sqrt{f_{ck}} = 1312.8936 \text{ kN/m}^2$$

$$K_s \times T_c = 1312.8936 \text{ kN/m}^2$$

$$T_v \leq K_s \times T_c \text{ hence, safe}$$

Reinforcement Calculation

Calculation of Maximum Bar Size

Along X Axis

Bar diameter corresponding to max bar size (d_b) = 25 mm

As Per IS 456 2000 Clause 26.2.1

$$\text{Development Length}(l_d) = \frac{d_b \times 0.87 \times f_y}{4 \times \gamma_{bd}} = 0.956 \text{ m}$$

$$\text{Allowable Length}(l_{db}) = \left[\frac{(B - b)}{2} - cc \right] = 1.045 \text{ m}$$

$$l_{db} \geq l_d \text{ hence, safe}$$

Along Z Axis

Bar diameter corresponding to max bar size(d_b) = 25 mm

As Per IS 456 2000 Clause 26.2.1

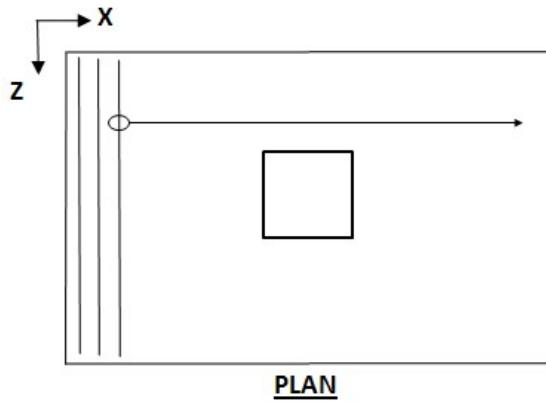
$$\text{Development Length}(l_d) = \frac{d_b \times 0.87 \times f_y}{4 \times \gamma_{bd}} = 0.956 \text{ m}$$

$$\text{Allowable Length}(l_{db}) = \left[\frac{(H - h)}{2} - cc \right] = 1.070 \text{ m}$$

$$l_{db} \geq l_d \text{ hence, safe}$$

Bottom Reinforcement Design

Along Z Axis



For moment w.r.t. X Axis (M_x)

As Per IS 456 2000 Clause 26.5.2.1

Critical Load Case = #3

Minimum Area of Steel ($A_{st,min}$) = 991.234 mm²

Calculated Area of Steel (A_{st}) = 2520.115 mm²

Provided Area of Steel ($A_{st,Provided}$) = 2520.115 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Selected bar Size (d_b) = Ø10

Minimum spacing allowed (S_{min}) = 0.050 m

Selected spacing (S) = 0.079 m

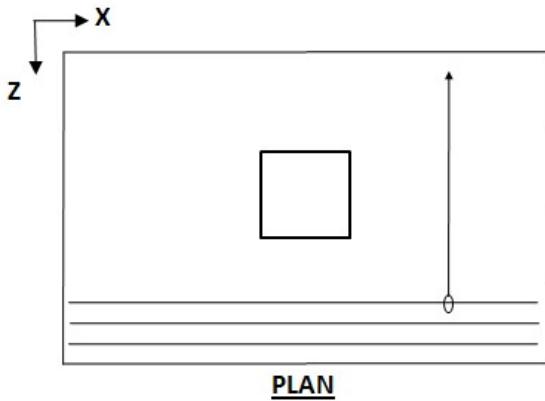
$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø10 @ 0.075 m o.c.

Along X Axis



For moment w.r.t. Z Axis (M_z)

As Per IS 456 2000 Clause 26.5.2.1

Critical Load Case = #3

Minimum Area of Steel ($A_{st,min}$) = 988.003 mm²

Calculated Area of Steel (A_{st}) = 2374.804 mm²

Provided Area of Steel ($A_{st,Provided}$) = 2374.804 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.054 m

$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

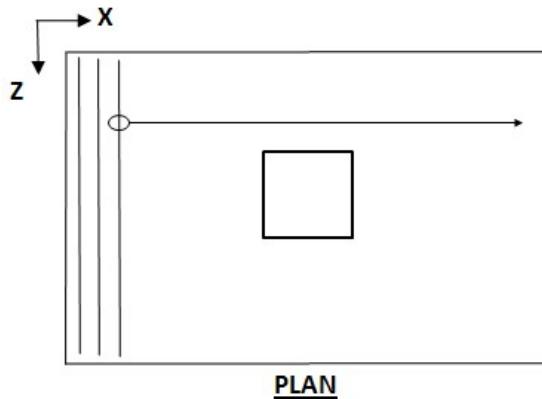
The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0.050 m o.c.

[Top Reinforcement Design](#)

[Along Z Axis](#)



Minimum Area of Steel ($A_{st,min}$) = 991.234 mm²

Calculated Area of Steel (A_{st}) = 984.772 mm²

Provided Area of Steel ($A_{st,Provided}$) = 991.234 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Governing Moment = 14.114 kNm

Selected bar Size (d_b) = Ø6

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.075 m

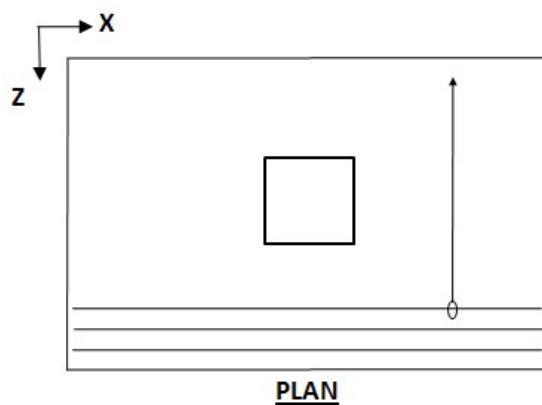
$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø6 @ 0 m o.c.

Along X Axis



Minimum Area of Steel ($A_{st,min}$) = 988.003 mm²

Calculated Area of Steel (A_{st}) = 2374.804 mm²

Provided Area of Steel ($A_{st,Provided}$) = 2374.804 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Governing Moment = 13.505 kNm

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.054 m

$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0 m o.c.

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 796.824 kN

Critical Applied Moment Along X Direction: 15.936 kNm

Critical Applied Moment Along Z Direction: 15.936 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.182 m

Position Of Neutral Axis Along Z Direction: 0.182 m

Pedestal Moment Capacity Along X Direction: 110.801 kNm

Pedestal Moment Capacity Along Z Direction: 125.969 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 577.848 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m
Position Of Neutral Axis Along Z Direction: 0.137 m
Pedestal Moment Capacity Along X Direction: 93.412 kNm
Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²
Pedestal Main/Compression Reinforcement: 16 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 783.137 kN
Critical Applied Moment Along X Direction: 15.662 kNm
Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m
Position Of Neutral Axis Along Z Direction: 0.180 m
Pedestal Moment Capacity Along X Direction: 110.061 kNm
Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²
Pedestal Main/Compression Reinforcement: 12 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN
Critical Applied Moment Along X Direction: 21.591 kNm
Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m
Position Of Neutral Axis Along Z Direction: 0.235 m
Pedestal Moment Capacity Along X Direction: 116.443 kNm
Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²
Pedestal Main/Compression Reinforcement: 28 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1108.293 kN

Critical Applied Moment Along X Direction: 22.165 kNm

Critical Applied Moment Along Z Direction: 22.165 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.224 kNm

Pedestal Moment Capacity Along Z Direction: 133.768 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 803.721 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1079.582 kN

Critical Applied Moment Along X Direction: 21.591 kNm

Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m

Position Of Neutral Axis Along Z Direction: 0.235 m

Pedestal Moment Capacity Along X Direction: 116.443 kNm

Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²

Pedestal Main/Compression Reinforcement: 28 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m

Position Of Neutral Axis Along Z Direction: 0.180 m

Pedestal Moment Capacity Along X Direction: 110.061 kNm

Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 802.558 kN

Critical Applied Moment Along X Direction: 16.051 kNm

Critical Applied Moment Along Z Direction: 16.051 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.183 m

Position Of Neutral Axis Along Z Direction: 0.183 m

Pedestal Moment Capacity Along X Direction: 111.028 kNm

Pedestal Moment Capacity Along Z Direction: 126.226 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 590.780 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1106.751 kN

Critical Applied Moment Along X Direction: 22.135 kNm

Critical Applied Moment Along Z Direction: 22.135 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.240 kNm

Pedestal Moment Capacity Along Z Direction: 133.790 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 802.604 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1137.123 kN

Critical Applied Moment Along X Direction: 22.742 kNm

Critical Applied Moment Along Z Direction: 22.742 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.244 m

Position Of Neutral Axis Along Z Direction: 0.244 m

Pedestal Moment Capacity Along X Direction: 117.002 kNm

Pedestal Moment Capacity Along Z Direction: 133.264 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 824.628 mm²

Pedestal Main/Compression Reinforcement: 32 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1106.751 kN

Critical Applied Moment Along X Direction: 22.135 kNm

Critical Applied Moment Along Z Direction: 22.135 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.240 kNm

Pedestal Moment Capacity Along Z Direction: 133.790 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 802.604 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 802.558 kN

Critical Applied Moment Along X Direction: 16.051 kNm

Critical Applied Moment Along Z Direction: 16.051 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.183 m

Position Of Neutral Axis Along Z Direction: 0.183 m

Pedestal Moment Capacity Along X Direction: 111.028 kNm

Pedestal Moment Capacity Along Z Direction: 126.226 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 590.780 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m
Position Of Neutral Axis Along Z Direction: 0.180 m
Pedestal Moment Capacity Along X Direction: 110.061 kNm
Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²
Pedestal Main/Compression Reinforcement: 12 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN
Critical Applied Moment Along X Direction: 21.591 kNm
Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m
Position Of Neutral Axis Along Z Direction: 0.235 m
Pedestal Moment Capacity Along X Direction: 116.443 kNm
Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²
Pedestal Main/Compression Reinforcement: 28 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1108.293 kN
Critical Applied Moment Along X Direction: 22.165 kNm
Critical Applied Moment Along Z Direction: 22.165 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m
Position Of Neutral Axis Along Z Direction: 0.239 m
Pedestal Moment Capacity Along X Direction: 117.224 kNm
Pedestal Moment Capacity Along Z Direction: 133.768 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 803.721 mm²
Pedestal Main/Compression Reinforcement: 16 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN

Critical Applied Moment Along X Direction: 21.591 kNm

Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m

Position Of Neutral Axis Along Z Direction: 0.235 m

Pedestal Moment Capacity Along X Direction: 116.443 kNm

Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²

Pedestal Main/Compression Reinforcement: 28 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m

Position Of Neutral Axis Along Z Direction: 0.180 m

Pedestal Moment Capacity Along X Direction: 110.061 kNm

Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 796.824 kN

Critical Applied Moment Along X Direction: 15.936 kNm

Critical Applied Moment Along Z Direction: 15.936 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.182 m

Position Of Neutral Axis Along Z Direction: 0.182 m

Pedestal Moment Capacity Along X Direction: 110.801 kNm

Pedestal Moment Capacity Along Z Direction: 125.969 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 577.848 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

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Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

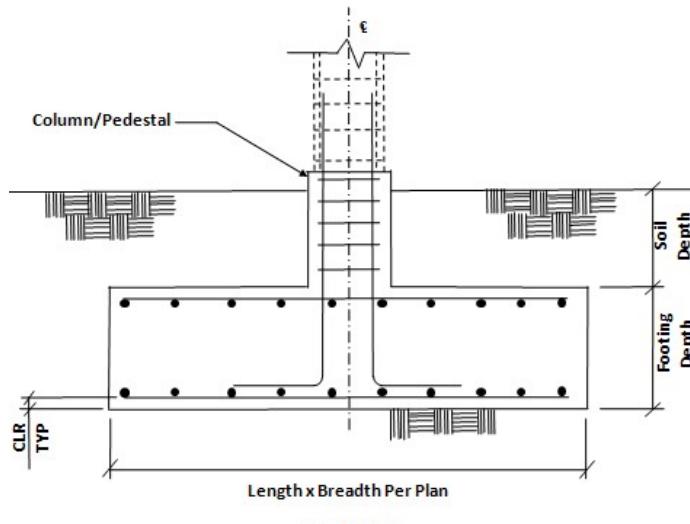
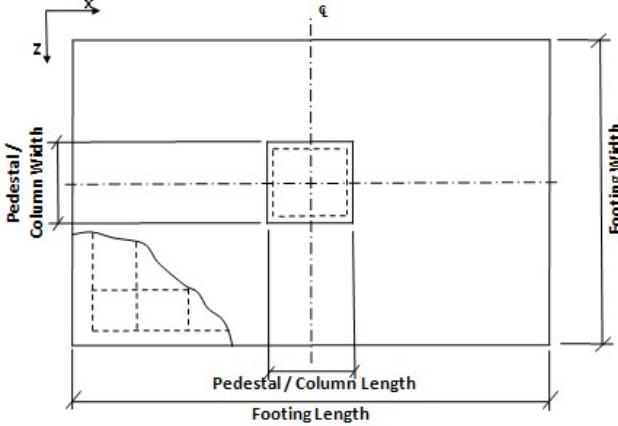
Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Isolated Footing 3

ELEVATIONPLAN

Input Values

Footing Geomtry

Design Type : Calculate Dimension

Footing Thickness (Ft) : 12.000 in

Footing Length - X (Fl) : 40.000 in

Footing Width - Z (Fw) : 40.000 in

Eccentricity along X (Oxd) : 0.000 in

Eccentricity along Z (Ozd) : 0.000 in

Column Dimensions

Column Shape : Rectangular

Column Length - X (Pl) : 0.450 m

Column Width - Z (Pw) : 0.400 m

Pedestal

Include Pedestal? Yes
 Pedestal Shape : Rectangular
 Pedestal Height (Ph) : 0.015 m
 Pedestal Length - X (Pl) : 0.450 m
 Pedestal Width - Z (Pw) : 0.400 m

Design Parameters

Concrete and Rebar Properties

Unit Weight of Concrete : 150.000 lb/ft³
 Strength of Concrete : 4.000 ksi
 Yield Strength of Steel : 60.000 ksi
 Minimum Bar Size : Ø6
 Maximum Bar Size : Ø32
 Minimum Bar Spacing : 2.000 in
 Maximum Bar Spacing : 18.000 in
 Pedestal Clear Cover (P, CL) : 3.000 in
 Footing Clear Cover (F, CL) : 3.000 in

Soil Properties

Soil Type : UnDrained
 Unit Weight : 112.000 lb/ft³
 Soil Bearing Capacity : 4.000 kip/ft²
 Soil Surcharge : 0.000 kip/in²
 Depth of Soil above Footing : 0.000 in
 Undrained Shear Strength : 0.000 kip/in²
 Min Percentage of Slab : 0.000

Sliding and Overturning

Coefficient of Friction : 0.500
 Factor of Safety Against Sliding : 1.500
 Factor of Safety Against Overturning : 1.500

Load Combination/s- Service Stress Level	
Load Combination Number	Load Combination Title
1	DEAD
2	LIVE
3	COMBINATION LOAD CASE 3
101	1.000 x DL+1.000 x DL+1.000 x DL

102	0.800 x DL+0.800 x DL+0.800 x DL
Load Combination/s- Strength Level	
Load Combination Number	Load Combination Title
1	DEAD
2	LIVE
3	COMBINATION LOAD CASE 3

Applied Loads - Service Stress Level					
LC	Axial (kN)	Shear X (kN)	Shear Z (kN)	Moment X (kNm)	Moment Z (kNm)
1	458.864	0.000	-2.415	-2.401	0.000
2	72.352	0.000	-0.806	-0.802	0.000
3	796.824	0.000	-4.831	-4.805	0.000
101	1328.040	0.000	-8.052	-8.008	0.000
102	1062.432	0.000	-6.442	-6.406	0.000

Applied Loads - Strength Level					
LC	Axial (kN)	Shear X (kN)	Shear Z (kN)	Moment X (kNm)	Moment Z (kNm)
1	458.864	0.000	-2.415	-2.401	0.000
2	72.352	0.000	-0.806	-0.802	0.000
3	796.824	0.000	-4.831	-4.805	0.000

Design Calculations

Footing Size

Initial Length (L_o) = 1.016 m

Initial Width (W_o) = 1.016 m

Uplift force due to buoyancy = 0.000 kN

Effect due to adhesion = 0.000 kN

Area from initial length and width, $A_o = L_o \times W_o = 1.032 \text{ m}^2$

Min. area required from bearing pressure, $A_{\min} = P / q_{\max} = 6.974 \text{ m}^2$

Note: A_{\min} is an initial estimation.

P = Critical Factored Axial Load (without self weight/buoyancy/soil).

q_{\max} = Respective Factored Bearing Capacity.

Final Footing Size

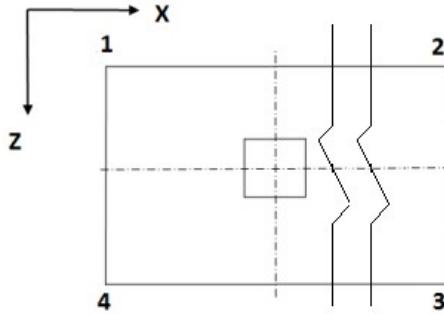
Length (L_2) = 2.743 m Governing Load Case : # 101

Width (W_2) = 2.743 m Governing Load Case : # 101

Depth (D_2) = 0.306 m Governing Load Case : # 101

$$\text{Area } (A_2) = 7.525 \text{ m}^2$$

Pressures at Four Corner



Load Case	Pressure at corner 1 (q_1) (kN/m ²)	Pressure at corner 2 (q_2) (kN/m ²)	Pressure at corner 3 (q_3) (kN/m ²)	Pressure at corner 4 (q_4) (kN/m ²)	Area of footing in uplift (A_u) (m ²)
101	186.7478	186.7478	180.5946	180.5946	0.000
101	186.7478	186.7478	180.5946	180.5946	0.000
101	186.7478	186.7478	180.5946	180.5946	0.000
101	186.7478	186.7478	180.5946	180.5946	0.000

If A_u is zero, there is no uplift and no pressure adjustment is necessary. Otherwise, to account for uplift, areas of negative pressure will be set to zero and the pressure will be redistributed to remaining corners.

Summary of adjusted Pressures at Four Corner

Load Case	Pressure at corner 1 (q_1) (kN/m ²)	Pressure at corner 2 (q_2) (kN/m ²)	Pressure at corner 3 (q_3) (kN/m ²)	Pressure at corner 4 (q_4) (kN/m ²)
101	186.7478	186.7478	180.5946	180.5946
101	186.7478	186.7478	180.5946	180.5946
101	186.7478	186.7478	180.5946	180.5946
101	186.7478	186.7478	180.5946	180.5946

Details of Out-of-Contact Area (If Any)

Governing load case = N/A

Plan area of footing = 7.525 sq.m

Area not in contact with soil = 0.000 sq.m

% of total area not in contact = 0.000%

Check For Stability Against Overturning And Sliding

-	Factor of safety against sliding		Factor of safety against overturning	
Load Case No.	Along X-Direction	Along Z-Direction	About X-Direction	About Z-Direction
1	N/A	106.196	221.647	N/A
2	N/A	78.491	163.700	N/A
3	N/A	88.066	183.773	N/A
101	N/A	85.826	179.098	N/A
102	N/A	86.666	180.851	N/A

Critical Load Case And The Governing Factor Of Safety For Overturning and Sliding X Direction

Critical Load Case for Sliding along X-Direction : 1

Governing Disturbing Force : 0.000 kN

Governing Restoring Force : 256.488 kN

Minimum Sliding Ratio for the Critical Load Case : 0.000

Critical Load Case for Overturning about X-Direction : 2

Governing Overturning Moment : -1.060 kNm

Governing Resisting Moment : 173.456 kNm

Minimum Overturning Ratio for the Critical Load Case : 163.700

Critical Load Case And The Governing Factor Of Safety For Overturning and Sliding Z Direction

Critical Load Case for Sliding along Z-Direction : 2

Governing Disturbing Force : -0.806 kN

Governing Restoring Force : 63.232 kN

Minimum Sliding Ratio for the Critical Load Case : 78.491

Critical Load Case for Overturning about Z-Direction : 1

Governing Overturning Moment : 0.000 kNm

Governing Resisting Moment : 703.586 kNm

Minimum Overturning Ratio for the Critical Load Case : 0.000

Moment CalculationCheck Trial Depth against moment (w.r.t. X Axis)**Critical Load Case = #3**

Effective Depth = $D - (cc + 0.5 \times d_b) = 0.226 \text{ m}$

Governing moment (M_u) = 201.840 kNm

As Per IS 456 2000 ANNEX G G-1.1C

Limiting Factor1 (K_{umax}) = $\frac{700}{(1100 + 0.87 \times f_y)} = 0.479483$

Limiting Factor2 (R_{umax}) = $0.36 \times f_{ck} \times k_{umax} \times (1 - 0.42 \times k_{umax}) = 3801.834636 \text{ kN/m}^2$

Limit Moment Of Resistance (M_{umax}) = $R_{umax} \times B \times d_e^2 = 530.787790 \text{ kNm}$

$M_u \leq M_{umax}$ hence, safe

Check Trial Depth against moment (w.r.t. Z Axis)

Critical Load Case = #3

$$\text{Effective Depth} = D - (cc + 0.5 \times d_b) = 0.226 \text{ m}$$

$$\text{Governing moment } (M_u) = 190.938 \text{ kNm}$$

As Per IS 456 2000 ANNEX G G-1.1C

$$\text{Limiting Factor1 } (K_{umax}) = \frac{700}{(1100 + 0.87 \times f_y)} = 0.479483$$

$$\text{Limiting Factor2 } (R_{umax}) = \frac{0.36 \times f_{ck} \times k_{umax} \times (1 - 0.42 \times k_{umax})}{k_{umax}} = 3801.834636 \text{ kN/m}^2$$

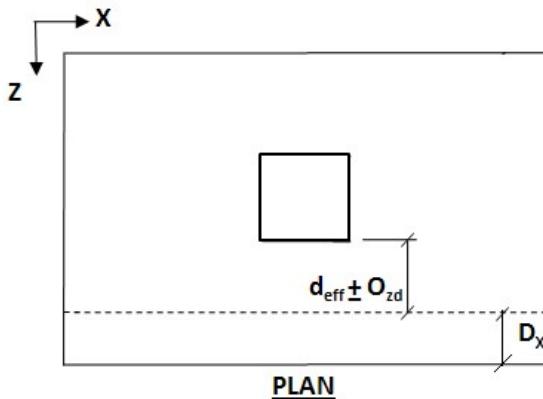
$$\text{Limit Moment Of Resistance } (M_{umax}) = \frac{R_{umax} \times B \times d_e^2}{4} = 530.787790 \text{ kNm}$$

$M_u \leq M_{umax}$ hence, safe

Shear Calculation

Check Trial Depth for one way shear (Along X Axis)

(Shear Plane Parallel to X Axis)



Critical Load Case = #3

$$D_x = 0.226 \text{ m}$$

$$\text{Shear Force}(S) = 277.926 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 449.088472 \text{ kN/m}^2$$

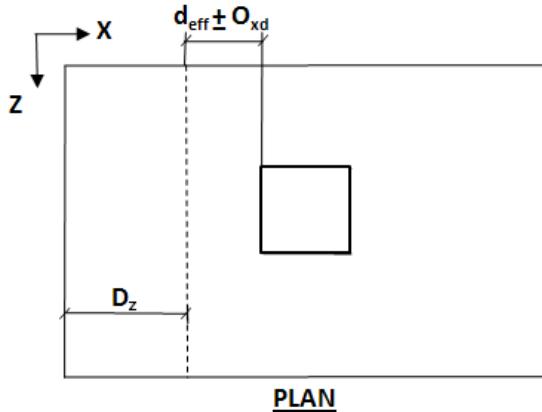
$$\text{Percentage Of Steel}(P_t) = 0.4045$$

As Per IS 456 2000 Clause 40 Table 19

$$\text{Shear Strength Of Concrete}(T_c) = 451.437 \text{ kN/m}^2$$

$T_v < T_c$ hence, safe

Check Trial Depth for one way shear (Along Z Axis)
(Shear Plane Parallel to Z Axis)



Critical Load Case = #3

$$D_z = 0.226 \text{ m}$$

$$\text{Shear Force}(S) = 267.525 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 432.283198 \text{ kN/m}^2$$

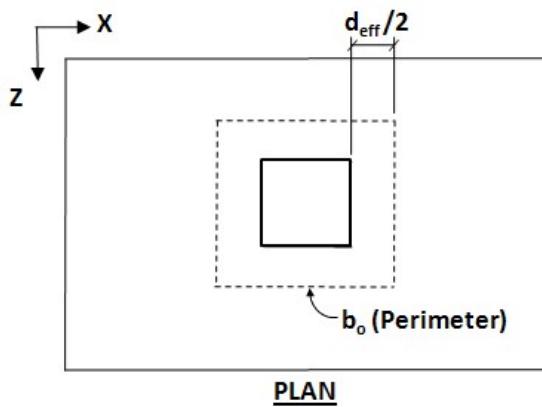
$$\text{Percentage Of Steel}(P_t) = 0.4293$$

As Per IS 456 2000 Clause 40 Table 19

$$\text{Shear Strength Of Concrete}(T_c) = 462.870 \text{ kN/m}^2$$

$T_v < T_c$ hence, safe

Check Trial Depth for two way shear



Critical Load Case = #3

$$\text{Shear Force}(S) = 752.070 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 1280.990 \text{ kN/m}^2$$

As Per IS 456 2000 Clause 31.6.3.1

$$K_s = \min[(0.5 + \beta), 1] = 1.000$$

$$\text{Shear Strength}(T_c) = 0.25 \times \sqrt{f_{ck}} = 1312.8936 \text{ kN/m}^2$$

$$K_s \times T_c = 1312.8936 \text{ kN/m}^2$$

$$T_v \leq K_s \times T_c \text{ hence, safe}$$

Reinforcement Calculation

Calculation of Maximum Bar Size

Along X Axis

Bar diameter corresponding to max bar size (d_b) = 25 mm

As Per IS 456 2000 Clause 26.2.1

$$\text{Development Length}(l_d) = \frac{d_b \times 0.87 \times f_y}{4 \times \gamma_{bd}} = 0.956 \text{ m}$$

$$\text{Allowable Length}(l_{db}) = \left[\frac{(B - b)}{2} - cc \right] = 1.070 \text{ m}$$

$$l_{db} \geq l_d \text{ hence, safe}$$

Along Z Axis

Bar diameter corresponding to max bar size(d_b) = 25 mm

As Per IS 456 2000 Clause 26.2.1

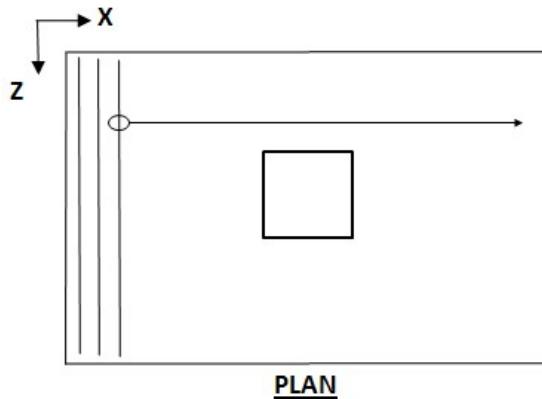
$$\text{Development Length}(l_d) = \frac{d_b \times 0.87 \times f_y}{4 \times \gamma_{bd}} = 0.956 \text{ m}$$

$$\text{Allowable Length}(l_{db}) = \left[\frac{(H - h)}{2} - cc \right] = 1.095 \text{ m}$$

$$l_{db} \geq l_d \text{ hence, safe}$$

Bottom Reinforcement Design

Along Z Axis



For moment w.r.t. X Axis (M_x)

As Per IS 456 2000 Clause 26.5.2.1

Critical Load Case = #3

Minimum Area of Steel ($A_{st,min}$) = 1009.936 mm²

Calculated Area of Steel (A_{st}) = 2657.026 mm²

Provided Area of Steel ($A_{st,Provided}$) = 2657.026 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Selected bar Size (d_b) = Ø10

Minimum spacing allowed (S_{min}) = 0.050 m

Selected spacing (S) = 0.078 m

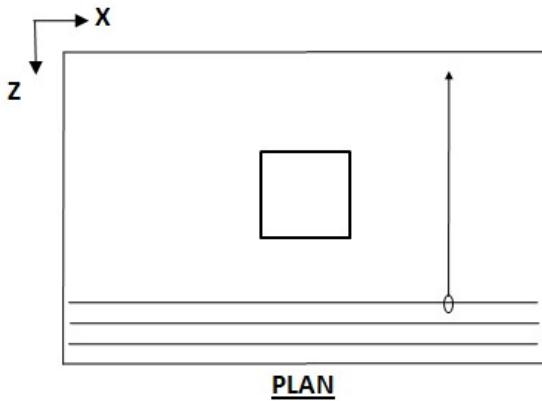
$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø10 @ 0.075 m o.c.

[Along X Axis](#)



For moment w.r.t. Z Axis (M_z)

As Per IS 456 2000 Clause 26.5.2.1

Critical Load Case = #3

Minimum Area of Steel ($A_{st,min}$) = 1006.645 mm²

Calculated Area of Steel (A_{st}) = 2503.557 mm²

Provided Area of Steel ($A_{st,Provided}$) = 2503.557 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.053 m

$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

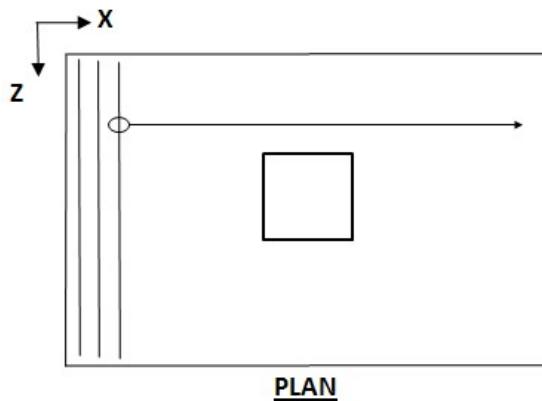
The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0.050 m o.c.

[Top Reinforcement Design](#)

[Along Z Axis](#)



Minimum Area of Steel ($A_{st,min}$) = 1009.936 mm²

Calculated Area of Steel (A_{st}) = 1003.353 mm²

Provided Area of Steel ($A_{st,Provided}$) = 1009.936 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Governing Moment = 15.024 kNm

Selected bar Size (d_b) = Ø6

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.074 m

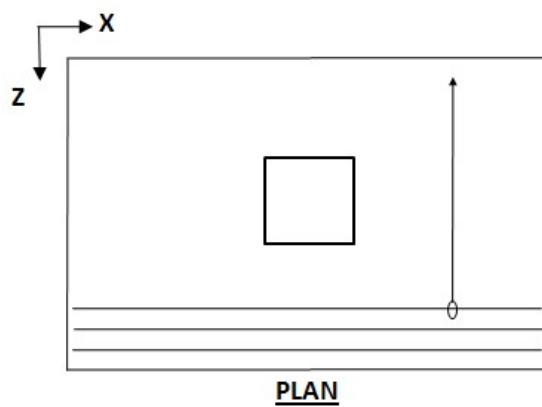
$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø6 @ 0 m o.c.

Along X Axis



Minimum Area of Steel ($A_{st,min}$) = 1006.645 mm²

Calculated Area of Steel (A_{st}) = 2503.557 mm²

Provided Area of Steel ($A_{st,Provided}$) = 2503.557 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Governing Moment = 14.390 kNm

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.053 m

$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0 m o.c.

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 796.824 kN

Critical Applied Moment Along X Direction: 15.936 kNm

Critical Applied Moment Along Z Direction: 15.936 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.182 m

Position Of Neutral Axis Along Z Direction: 0.182 m

Pedestal Moment Capacity Along X Direction: 110.801 kNm

Pedestal Moment Capacity Along Z Direction: 125.969 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 577.848 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

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Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m
Position Of Neutral Axis Along Z Direction: 0.137 m
Pedestal Moment Capacity Along X Direction: 93.412 kNm
Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²
Pedestal Main/Compression Reinforcement: 16 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 783.137 kN
Critical Applied Moment Along X Direction: 15.662 kNm
Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m
Position Of Neutral Axis Along Z Direction: 0.180 m
Pedestal Moment Capacity Along X Direction: 110.061 kNm
Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²
Pedestal Main/Compression Reinforcement: 12 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN
Critical Applied Moment Along X Direction: 21.591 kNm
Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m
Position Of Neutral Axis Along Z Direction: 0.235 m
Pedestal Moment Capacity Along X Direction: 116.443 kNm
Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²
Pedestal Main/Compression Reinforcement: 28 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1108.293 kN

Critical Applied Moment Along X Direction: 22.165 kNm

Critical Applied Moment Along Z Direction: 22.165 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.224 kNm

Pedestal Moment Capacity Along Z Direction: 133.768 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 803.721 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1079.582 kN

Critical Applied Moment Along X Direction: 21.591 kNm

Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m

Position Of Neutral Axis Along Z Direction: 0.235 m

Pedestal Moment Capacity Along X Direction: 116.443 kNm

Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²

Pedestal Main/Compression Reinforcement: 28 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m

Position Of Neutral Axis Along Z Direction: 0.180 m

Pedestal Moment Capacity Along X Direction: 110.061 kNm

Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 802.558 kN

Critical Applied Moment Along X Direction: 16.051 kNm

Critical Applied Moment Along Z Direction: 16.051 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.183 m

Position Of Neutral Axis Along Z Direction: 0.183 m

Pedestal Moment Capacity Along X Direction: 111.028 kNm

Pedestal Moment Capacity Along Z Direction: 126.226 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 590.780 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1106.751 kN

Critical Applied Moment Along X Direction: 22.135 kNm

Critical Applied Moment Along Z Direction: 22.135 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.240 kNm

Pedestal Moment Capacity Along Z Direction: 133.790 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 802.604 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1137.123 kN

Critical Applied Moment Along X Direction: 22.742 kNm

Critical Applied Moment Along Z Direction: 22.742 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.244 m

Position Of Neutral Axis Along Z Direction: 0.244 m

Pedestal Moment Capacity Along X Direction: 117.002 kNm

Pedestal Moment Capacity Along Z Direction: 133.264 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 824.628 mm²

Pedestal Main/Compression Reinforcement: 32 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1106.751 kN

Critical Applied Moment Along X Direction: 22.135 kNm

Critical Applied Moment Along Z Direction: 22.135 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.240 kNm

Pedestal Moment Capacity Along Z Direction: 133.790 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 802.604 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 802.558 kN

Critical Applied Moment Along X Direction: 16.051 kNm

Critical Applied Moment Along Z Direction: 16.051 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.183 m

Position Of Neutral Axis Along Z Direction: 0.183 m

Pedestal Moment Capacity Along X Direction: 111.028 kNm

Pedestal Moment Capacity Along Z Direction: 126.226 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 590.780 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m
Position Of Neutral Axis Along Z Direction: 0.180 m
Pedestal Moment Capacity Along X Direction: 110.061 kNm
Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²
Pedestal Main/Compression Reinforcement: 12 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN
Critical Applied Moment Along X Direction: 21.591 kNm
Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m
Position Of Neutral Axis Along Z Direction: 0.235 m
Pedestal Moment Capacity Along X Direction: 116.443 kNm
Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²
Pedestal Main/Compression Reinforcement: 28 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1108.293 kN
Critical Applied Moment Along X Direction: 22.165 kNm
Critical Applied Moment Along Z Direction: 22.165 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m
Position Of Neutral Axis Along Z Direction: 0.239 m
Pedestal Moment Capacity Along X Direction: 117.224 kNm
Pedestal Moment Capacity Along Z Direction: 133.768 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 803.721 mm²
Pedestal Main/Compression Reinforcement: 16 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN

Critical Applied Moment Along X Direction: 21.591 kNm

Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m

Position Of Neutral Axis Along Z Direction: 0.235 m

Pedestal Moment Capacity Along X Direction: 116.443 kNm

Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²

Pedestal Main/Compression Reinforcement: 28 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m

Position Of Neutral Axis Along Z Direction: 0.180 m

Pedestal Moment Capacity Along X Direction: 110.061 kNm

Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 796.824 kN

Critical Applied Moment Along X Direction: 15.936 kNm

Critical Applied Moment Along Z Direction: 15.936 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.182 m

Position Of Neutral Axis Along Z Direction: 0.182 m

Pedestal Moment Capacity Along X Direction: 110.801 kNm

Pedestal Moment Capacity Along Z Direction: 125.969 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 577.848 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

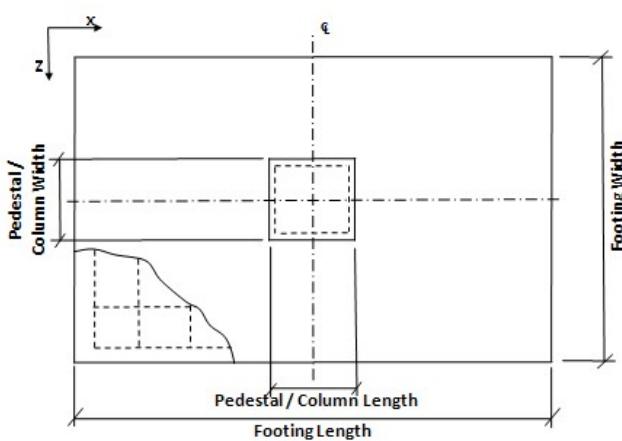
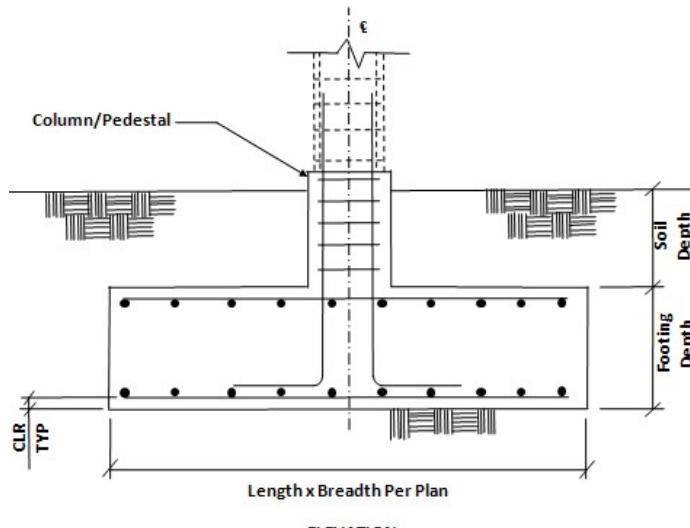
Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Isolated Footing 4



Input Values

Footing Geomtry

Design Type : Calculate Dimension
 Footing Thickness (Ft) : 12.000 in
 Footing Length - X (Fl) : 40.000 in
 Footing Width - Z (Fw) : 40.000 in
 Eccentricity along X (Oxd) : 0.000 in
 Eccentricity along Z (Ozd) : 0.000 in

Column Dimensions

Column Shape : Rectangular
 Column Length - X (Pl) : 0.450 m
 Column Width - Z (Pw) : 0.400 m

Pedestal

Include Pedestal? Yes
 Pedestal Shape : Rectangular
 Pedestal Height (Ph) : 0.015 m
 Pedestal Length - X (Pl) : 0.450 m
 Pedestal Width - Z (Pw) : 0.400 m

Design Parameters

Concrete and Rebar Properties

Unit Weight of Concrete : 150.000 lb/ft³
 Strength of Concrete : 4.000 ksi
 Yield Strength of Steel : 60.000 ksi
 Minimum Bar Size : Ø6
 Maximum Bar Size : Ø32
 Minimum Bar Spacing : 2.000 in
 Maximum Bar Spacing : 18.000 in
 Pedestal Clear Cover (P, CL) : 3.000 in
 Footing Clear Cover (F, CL) : 3.000 in

Soil Properties

Soil Type : UnDrained
 Unit Weight : 112.000 lb/ft³
 Soil Bearing Capacity : 4.000 kip/ft²
 Soil Surcharge : 0.000 kip/in²
 Depth of Soil above Footing : 0.000 in
 Undrained Shear Strength : 0.000 kip/in²
 Min Percentage of Slab : 0.000

Sliding and Overturning

Coefficient of Friction : 0.500
 Factor of Safety Against Sliding : 1.500
 Factor of Safety Against Overturning : 1.500

Load Combination/s- Service Stress Level	
Load Combination Number	Load Combination Title
1	DEAD
2	LIVE
3	COMBINATION LOAD CASE 3
101	1.000 x DL+1.000 x DL+1.000 x DL

102	0.800 x DL+0.800 x DL+0.800 x DL
Load Combination/s- Strength Level	
Load Combination Number	Load Combination Title
1	DEAD
2	LIVE
3	COMBINATION LOAD CASE 3

Applied Loads - Service Stress Level					
LC	Axial (kN)	Shear X (kN)	Shear Z (kN)	Moment X (kNm)	Moment Z (kNm)
1	448.716	0.215	-2.379	-2.365	-0.234
2	68.982	0.073	-0.781	-0.777	-0.078
3	776.547	0.433	-4.740	-4.713	-0.467
101	1294.245	0.721	-7.900	-7.855	-0.778
102	1035.396	0.577	-6.320	-6.284	-0.623

Applied Loads - Strength Level					
LC	Axial (kN)	Shear X (kN)	Shear Z (kN)	Moment X (kNm)	Moment Z (kNm)
1	448.716	0.215	-2.379	-2.365	-0.234
2	68.982	0.073	-0.781	-0.777	-0.078
3	776.547	0.433	-4.740	-4.713	-0.467

Design Calculations

Footing Size

Initial Length (L_o) = 1.016 m

Initial Width (W_o) = 1.016 m

Uplift force due to buoyancy = 0.000 kN

Effect due to adhesion = 0.000 kN

Area from initial length and width, $A_o = L_o \times W_o = 1.032 \text{ m}^2$

Min. area required from bearing pressure, $A_{\min} = P / q_{\max} = 6.797 \text{ m}^2$

Note: A_{\min} is an initial estimation.

P = Critical Factored Axial Load (without self weight/buoyancy/soil).

q_{\max} = Respective Factored Bearing Capacity.

Final Footing Size

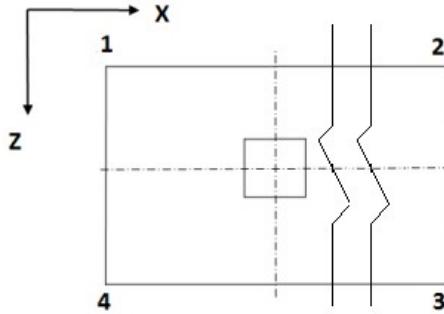
Length (L_2) = 2.692 m Governing Load Case : # 101

Width (W_2) = 2.692 m Governing Load Case : # 101

Depth (D_2) = 0.306 m Governing Load Case : # 101

$$\text{Area } (A_2) = 7.249 \text{ m}^2$$

Pressures at Four Corner



Load Case	Pressure at corner 1 (q_1) (kN/m ²)	Pressure at corner 2 (q_2) (kN/m ²)	Pressure at corner 3 (q_3) (kN/m ²)	Pressure at corner 4 (q_4) (kN/m ²)	Area of footing in uplift (A_u) (m ²)
101	188.6138	189.2342	182.8500	182.2296	0.000
101	188.6138	189.2342	182.8500	182.2296	0.000
101	188.6138	189.2342	182.8500	182.2296	0.000
101	188.6138	189.2342	182.8500	182.2296	0.000

If A_u is zero, there is no uplift and no pressure adjustment is necessary. Otherwise, to account for uplift, areas of negative pressure will be set to zero and the pressure will be redistributed to remaining corners.

Summary of adjusted Pressures at Four Corner

Load Case	Pressure at corner 1 (q_1) (kN/m ²)	Pressure at corner 2 (q_2) (kN/m ²)	Pressure at corner 3 (q_3) (kN/m ²)	Pressure at corner 4 (q_4) (kN/m ²)
101	188.6138	189.2342	182.8500	182.2296
101	188.6138	189.2342	182.8500	182.2296
101	188.6138	189.2342	182.8500	182.2296
101	188.6138	189.2342	182.8500	182.2296

Details of Out-of-Contact Area (If Any)

Governing load case = N/A

Plan area of footing = 7.249 sq.m

Area not in contact with soil = 0.000 sq.m

% of total area not in contact = 0.000%

Check For Stability Against Overturning And Sliding

-	Factor of safety against sliding		Factor of safety against overturning	
Load Case No.	Along X-Direction	Along Z-Direction	About X-Direction	About Z-Direction
1	1165.119	105.271	215.685	2229.547
2	824.985	77.504	158.697	1610.403
3	958.003	87.409	179.060	1842.451
101	933.896	85.209	174.555	1796.091
102	942.936	86.034	176.244	1813.476

Critical Load Case And The Governing Factor Of Safety For Overturning and Sliding X Direction

Critical Load Case for Sliding along X-Direction : 2

Governing Disturbing Force : 0.073 kN

Governing Restoring Force : 60.556 kN

Minimum Sliding Ratio for the Critical Load Case : 824.985

Critical Load Case for Overturning about X-Direction : 2

Governing Overturning Moment : -1.027 kNm

Governing Resisting Moment : 163.037 kNm

Minimum Overturning Ratio for the Critical Load Case : 158.697

Critical Load Case And The Governing Factor Of Safety For Overturning and Sliding Z Direction

Critical Load Case for Sliding along Z-Direction : 2

Governing Disturbing Force : -0.781 kN

Governing Restoring Force : 60.556 kN

Minimum Sliding Ratio for the Critical Load Case : 77.504

Critical Load Case for Overturning about Z-Direction : 2

Governing Overturning Moment : -0.101 kNm

Governing Resisting Moment : 163.037 kNm

Minimum Overturning Ratio for the Critical Load Case : 1610.403

Moment CalculationCheck Trial Depth against moment (w.r.t. X Axis)**Critical Load Case = #3**

Effective Depth = $D - (cc + 0.5 \times d_b) = 0.226 \text{ m}$

Governing moment (M_u) = 191.882 kNm

As Per IS 456 2000 ANNEX G G-1.1C

Limiting Factor1 (K_{umax}) = $\frac{700}{(1100 + 0.87 \times f_y)} = 0.479483$

Limiting Factor2 (R_{umax}) = $0.36 \times f_{ck} \times k_{umax} \times (1 - 0.42 \times k_{umax}) = 3801.834636 \text{ kN/m}^2$

Limit Moment Of Resistance (M_{umax}) = $R_{umax} \times B \times d_e^2 = 520.958387 \text{ kNm}$

$M_u \leq M_{umax}$ hence, safe

Check Trial Depth against moment (w.r.t. Z Axis)

Critical Load Case = #3

$$\text{Effective Depth} = D - (cc + 0.5 \times d_b) = 0.226 \text{ m}$$

$$\text{Governing moment } (M_u) = 181.511 \text{ kNm}$$

As Per IS 456 2000 ANNEX G G-1.1C

$$\text{Limiting Factor1 } (K_{umax}) = \frac{700}{(1100 + 0.87 \times f_y)} = 0.479483$$

$$\text{Limiting Factor2 } (R_{umax}) = \frac{0.36 \times f_{ck} \times k_{umax} \times (1 - 0.42 \times k_{umax})}{k_{umax}} = 3801.834636 \text{ kN/m}^2$$

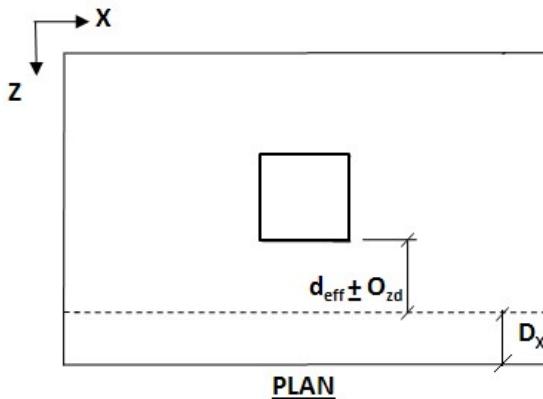
$$\text{Limit Moment Of Resistance } (M_{umax}) = \frac{R_{umax} \times B \times d_e^2}{4} = 520.958387 \text{ kNm}$$

$M_u \leq M_{umax}$ hence, safe

Shear Calculation

Check Trial Depth for one way shear (Along X Axis)

(Shear Plane Parallel to X Axis)



Critical Load Case = #3

$$D_X = 0.226 \text{ m}$$

$$\text{Shear Force}(S) = 268.645 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 442.283255 \text{ kN/m}^2$$

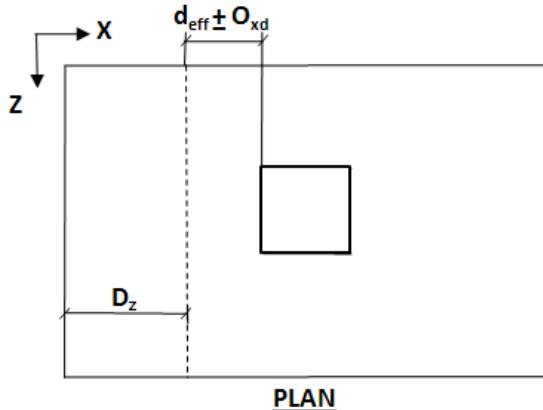
$$\text{Percentage Of Steel}(P_t) = 0.3910$$

As Per IS 456 2000 Clause 40 Table 19

$$\text{Shear Strength Of Concrete}(T_c) = 444.984 \text{ kN/m}^2$$

$T_v < T_c$ hence, safe

Check Trial Depth for one way shear (Along Z Axis)
(Shear Plane Parallel to Z Axis)



Critical Load Case = #3

$$D_z = 0.226 \text{ m}$$

$$\text{Shear Force}(S) = 258.610 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 425.762140 \text{ kN/m}^2$$

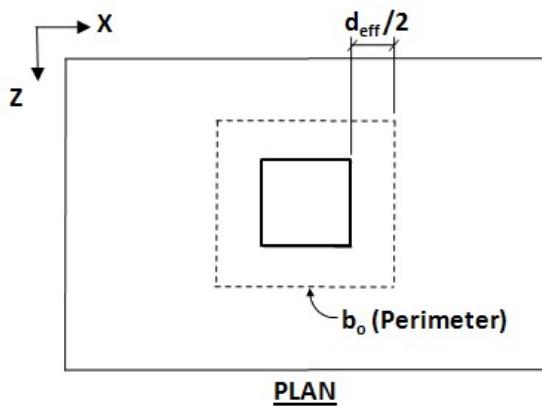
$$\text{Percentage Of Steel}(P_t) = 0.4149$$

As Per IS 456 2000 Clause 40 Table 19

$$\text{Shear Strength Of Concrete}(T_c) = 456.269 \text{ kN/m}^2$$

$T_v < T_c$ hence, safe

Check Trial Depth for two way shear



Critical Load Case = #3

$$\text{Shear Force}(S) = 731.270 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 1245.562 \text{ kN/m}^2$$

As Per IS 456 2000 Clause 31.6.3.1

$$K_s = \min[(0.5 + \beta), 1] = 1.000$$

$$\text{Shear Strength}(T_c) = 0.25 \times \sqrt{f_{ck}} = 1312.8936 \text{ kN/m}^2$$

$$K_s \times T_c = 1312.8936 \text{ kN/m}^2$$

$$T_v \leq K_s \times T_c \text{ hence, safe}$$

Reinforcement Calculation

Calculation of Maximum Bar Size

Along X Axis

Bar diameter corresponding to max bar size (d_b) = 25 mm

As Per IS 456 2000 Clause 26.2.1

$$\text{Development Length}(l_d) = \frac{d_b \times 0.87 \times f_y}{4 \times \gamma_{bd}} = 0.956 \text{ m}$$

$$\text{Allowable Length}(l_{db}) = \left[\frac{(B - b)}{2} - cc \right] = 1.045 \text{ m}$$

$$l_{db} \geq l_d \text{ hence, safe}$$

Along Z Axis

Bar diameter corresponding to max bar size(d_b) = 25 mm

As Per IS 456 2000 Clause 26.2.1

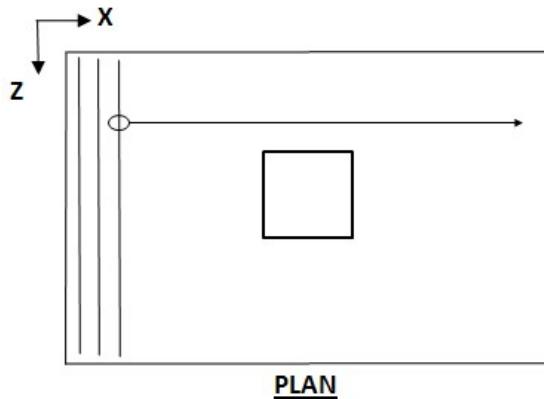
$$\text{Development Length}(l_d) = \frac{d_b \times 0.87 \times f_y}{4 \times \gamma_{bd}} = 0.956 \text{ m}$$

$$\text{Allowable Length}(l_{db}) = \left[\frac{(H - h)}{2} - cc \right] = 1.070 \text{ m}$$

$$l_{db} \geq l_d \text{ hence, safe}$$

Bottom Reinforcement Design

Along Z Axis



For moment w.r.t. X Axis (M_x)

As Per IS 456 2000 Clause 26.5.2.1

Critical Load Case = #3

Minimum Area of Steel ($A_{st,min}$) = 991.234 mm²

Calculated Area of Steel (A_{st}) = 2520.115 mm²

Provided Area of Steel ($A_{st,Provided}$) = 2520.115 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Selected bar Size (d_b) = Ø10

Minimum spacing allowed (S_{min}) = 0.050 m

Selected spacing (S) = 0.079 m

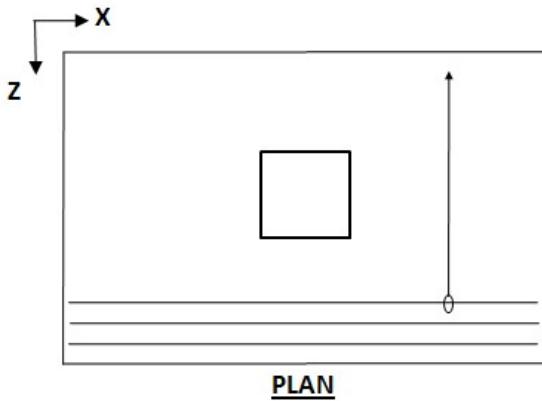
$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø10 @ 0.075 m o.c.

[Along X Axis](#)



For moment w.r.t. Z Axis (M_z)

As Per IS 456 2000 Clause 26.5.2.1

Critical Load Case = #3

Minimum Area of Steel ($A_{st,min}$) = 988.003 mm²

Calculated Area of Steel (A_{st}) = 2374.808 mm²

Provided Area of Steel ($A_{st,Provided}$) = 2374.808 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.054 m

$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

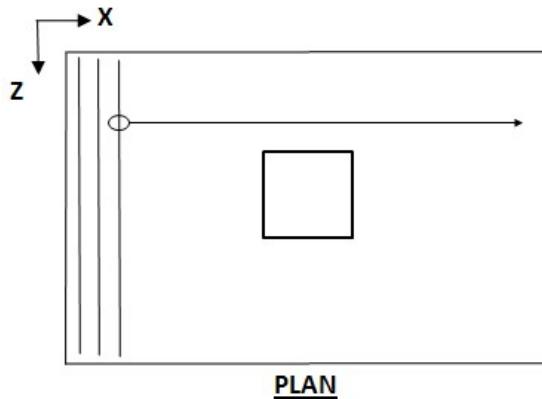
The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0.050 m o.c.

[Top Reinforcement Design](#)

[Along Z Axis](#)



Minimum Area of Steel ($A_{st,min}$) = 991.234 mm²

Calculated Area of Steel (A_{st}) = 984.772 mm²

Provided Area of Steel ($A_{st,Provided}$) = 991.234 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Governing Moment = 14.114 kNm

Selected bar Size (d_b) = Ø6

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.075 m

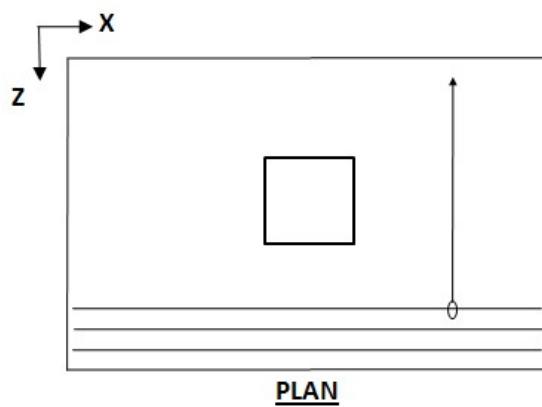
$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø6 @ 0 m o.c.

Along X Axis



Minimum Area of Steel ($A_{st,min}$) = 988.003 mm²

Calculated Area of Steel (A_{st}) = 2374.808 mm²

Provided Area of Steel ($A_{st,Provided}$) = 2374.808 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Governing Moment = 13.505 kNm

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.054 m

$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0 m o.c.

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 796.824 kN

Critical Applied Moment Along X Direction: 15.936 kNm

Critical Applied Moment Along Z Direction: 15.936 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.182 m

Position Of Neutral Axis Along Z Direction: 0.182 m

Pedestal Moment Capacity Along X Direction: 110.801 kNm

Pedestal Moment Capacity Along Z Direction: 125.969 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 577.848 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

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Position Of Neutral Axis Along Z Direction: 0.178 m

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Pedestal Moment Capacity Along Z Direction: 122.899 kNm

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Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m
Position Of Neutral Axis Along Z Direction: 0.137 m
Pedestal Moment Capacity Along X Direction: 93.412 kNm
Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²
Pedestal Main/Compression Reinforcement: 16 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 783.137 kN
Critical Applied Moment Along X Direction: 15.662 kNm
Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m
Position Of Neutral Axis Along Z Direction: 0.180 m
Pedestal Moment Capacity Along X Direction: 110.061 kNm
Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²
Pedestal Main/Compression Reinforcement: 12 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN
Critical Applied Moment Along X Direction: 21.591 kNm
Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m
Position Of Neutral Axis Along Z Direction: 0.235 m
Pedestal Moment Capacity Along X Direction: 116.443 kNm
Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²
Pedestal Main/Compression Reinforcement: 28 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1108.293 kN

Critical Applied Moment Along X Direction: 22.165 kNm

Critical Applied Moment Along Z Direction: 22.165 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.224 kNm

Pedestal Moment Capacity Along Z Direction: 133.768 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 803.721 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1079.582 kN

Critical Applied Moment Along X Direction: 21.591 kNm

Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m

Position Of Neutral Axis Along Z Direction: 0.235 m

Pedestal Moment Capacity Along X Direction: 116.443 kNm

Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²

Pedestal Main/Compression Reinforcement: 28 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m

Position Of Neutral Axis Along Z Direction: 0.180 m

Pedestal Moment Capacity Along X Direction: 110.061 kNm

Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 802.558 kN

Critical Applied Moment Along X Direction: 16.051 kNm

Critical Applied Moment Along Z Direction: 16.051 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.183 m

Position Of Neutral Axis Along Z Direction: 0.183 m

Pedestal Moment Capacity Along X Direction: 111.028 kNm

Pedestal Moment Capacity Along Z Direction: 126.226 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 590.780 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1106.751 kN

Critical Applied Moment Along X Direction: 22.135 kNm

Critical Applied Moment Along Z Direction: 22.135 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.240 kNm

Pedestal Moment Capacity Along Z Direction: 133.790 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 802.604 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1137.123 kN

Critical Applied Moment Along X Direction: 22.742 kNm

Critical Applied Moment Along Z Direction: 22.742 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.244 m

Position Of Neutral Axis Along Z Direction: 0.244 m

Pedestal Moment Capacity Along X Direction: 117.002 kNm

Pedestal Moment Capacity Along Z Direction: 133.264 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 824.628 mm²

Pedestal Main/Compression Reinforcement: 32 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1106.751 kN

Critical Applied Moment Along X Direction: 22.135 kNm

Critical Applied Moment Along Z Direction: 22.135 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.240 kNm

Pedestal Moment Capacity Along Z Direction: 133.790 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 802.604 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 802.558 kN

Critical Applied Moment Along X Direction: 16.051 kNm

Critical Applied Moment Along Z Direction: 16.051 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.183 m

Position Of Neutral Axis Along Z Direction: 0.183 m

Pedestal Moment Capacity Along X Direction: 111.028 kNm

Pedestal Moment Capacity Along Z Direction: 126.226 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 590.780 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m
Position Of Neutral Axis Along Z Direction: 0.180 m
Pedestal Moment Capacity Along X Direction: 110.061 kNm
Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²
Pedestal Main/Compression Reinforcement: 12 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN
Critical Applied Moment Along X Direction: 21.591 kNm
Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m
Position Of Neutral Axis Along Z Direction: 0.235 m
Pedestal Moment Capacity Along X Direction: 116.443 kNm
Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²
Pedestal Main/Compression Reinforcement: 28 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1108.293 kN
Critical Applied Moment Along X Direction: 22.165 kNm
Critical Applied Moment Along Z Direction: 22.165 kNm

Pedestal design is performed in accordance with IS 456 Section 39

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Pedestal Moment Capacity Along Z Direction: 133.768 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 803.721 mm²
Pedestal Main/Compression Reinforcement: 16 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN

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Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

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Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m

Position Of Neutral Axis Along Z Direction: 0.180 m

Pedestal Moment Capacity Along X Direction: 110.061 kNm

Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
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Required Main Reinforcement: 567.922 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

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Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

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Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 796.824 kN

Critical Applied Moment Along X Direction: 15.936 kNm

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Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 577.848 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

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Critical load Case : 3

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Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

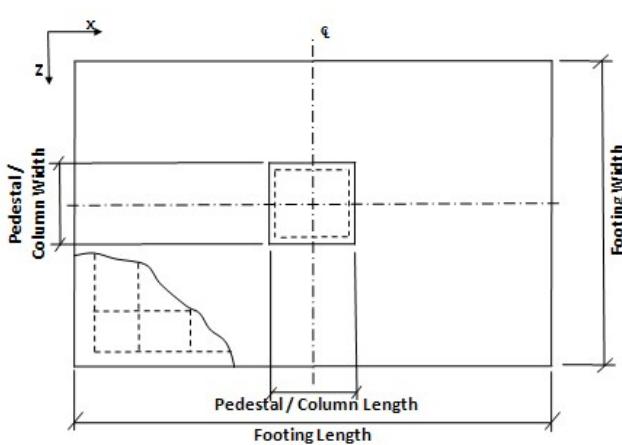
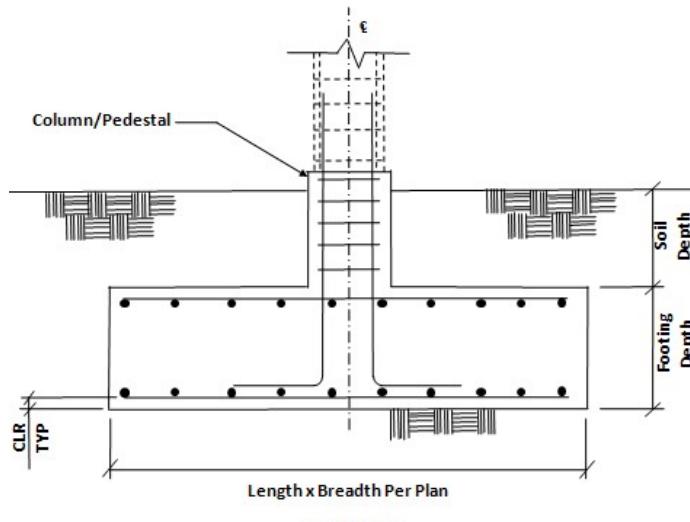
Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Isolated Footing 5



Input Values

Footing Geomtry

Design Type : Calculate Dimension
 Footing Thickness (Ft) : 12.000 in
 Footing Length - X (Fl) : 40.000 in
 Footing Width - Z (Fw) : 40.000 in
 Eccentricity along X (Oxd) : 0.000 in
 Eccentricity along Z (Ozd) : 0.000 in

Column Dimensions

Column Shape : Rectangular
 Column Length - X (Pl) : 0.450 m
 Column Width - Z (Pw) : 0.400 m

Pedestal

Include Pedestal? Yes
 Pedestal Shape : Rectangular
 Pedestal Height (Ph) : 0.015 m
 Pedestal Length - X (Pl) : 0.450 m
 Pedestal Width - Z (Pw) : 0.400 m

Design Parameters

Concrete and Rebar Properties

Unit Weight of Concrete : 150.000 lb/ft³
 Strength of Concrete : 4.000 ksi
 Yield Strength of Steel : 60.000 ksi
 Minimum Bar Size : Ø6
 Maximum Bar Size : Ø32
 Minimum Bar Spacing : 2.000 in
 Maximum Bar Spacing : 18.000 in
 Pedestal Clear Cover (P, CL) : 3.000 in
 Footing Clear Cover (F, CL) : 3.000 in

Soil Properties

Soil Type : UnDrained
 Unit Weight : 112.000 lb/ft³
 Soil Bearing Capacity : 4.000 kip/ft²
 Soil Surcharge : 0.000 kip/in²
 Depth of Soil above Footing : 0.000 in
 Undrained Shear Strength : 0.000 kip/in²
 Min Percentage of Slab : 0.000

Sliding and Overturning

Coefficient of Friction : 0.500
 Factor of Safety Against Sliding : 1.500
 Factor of Safety Against Overturning : 1.500

Load Combination/s- Service Stress Level	
Load Combination Number	Load Combination Title
1	DEAD
2	LIVE
3	COMBINATION LOAD CASE 3
101	1.000 x DL+1.000 x DL+1.000 x DL

102	0.800 x DL+0.800 x DL+0.800 x DL
Load Combination/s- Strength Level	
Load Combination Number	Load Combination Title
1	DEAD
2	LIVE
3	COMBINATION LOAD CASE 3

Applied Loads - Service Stress Level					
LC	Axial (kN)	Shear X (kN)	Shear Z (kN)	Moment X (kNm)	Moment Z (kNm)
1	343.039	1.982	-1.854	-1.843	-1.966
2	38.969	0.459	-0.432	-0.430	-0.456
3	573.013	3.661	-3.428	-3.410	-3.634
101	955.021	6.102	-5.714	-5.683	-6.057
102	764.017	4.882	-4.571	-4.546	-4.845

Applied Loads - Strength Level					
LC	Axial (kN)	Shear X (kN)	Shear Z (kN)	Moment X (kNm)	Moment Z (kNm)
1	343.039	1.982	-1.854	-1.843	-1.966
2	38.969	0.459	-0.432	-0.430	-0.456
3	573.013	3.661	-3.428	-3.410	-3.634

Design Calculations

Footing Size

Initial Length (L_o) = 1.016 m

Initial Width (W_o) = 1.016 m

Uplift force due to buoyancy = 0.000 kN

Effect due to adhesion = 0.000 kN

Area from initial length and width, $A_o = L_o \times W_o = 1.032 \text{ m}^2$

Min. area required from bearing pressure, $A_{\min} = P / q_{\max} = 5.026 \text{ m}^2$

Note: A_{\min} is an initial estimation.

P = Critical Factored Axial Load (without self weight/buoyancy/soil).

q_{\max} = Respective Factored Bearing Capacity.

Final Footing Size

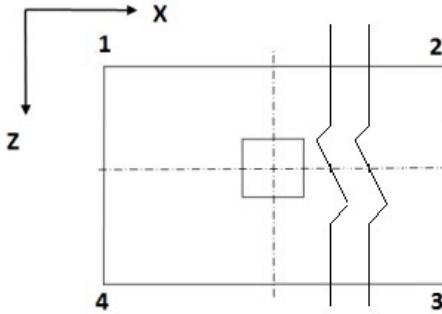
Length (L_2) = 2.337 m Governing Load Case : # 101

Width (W_2) = 2.337 m Governing Load Case : # 101

Depth (D_2) = 0.306 m Governing Load Case : # 101

$$\text{Area } (A_2) = 5.461 \text{ m}^2$$

Pressures at Four Corner



Load Case	Pressure at corner 1 (q_1) (kN/m ²)	Pressure at corner 2 (q_2) (kN/m ²)	Pressure at corner 3 (q_3) (kN/m ²)	Pressure at corner 4 (q_4) (kN/m ²)	Area of footing in uplift (A_u) (m ²)
101	181.8519	189.3845	182.3203	174.7877	0.000
101	181.8519	189.3845	182.3203	174.7877	0.000
101	181.8519	189.3845	182.3203	174.7877	0.000
101	181.8519	189.3845	182.3203	174.7877	0.000

If A_u is zero, there is no uplift and no pressure adjustment is necessary. Otherwise, to account for uplift, areas of negative pressure will be set to zero and the pressure will be redistributed to remaining corners.

Summary of adjusted Pressures at Four Corner

Load Case	Pressure at corner 1 (q_1) (kN/m ²)	Pressure at corner 2 (q_2) (kN/m ²)	Pressure at corner 3 (q_3) (kN/m ²)	Pressure at corner 4 (q_4) (kN/m ²)
101	181.8519	189.3845	182.3203	174.7877
101	181.8519	189.3845	182.3203	174.7877
101	181.8519	189.3845	182.3203	174.7877
101	181.8519	189.3845	182.3203	174.7877

Details of Out-of-Contact Area (If Any)

Governing load case = N/A

Plan area of footing = 5.461 sq.m

Area not in contact with soil = 0.000 sq.m

% of total area not in contact = 0.000%

Check For Stability Against Overturning And Sliding

-	Factor of safety against sliding		Factor of safety against overturning	
Load Case No.	Along X-Direction	Along Z-Direction	About X-Direction	About Z-Direction
1	96.450	103.102	183.315	171.761
2	85.263	90.675	161.000	151.581
3	83.617	89.298	158.729	148.860
101	81.471	87.006	154.656	145.040
102	82.276	87.865	156.183	146.472

Critical Load Case And The Governing Factor Of Safety For Overturning and Sliding X Direction

Critical Load Case for Sliding along X-Direction : 101

Governing Disturbing Force : 6.102 kN

Governing Restoring Force : 497.153 kN

Minimum Sliding Ratio for the Critical Load Case : 81.471

Critical Load Case for Overturning about X-Direction : 101

Governing Overturning Moment : -7.512 kNm

Governing Resisting Moment : 1161.725 kNm

Minimum Overturning Ratio for the Critical Load Case : 154.656

Critical Load Case And The Governing Factor Of Safety For Overturning and Sliding Z Direction

Critical Load Case for Sliding along Z-Direction : 101

Governing Disturbing Force : -5.714 kN

Governing Restoring Force : 497.153 kN

Minimum Sliding Ratio for the Critical Load Case : 87.006

Critical Load Case for Overturning about Z-Direction : 101

Governing Overturning Moment : -8.010 kNm

Governing Resisting Moment : 1161.725 kNm

Minimum Overturning Ratio for the Critical Load Case : 145.040

Moment CalculationCheck Trial Depth against moment (w.r.t. X Axis)**Critical Load Case = #3**

Effective Depth = $D - (cc + 0.5 \times d_b) = 0.226 \text{ m}$

Governing moment (M_u) = 116.658 kNm

As Per IS 456 2000 ANNEX G G-1.1C

Limiting Factor1 (K_{umax}) = $\frac{700}{(1100 + 0.87 \times f_y)} = 0.479483$

Limiting Factor2 (R_{umax}) = $0.36 \times f_{ck} \times k_{umax} \times (1 - 0.42 \times k_{umax}) = 3801.834636 \text{ kN/m}^2$

Limit Moment Of Resistance (M_{umax}) = $R_{umax} \times B \times d_e^2 = 452.152562 \text{ kNm}$

$M_u \leq M_{umax}$ hence, safe

Check Trial Depth against moment (w.r.t. Z Axis)

Critical Load Case = #3

$$\text{Effective Depth} = D - (cc + 0.5 \times d_b) = 0.226 \text{ m}$$

$$\text{Governing moment } (M_u) = 110.837 \text{ kNm}$$

As Per IS 456 2000 ANNEX G G-1.1C

$$\text{Limiting Factor1 } (K_{umax}) = \frac{700}{(1100 + 0.87 \times f_y)} = 0.479483$$

$$\text{Limiting Factor2 } (R_{umax}) = \frac{0.36 \times f_{ck} \times k_{umax} \times (1 - 0.42 \times k_{umax})}{k_{umax}} = 3801.834636 \text{ kN/m}^2$$

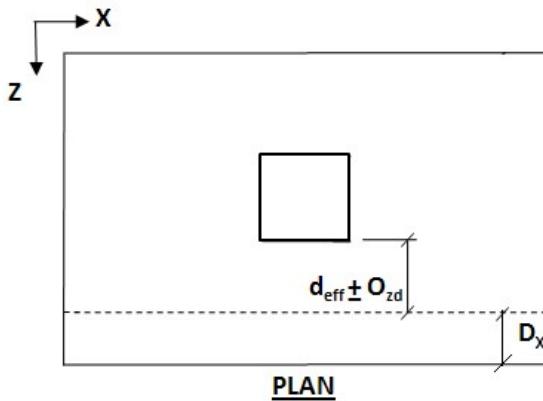
$$\text{Limit Moment Of Resistance } (M_{umax}) = \frac{R_{umax} \times B \times d_e^2}{4} = 452.152562 \text{ kNm}$$

$M_u \leq M_{umax}$ hence, safe

Shear Calculation

Check Trial Depth for one way shear (Along X Axis)

(Shear Plane Parallel to X Axis)



Critical Load Case = #3

$$D_X = 0.226 \text{ m}$$

$$\text{Shear Force}(S) = 184.653 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 350.264584 \text{ kN/m}^2$$

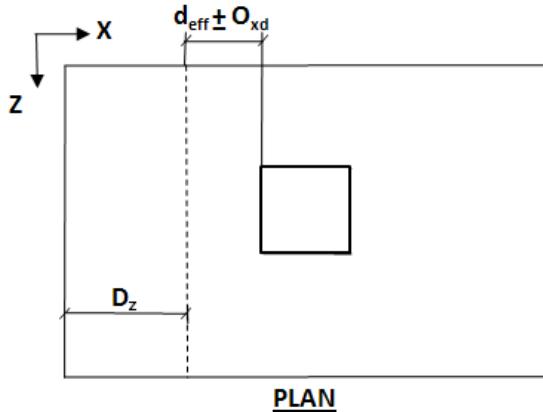
$$\text{Percentage Of Steel}(P_t) = 0.2699$$

As Per IS 456 2000 Clause 40 Table 19

$$\text{Shear Strength Of Concrete}(T_c) = 379.500 \text{ kN/m}^2$$

$T_v < T_c$ hence, safe

Check Trial Depth for one way shear (Along Z Axis)
(Shear Plane Parallel to Z Axis)



Critical Load Case = #3

$$D_Z = 0.226 \text{ m}$$

$$\text{Shear Force}(S) = 178.640 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 338.857822 \text{ kN/m}^2$$

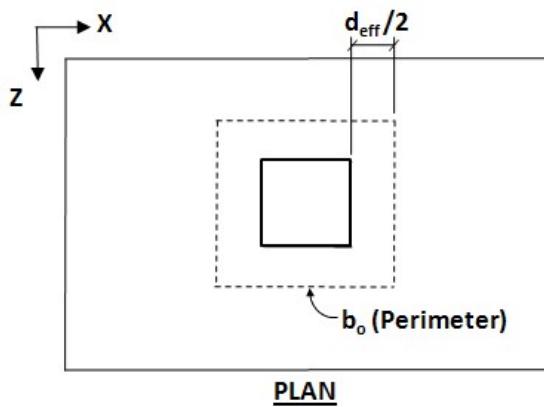
$$\text{Percentage Of Steel}(P_t) = 0.2847$$

As Per IS 456 2000 Clause 40 Table 19

$$\text{Shear Strength Of Concrete}(T_c) = 388.431 \text{ kN/m}^2$$

$T_v < T_c$ hence, safe

Check Trial Depth for two way shear



Critical Load Case = #3

$$\text{Shear Force}(S) = 528.661 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 900.461 \text{ kN/m}^2$$

As Per IS 456 2000 Clause 31.6.3.1

$$K_s = \min[0.5 + \beta, 1] = 1.000$$

$$\text{Shear Strength}(T_c) = 0.25 \times \sqrt{f_{ck}} = 1312.8936 \text{ kN/m}^2$$

$$K_s \times T_c = 1312.8936 \text{ kN/m}^2$$

$$T_v \leq K_s \times T_c \text{ hence, safe}$$

Reinforcement Calculation

Calculation of Maximum Bar Size

Along X Axis

Bar diameter corresponding to max bar size (d_b) = 20 mm

As Per IS 456 2000 Clause 26.2.1

$$\text{Development Length}(l_d) = \frac{d_b \times 0.87 \times f_y}{4 \times \gamma_{bd}} = 0.765 \text{ m}$$

$$\text{Allowable Length}(l_{db}) = \left[\frac{(B - b)}{2} - cc \right] = 0.867 \text{ m}$$

$$l_{db} \geq l_d \text{ hence, safe}$$

Along Z Axis

Bar diameter corresponding to max bar size(d_b) = 20 mm

As Per IS 456 2000 Clause 26.2.1

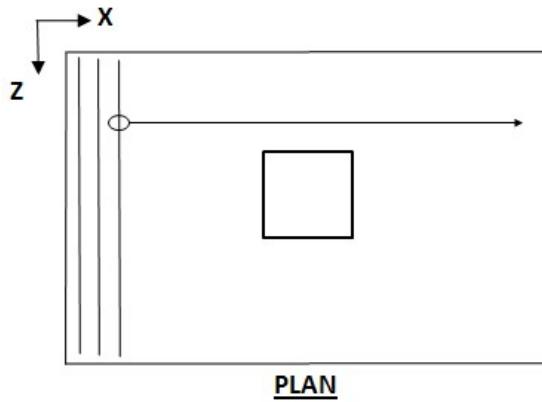
$$\text{Development Length}(l_d) = \frac{d_b \times 0.87 \times f_y}{4 \times \gamma_{bd}} = 0.765 \text{ m}$$

$$\text{Allowable Length}(l_{db}) = \left[\frac{(H - h)}{2} - cc \right] = 0.892 \text{ m}$$

$$l_{db} \geq l_d \text{ hence, safe}$$

Bottom Reinforcement Design

Along Z Axis



For moment w.r.t. X Axis (M_x)

As Per IS 456 2000 Clause 26.5.2.1

Critical Load Case = #3

Minimum Area of Steel ($A_{st,min}$) = 857.512 mm²

Calculated Area of Steel (A_{st}) = 1500.887 mm²

Provided Area of Steel ($A_{st,Provided}$) = 1500.887 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.048 m

Selected spacing (S) = 0.075 m

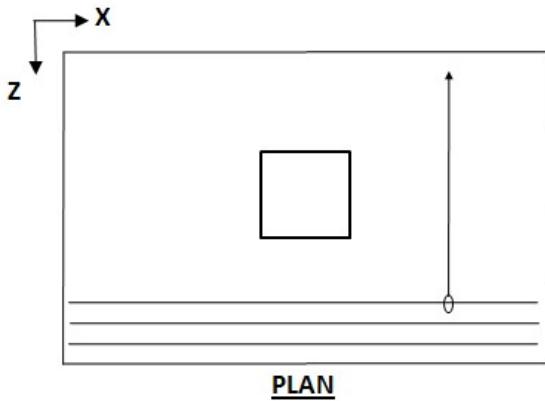
$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0.075 m o.c.

Along X Axis



For moment w.r.t. Z Axis (M_z)

As Per IS 456 2000 Clause 26.5.2.1

Critical Load Case = #3

Minimum Area of Steel ($A_{st,min}$) = 857.512 mm²

Calculated Area of Steel (A_{st}) = 1422.691 mm²

Provided Area of Steel ($A_{st,Provided}$) = 1422.691 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.078 m

$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

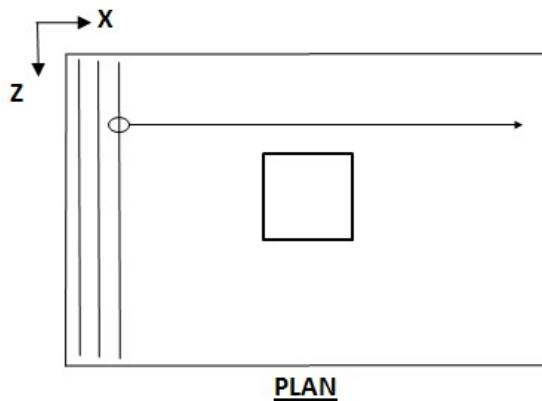
The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0.075 m o.c.

[Top Reinforcement Design](#)

[Along Z Axis](#)



Minimum Area of Steel ($A_{st,min}$) = 857.512 mm²

Calculated Area of Steel (A_{st}) = 854.708 mm²

Provided Area of Steel ($A_{st,Provided}$) = 857.512 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Governing Moment = 8.744 kNm

Selected bar Size (d_b) = Ø6

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.073 m

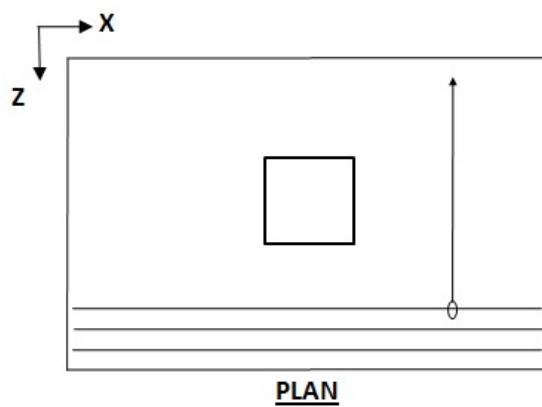
$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø6 @ 0 m o.c.

Along X Axis



Minimum Area of Steel ($A_{st,min}$) = 857.512 mm²

Calculated Area of Steel (A_{st}) = 1422.691 mm²

Provided Area of Steel ($A_{st,Provided}$) = 1422.691 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Governing Moment = 8.298 kNm

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.078 m

$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0 m o.c.

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 796.824 kN

Critical Applied Moment Along X Direction: 15.936 kNm

Critical Applied Moment Along Z Direction: 15.936 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.182 m

Position Of Neutral Axis Along Z Direction: 0.182 m

Pedestal Moment Capacity Along X Direction: 110.801 kNm

Pedestal Moment Capacity Along Z Direction: 125.969 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 577.848 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m
Position Of Neutral Axis Along Z Direction: 0.137 m
Pedestal Moment Capacity Along X Direction: 93.412 kNm
Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²
Pedestal Main/Compression Reinforcement: 16 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 783.137 kN
Critical Applied Moment Along X Direction: 15.662 kNm
Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m
Position Of Neutral Axis Along Z Direction: 0.180 m
Pedestal Moment Capacity Along X Direction: 110.061 kNm
Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²
Pedestal Main/Compression Reinforcement: 12 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN
Critical Applied Moment Along X Direction: 21.591 kNm
Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m
Position Of Neutral Axis Along Z Direction: 0.235 m
Pedestal Moment Capacity Along X Direction: 116.443 kNm
Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²
Pedestal Main/Compression Reinforcement: 28 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1108.293 kN

Critical Applied Moment Along X Direction: 22.165 kNm

Critical Applied Moment Along Z Direction: 22.165 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.224 kNm

Pedestal Moment Capacity Along Z Direction: 133.768 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 803.721 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1079.582 kN

Critical Applied Moment Along X Direction: 21.591 kNm

Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m

Position Of Neutral Axis Along Z Direction: 0.235 m

Pedestal Moment Capacity Along X Direction: 116.443 kNm

Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²

Pedestal Main/Compression Reinforcement: 28 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m

Position Of Neutral Axis Along Z Direction: 0.180 m

Pedestal Moment Capacity Along X Direction: 110.061 kNm

Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 802.558 kN

Critical Applied Moment Along X Direction: 16.051 kNm

Critical Applied Moment Along Z Direction: 16.051 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.183 m

Position Of Neutral Axis Along Z Direction: 0.183 m

Pedestal Moment Capacity Along X Direction: 111.028 kNm

Pedestal Moment Capacity Along Z Direction: 126.226 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 590.780 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1106.751 kN

Critical Applied Moment Along X Direction: 22.135 kNm

Critical Applied Moment Along Z Direction: 22.135 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.240 kNm

Pedestal Moment Capacity Along Z Direction: 133.790 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 802.604 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1137.123 kN

Critical Applied Moment Along X Direction: 22.742 kNm

Critical Applied Moment Along Z Direction: 22.742 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.244 m

Position Of Neutral Axis Along Z Direction: 0.244 m

Pedestal Moment Capacity Along X Direction: 117.002 kNm

Pedestal Moment Capacity Along Z Direction: 133.264 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 824.628 mm²

Pedestal Main/Compression Reinforcement: 32 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1106.751 kN

Critical Applied Moment Along X Direction: 22.135 kNm

Critical Applied Moment Along Z Direction: 22.135 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.240 kNm

Pedestal Moment Capacity Along Z Direction: 133.790 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 802.604 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 802.558 kN

Critical Applied Moment Along X Direction: 16.051 kNm

Critical Applied Moment Along Z Direction: 16.051 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.183 m

Position Of Neutral Axis Along Z Direction: 0.183 m

Pedestal Moment Capacity Along X Direction: 111.028 kNm

Pedestal Moment Capacity Along Z Direction: 126.226 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 590.780 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m
Position Of Neutral Axis Along Z Direction: 0.180 m
Pedestal Moment Capacity Along X Direction: 110.061 kNm
Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²
Pedestal Main/Compression Reinforcement: 12 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN
Critical Applied Moment Along X Direction: 21.591 kNm
Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m
Position Of Neutral Axis Along Z Direction: 0.235 m
Pedestal Moment Capacity Along X Direction: 116.443 kNm
Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²
Pedestal Main/Compression Reinforcement: 28 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1108.293 kN
Critical Applied Moment Along X Direction: 22.165 kNm
Critical Applied Moment Along Z Direction: 22.165 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m
Position Of Neutral Axis Along Z Direction: 0.239 m
Pedestal Moment Capacity Along X Direction: 117.224 kNm
Pedestal Moment Capacity Along Z Direction: 133.768 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 803.721 mm²
Pedestal Main/Compression Reinforcement: 16 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN

Critical Applied Moment Along X Direction: 21.591 kNm

Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m

Position Of Neutral Axis Along Z Direction: 0.235 m

Pedestal Moment Capacity Along X Direction: 116.443 kNm

Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²

Pedestal Main/Compression Reinforcement: 28 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m

Position Of Neutral Axis Along Z Direction: 0.180 m

Pedestal Moment Capacity Along X Direction: 110.061 kNm

Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 796.824 kN

Critical Applied Moment Along X Direction: 15.936 kNm

Critical Applied Moment Along Z Direction: 15.936 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.182 m

Position Of Neutral Axis Along Z Direction: 0.182 m

Pedestal Moment Capacity Along X Direction: 110.801 kNm

Pedestal Moment Capacity Along Z Direction: 125.969 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 577.848 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

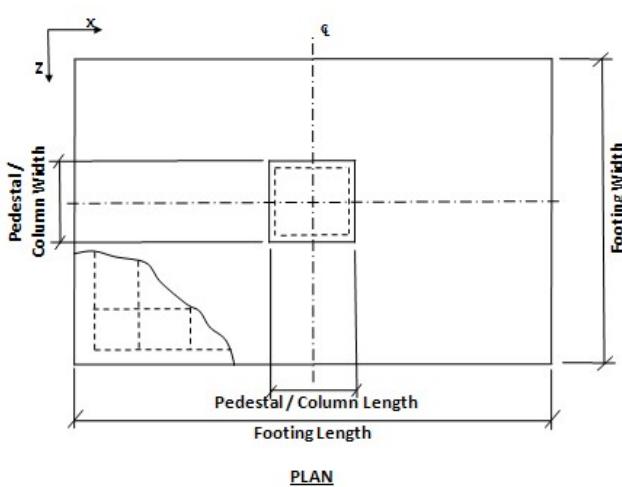
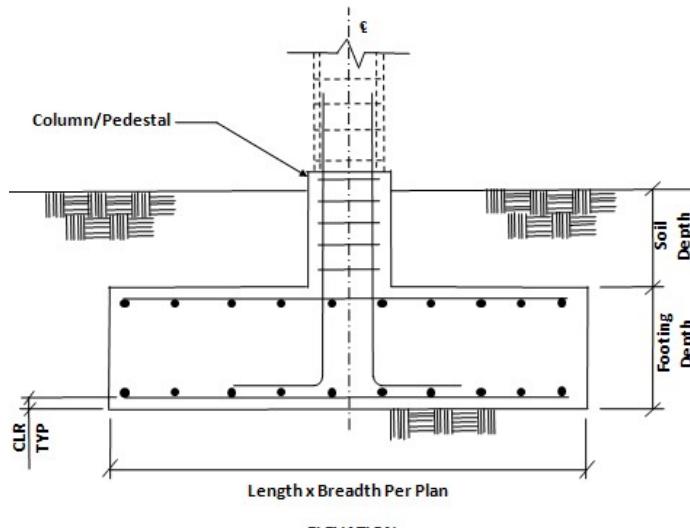
Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Isolated Footing 31



Input Values

Footing Geomtry

Design Type : Calculate Dimension
 Footing Thickness (Ft) : 12.000 in
 Footing Length - X (Fl) : 40.000 in
 Footing Width - Z (Fw) : 40.000 in
 Eccentricity along X (Oxd) : 0.000 in
 Eccentricity along Z (Ozd) : 0.000 in

Column Dimensions

Column Shape : Rectangular
 Column Length - X (Pl) : 0.450 m
 Column Width - Z (Pw) : 0.400 m

Pedestal

Include Pedestal? Yes

Pedestal Shape : Rectangular

Pedestal Height (Ph) : 0.015 m

Pedestal Length - X (Pl) : 0.450 m

Pedestal Width - Z (Pw) : 0.400 m

Design ParametersConcrete and Rebar Properties

Unit Weight of Concrete : 150.000 lb/ft³

Strength of Concrete : 4.000 ksi

Yield Strength of Steel : 60.000 ksi

Minimum Bar Size : Ø6

Maximum Bar Size : Ø32

Minimum Bar Spacing : 2.000 in

Maximum Bar Spacing : 18.000 in

Pedestal Clear Cover (P, CL) : 3.000 in

Footing Clear Cover (F, CL) : 3.000 in

Soil Properties

Soil Type : UnDrained

Unit Weight : 112.000 lb/ft³

Soil Bearing Capacity : 4.000 kip/ft²

Soil Surcharge : 0.000 kip/in²

Depth of Soil above Footing : 0.000 in

Undrained Shear Strength : 0.000 kip/in²

Min Percentage of Slab : 0.000

Sliding and Overturning

Coefficient of Friction : 0.500

Factor of Safety Against Sliding : 1.500

Factor of Safety Against Overturning : 1.500

Load Combination/s- Service Stress Level	
Load Combination Number	Load Combination Title
1	DEAD
2	LIVE
3	COMBINATION LOAD CASE 3
101	1.000 x DL+1.000 x DL+1.000 x DL

102	0.800 x DL+0.800 x DL+0.800 x DL
Load Combination/s- Strength Level	
Load Combination Number	Load Combination Title
1	DEAD
2	LIVE
3	COMBINATION LOAD CASE 3

Applied Loads - Service Stress Level					
LC	Axial (kN)	Shear X (kN)	Shear Z (kN)	Moment X (kNm)	Moment Z (kNm)
1	452.071	-2.556	-0.166	-0.181	2.535
2	70.021	-0.842	-0.061	-0.064	0.836
3	783.137	-5.096	-0.340	-0.368	5.056
101	1305.229	-8.494	-0.567	-0.613	8.427
102	1044.183	-6.795	-0.454	-0.491	6.742

Applied Loads - Strength Level					
LC	Axial (kN)	Shear X (kN)	Shear Z (kN)	Moment X (kNm)	Moment Z (kNm)
1	452.071	-2.556	-0.166	-0.181	2.535
2	70.021	-0.842	-0.061	-0.064	0.836
3	783.137	-5.096	-0.340	-0.368	5.056

Design Calculations

Footing Size

Initial Length (L_o) = 1.016 m

Initial Width (W_o) = 1.016 m

Uplift force due to buoyancy = 0.000 kN

Effect due to adhesion = 0.000 kN

Area from initial length and width, $A_o = L_o \times W_o = 1.032 \text{ m}^2$

Min. area required from bearing pressure, $A_{\min} = P / q_{\max} = 6.855 \text{ m}^2$

Note: A_{\min} is an initial estimation.

P = Critical Factored Axial Load (without self weight/buoyancy/soil).

q_{\max} = Respective Factored Bearing Capacity.

Final Footing Size

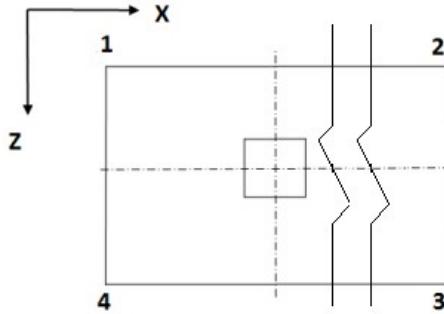
Length (L_2) = 2.692 m Governing Load Case : # 101

Width (W_2) = 2.692 m Governing Load Case : # 101

Depth (D_2) = 0.306 m Governing Load Case : # 101

$$\text{Area } (A_2) = 7.249 \text{ m}^2$$

Pressures at Four Corner



Load Case	Pressure at corner 1 (q_1) (kN/m ²)	Pressure at corner 2 (q_2) (kN/m ²)	Pressure at corner 3 (q_3) (kN/m ²)	Pressure at corner 4 (q_4) (kN/m ²)	Area of footing in uplift (A_u) (m ²)
101	190.9181	184.0651	183.5763	190.4293	0.000
101	190.9181	184.0651	183.5763	190.4293	0.000
101	190.9181	184.0651	183.5763	190.4293	0.000
101	190.9181	184.0651	183.5763	190.4293	0.000

If A_u is zero, there is no uplift and no pressure adjustment is necessary. Otherwise, to account for uplift, areas of negative pressure will be set to zero and the pressure will be redistributed to remaining corners.

Summary of adjusted Pressures at Four Corner

Load Case	Pressure at corner 1 (q_1) (kN/m ²)	Pressure at corner 2 (q_2) (kN/m ²)	Pressure at corner 3 (q_3) (kN/m ²)	Pressure at corner 4 (q_4) (kN/m ²)
101	190.9181	184.0651	183.5763	190.4293
101	190.9181	184.0651	183.5763	190.4293
101	190.9181	184.0651	183.5763	190.4293
101	190.9181	184.0651	183.5763	190.4293

Details of Out-of-Contact Area (If Any)

Governing load case = N/A

Plan area of footing = 7.249 sq.m

Area not in contact with soil = 0.000 sq.m

% of total area not in contact = 0.000%

Check For Stability Against Overturning And Sliding

-	Factor of safety against sliding		Factor of safety against overturning	
Load Case No.	Along X-Direction	Along Z-Direction	About X-Direction	About Z-Direction
1	98.633	1515.470	2893.412	202.407
2	72.576	1009.187	1971.411	148.819
3	81.950	1227.229	2357.330	168.138
101	79.904	1196.593	2298.480	163.941
102	80.671	1208.082	2320.548	165.515

Critical Load Case And The Governing Factor Of Safety For Overturning and Sliding X Direction

Critical Load Case for Sliding along X-Direction : 2

Governing Disturbing Force : -0.842 kN

Governing Restoring Force : 61.075 kN

Minimum Sliding Ratio for the Critical Load Case : 72.576

Critical Load Case for Overturning about X-Direction : 2

Governing Overturning Moment : -0.083 kNm

Governing Resisting Moment : 164.435 kNm

Minimum Overturning Ratio for the Critical Load Case : 1971.411

Critical Load Case And The Governing Factor Of Safety For Overturning and Sliding Z Direction

Critical Load Case for Sliding along Z-Direction : 2

Governing Disturbing Force : -0.061 kN

Governing Restoring Force : 61.075 kN

Minimum Sliding Ratio for the Critical Load Case : 1009.187

Critical Load Case for Overturning about Z-Direction : 2

Governing Overturning Moment : 1.105 kNm

Governing Resisting Moment : 164.435 kNm

Minimum Overturning Ratio for the Critical Load Case : 148.819

Moment CalculationCheck Trial Depth against moment (w.r.t. X Axis)**Critical Load Case = #3**

Effective Depth = $D - (cc + 0.5 \times d_b) = 0.226 \text{ m}$

Governing moment (M_u) = 191.251 kNm

As Per IS 456 2000 ANNEX G G-1.1C

Limiting Factor1 (K_{umax}) = $\frac{700}{(1100 + 0.87 \times f_y)} = 0.479483$

Limiting Factor2 (R_{umax}) = $0.36 \times f_{ck} \times k_{umax} \times (1 - 0.42 \times k_{umax}) = 3801.834636 \text{ kN/m}^2$

Limit Moment Of Resistance (M_{umax}) = $R_{umax} \times B \times d_e^2 = 520.958387 \text{ kNm}$

$M_u \leq M_{umax}$ hence, safe

Check Trial Depth against moment (w.r.t. Z Axis)

Critical Load Case = #3

$$\text{Effective Depth} = D - (cc + 0.5 \times d_b) = 0.226 \text{ m}$$

$$\text{Governing moment } (M_u) = 185.334 \text{ kNm}$$

As Per IS 456 2000 ANNEX G G-1.1C

$$\text{Limiting Factor1 } (K_{umax}) = \frac{700}{(1100 + 0.87 \times f_y)} = 0.479483$$

$$\text{Limiting Factor2 } (R_{umax}) = \frac{0.36 \times f_{ck} \times k_{umax} \times (1 - 0.42 \times k_{umax})}{k_{umax}} = 3801.834636 \text{ kN/m}^2$$

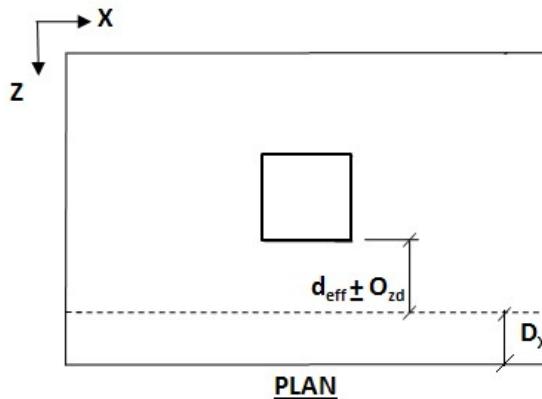
$$\text{Limit Moment Of Resistance } (M_{umax}) = \frac{R_{umax} \times B \times d_e^2}{4} = 520.958387 \text{ kNm}$$

$M_u \leq M_{umax}$ hence, safe

Shear Calculation

Check Trial Depth for one way shear (Along X Axis)

(Shear Plane Parallel to X Axis)



Critical Load Case = #3

$$D_X = 0.226 \text{ m}$$

$$\text{Shear Force}(S) = 268.014 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 441.243797 \text{ kN/m}^2$$

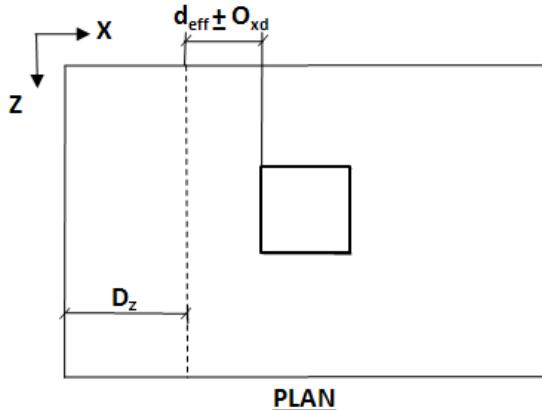
$$\text{Percentage Of Steel}(P_t) = 0.3998$$

As Per IS 456 2000 Clause 40 Table 19

$$\text{Shear Strength Of Concrete}(T_c) = 449.186 \text{ kN/m}^2$$

$T_v < T_c$ hence, safe

Check Trial Depth for one way shear (Along Z Axis)
(Shear Plane Parallel to Z Axis)



Critical Load Case = #3

$$D_z = 0.226 \text{ m}$$

$$\text{Shear Force}(S) = 263.811 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 434.324957 \text{ kN/m}^2$$

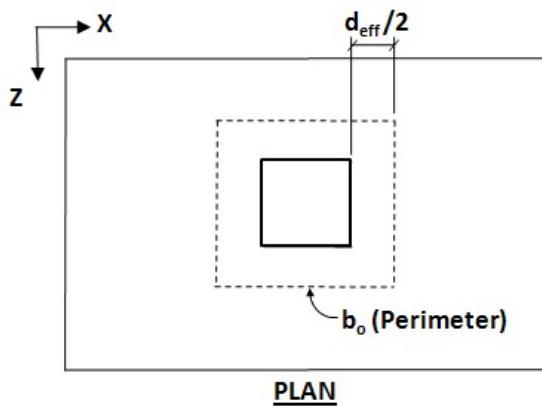
$$\text{Percentage Of Steel}(P_t) = 0.4134$$

As Per IS 456 2000 Clause 40 Table 19

$$\text{Shear Strength Of Concrete}(T_c) = 455.592 \text{ kN/m}^2$$

$T_v < T_c$ hence, safe

Check Trial Depth for two way shear



Critical Load Case = #3

$$\text{Shear Force}(S) = 737.477 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 1256.133 \text{ kN/m}^2$$

As Per IS 456 2000 Clause 31.6.3.1

$$K_s = \min[(0.5 + \beta), 1] = 1.000$$

$$\text{Shear Strength}(T_c) = 0.25 \times \sqrt{f_{ck}} = 1312.8936 \text{ kN/m}^2$$

$$K_s \times T_c = 1312.8936 \text{ kN/m}^2$$

$$T_v \leq K_s \times T_c \text{ hence, safe}$$

Reinforcement Calculation

Calculation of Maximum Bar Size

Along X Axis

Bar diameter corresponding to max bar size (d_b) = 25 mm

As Per IS 456 2000 Clause 26.2.1

$$\text{Development Length}(l_d) = \frac{d_b \times 0.87 \times f_y}{4 \times \gamma_{bd}} = 0.956 \text{ m}$$

$$\text{Allowable Length}(l_{db}) = \left[\frac{(B - b)}{2} - cc \right] = 1.045 \text{ m}$$

$$l_{db} \geq l_d \text{ hence, safe}$$

Along Z Axis

Bar diameter corresponding to max bar size(d_b) = 25 mm

As Per IS 456 2000 Clause 26.2.1

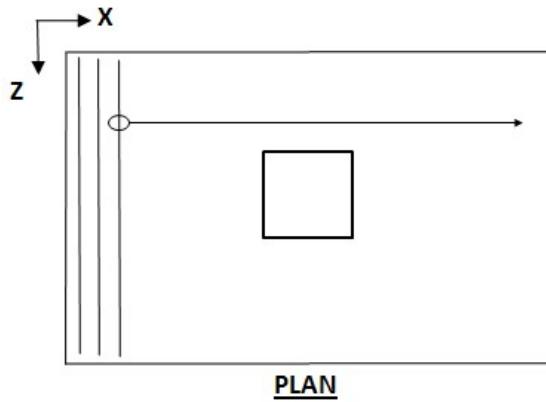
$$\text{Development Length}(l_d) = \frac{d_b \times 0.87 \times f_y}{4 \times \gamma_{bd}} = 0.956 \text{ m}$$

$$\text{Allowable Length}(l_{db}) = \left[\frac{(H - h)}{2} - cc \right] = 1.070 \text{ m}$$

$$l_{db} \geq l_d \text{ hence, safe}$$

Bottom Reinforcement Design

Along Z Axis



For moment w.r.t. X Axis (M_x)

As Per IS 456 2000 Clause 26.5.2.1

Critical Load Case = #3

Minimum Area of Steel ($A_{st,min}$) = 988.003 mm²

Calculated Area of Steel (A_{st}) = 2511.233 mm²

Provided Area of Steel ($A_{st,Provided}$) = 2511.233 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.048 m

Selected spacing (S) = 0.052 m

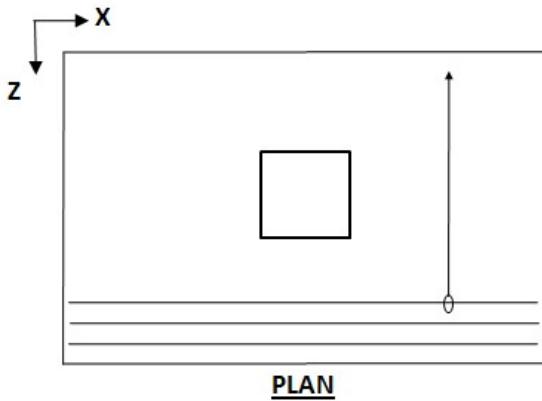
$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0.050 m o.c.

Along X Axis



For moment w.r.t. Z Axis (M_z)

As Per IS 456 2000 Clause 26.5.2.1

Critical Load Case = #3

Minimum Area of Steel ($A_{st,min}$) = 988.003 mm²

Calculated Area of Steel (A_{st}) = 2428.233 mm²

Provided Area of Steel ($A_{st,Provided}$) = 2428.233 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.053 m

$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

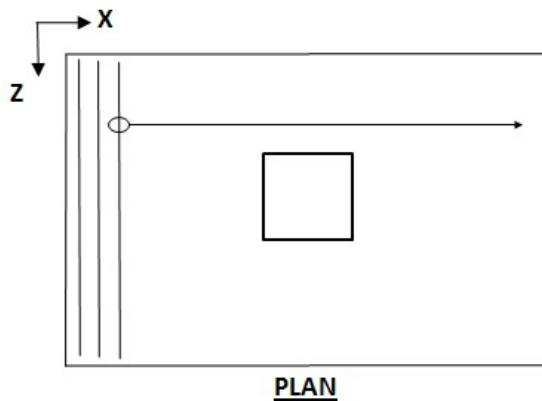
The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0.050 m o.c.

[Top Reinforcement Design](#)

[Along Z Axis](#)



Minimum Area of Steel ($A_{st,min}$) = 988.003 mm²

Calculated Area of Steel (A_{st}) = 984.772 mm²

Provided Area of Steel ($A_{st,Provided}$) = 988.003 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Governing Moment = 14.114 kNm

Selected bar Size (d_b) = Ø6

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.075 m

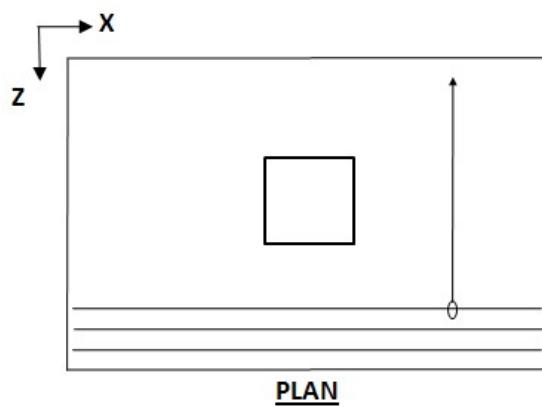
$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø6 @ 0 m o.c.

Along X Axis



Minimum Area of Steel ($A_{st,min}$) = 988.003 mm²

Calculated Area of Steel (A_{st}) = 2428.233 mm²

Provided Area of Steel ($A_{st,Provided}$) = 2428.233 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Governing Moment = 13.505 kNm

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.053 m

$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0 m o.c.

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 796.824 kN

Critical Applied Moment Along X Direction: 15.936 kNm

Critical Applied Moment Along Z Direction: 15.936 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.182 m

Position Of Neutral Axis Along Z Direction: 0.182 m

Pedestal Moment Capacity Along X Direction: 110.801 kNm

Pedestal Moment Capacity Along Z Direction: 125.969 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 577.848 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m
Position Of Neutral Axis Along Z Direction: 0.137 m
Pedestal Moment Capacity Along X Direction: 93.412 kNm
Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²
Pedestal Main/Compression Reinforcement: 16 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 783.137 kN
Critical Applied Moment Along X Direction: 15.662 kNm
Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m
Position Of Neutral Axis Along Z Direction: 0.180 m
Pedestal Moment Capacity Along X Direction: 110.061 kNm
Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²
Pedestal Main/Compression Reinforcement: 12 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN
Critical Applied Moment Along X Direction: 21.591 kNm
Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m
Position Of Neutral Axis Along Z Direction: 0.235 m
Pedestal Moment Capacity Along X Direction: 116.443 kNm
Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²
Pedestal Main/Compression Reinforcement: 28 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1108.293 kN

Critical Applied Moment Along X Direction: 22.165 kNm

Critical Applied Moment Along Z Direction: 22.165 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.224 kNm

Pedestal Moment Capacity Along Z Direction: 133.768 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 803.721 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1079.582 kN

Critical Applied Moment Along X Direction: 21.591 kNm

Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m

Position Of Neutral Axis Along Z Direction: 0.235 m

Pedestal Moment Capacity Along X Direction: 116.443 kNm

Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²

Pedestal Main/Compression Reinforcement: 28 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m

Position Of Neutral Axis Along Z Direction: 0.180 m

Pedestal Moment Capacity Along X Direction: 110.061 kNm

Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 802.558 kN

Critical Applied Moment Along X Direction: 16.051 kNm

Critical Applied Moment Along Z Direction: 16.051 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.183 m

Position Of Neutral Axis Along Z Direction: 0.183 m

Pedestal Moment Capacity Along X Direction: 111.028 kNm

Pedestal Moment Capacity Along Z Direction: 126.226 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 590.780 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1106.751 kN

Critical Applied Moment Along X Direction: 22.135 kNm

Critical Applied Moment Along Z Direction: 22.135 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.240 kNm

Pedestal Moment Capacity Along Z Direction: 133.790 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 802.604 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1137.123 kN

Critical Applied Moment Along X Direction: 22.742 kNm

Critical Applied Moment Along Z Direction: 22.742 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.244 m

Position Of Neutral Axis Along Z Direction: 0.244 m

Pedestal Moment Capacity Along X Direction: 117.002 kNm

Pedestal Moment Capacity Along Z Direction: 133.264 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 824.628 mm²

Pedestal Main/Compression Reinforcement: 32 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1106.751 kN

Critical Applied Moment Along X Direction: 22.135 kNm

Critical Applied Moment Along Z Direction: 22.135 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.240 kNm

Pedestal Moment Capacity Along Z Direction: 133.790 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 802.604 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 802.558 kN

Critical Applied Moment Along X Direction: 16.051 kNm

Critical Applied Moment Along Z Direction: 16.051 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.183 m

Position Of Neutral Axis Along Z Direction: 0.183 m

Pedestal Moment Capacity Along X Direction: 111.028 kNm

Pedestal Moment Capacity Along Z Direction: 126.226 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 590.780 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m
Position Of Neutral Axis Along Z Direction: 0.180 m
Pedestal Moment Capacity Along X Direction: 110.061 kNm
Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²
Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN
Critical Applied Moment Along X Direction: 21.591 kNm
Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

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Pedestal Moment Capacity Along X Direction: 116.443 kNm
Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
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Required Main Reinforcement: 782.901 mm²
Pedestal Main/Compression Reinforcement: 28 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1108.293 kN
Critical Applied Moment Along X Direction: 22.165 kNm
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Pedestal Moment Capacity Along Z Direction: 125.303 kNm

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Required Main Reinforcement: 567.922 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

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Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 796.824 kN

Critical Applied Moment Along X Direction: 15.936 kNm

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Pedestal design is performed in accordance with IS 456 Section 39

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Pedestal Moment Capacity Along Z Direction: 125.969 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 577.848 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

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Pedestal design is performed in accordance with IS 456 Section 39

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Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

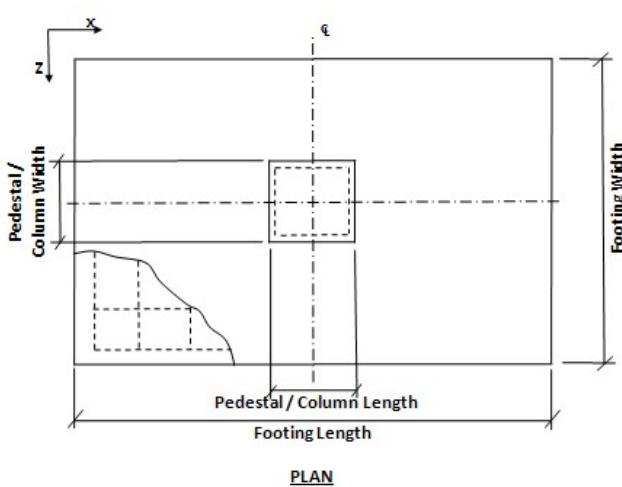
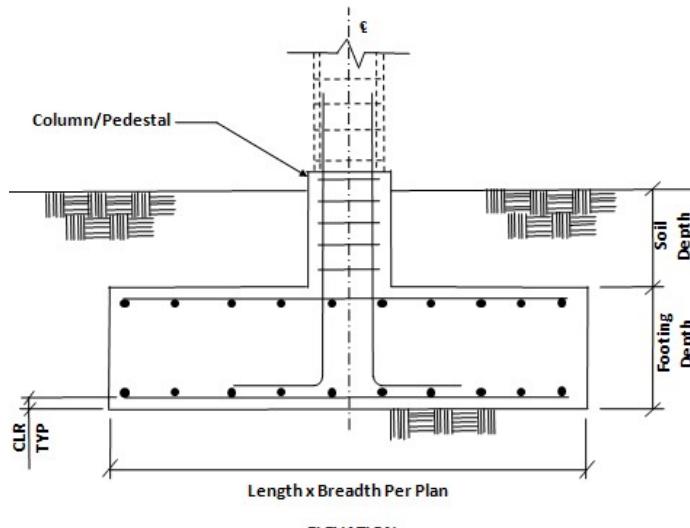
Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Isolated Footing 32



Input Values

Footing Geomtry

Design Type : Calculate Dimension
 Footing Thickness (Ft) : 12.000 in
 Footing Length - X (Fl) : 40.000 in
 Footing Width - Z (Fw) : 40.000 in
 Eccentricity along X (Oxd) : 0.000 in
 Eccentricity along Z (Ozd) : 0.000 in

Column Dimensions

Column Shape : Rectangular
 Column Length - X (Pl) : 0.450 m
 Column Width - Z (Pw) : 0.400 m

Pedestal

Include Pedestal? Yes
 Pedestal Shape : Rectangular
 Pedestal Height (Ph) : 0.015 m
 Pedestal Length - X (Pl) : 0.450 m
 Pedestal Width - Z (Pw) : 0.400 m

Design Parameters

Concrete and Rebar Properties

Unit Weight of Concrete : 150.000 lb/ft³
 Strength of Concrete : 4.000 ksi
 Yield Strength of Steel : 60.000 ksi
 Minimum Bar Size : Ø6
 Maximum Bar Size : Ø32
 Minimum Bar Spacing : 2.000 in
 Maximum Bar Spacing : 18.000 in
 Pedestal Clear Cover (P, CL) : 3.000 in
 Footing Clear Cover (F, CL) : 3.000 in

Soil Properties

Soil Type : UnDrained
 Unit Weight : 112.000 lb/ft³
 Soil Bearing Capacity : 4.000 kip/ft²
 Soil Surcharge : 0.000 kip/in²
 Depth of Soil above Footing : 0.000 in
 Undrained Shear Strength : 0.000 kip/in²
 Min Percentage of Slab : 0.000

Sliding and Overturning

Coefficient of Friction : 0.500
 Factor of Safety Against Sliding : 1.500
 Factor of Safety Against Overturning : 1.500

Load Combination/s- Service Stress Level	
Load Combination Number	Load Combination Title
1	DEAD
2	LIVE
3	COMBINATION LOAD CASE 3
101	1.000 x DL+1.000 x DL+1.000 x DL

102	0.800 x DL+0.800 x DL+0.800 x DL
Load Combination/s- Strength Level	
Load Combination Number	Load Combination Title
1	DEAD
2	LIVE
3	COMBINATION LOAD CASE 3

Applied Loads - Service Stress Level					
LC	Axial (kN)	Shear X (kN)	Shear Z (kN)	Moment X (kNm)	Moment Z (kNm)
1	594.911	-0.295	-0.229	-0.248	0.319
2	124.810	-0.127	-0.102	-0.108	0.134
3	1079.582	-0.634	-0.497	-0.534	0.680
101	1799.303	-1.056	-0.829	-0.890	1.133
102	1439.443	-0.845	-0.663	-0.712	0.906

Applied Loads - Strength Level					
LC	Axial (kN)	Shear X (kN)	Shear Z (kN)	Moment X (kNm)	Moment Z (kNm)
1	594.911	-0.295	-0.229	-0.248	0.319
2	124.810	-0.127	-0.102	-0.108	0.134
3	1079.582	-0.634	-0.497	-0.534	0.680

Design Calculations

Footing Size

Initial Length (L_o) = 1.016 m

Initial Width (W_o) = 1.016 m

Uplift force due to buoyancy = 0.000 kN

Effect due to adhesion = 0.000 kN

Area from initial length and width, $A_o = L_o \times W_o = 1.032 \text{ m}^2$

Min. area required from bearing pressure, $A_{\min} = P / q_{\max} = 9.893 \text{ m}^2$

Note: A_{\min} is an initial estimation.

P = Critical Factored Axial Load (without self weight/buoyancy/soil).

q_{\max} = Respective Factored Bearing Capacity.

Final Footing Size

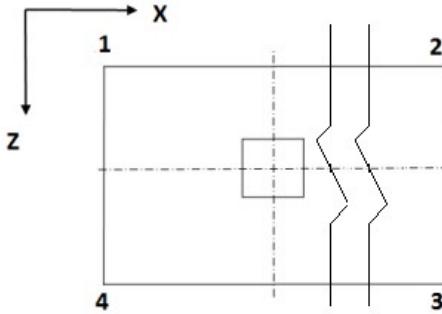
Length (L_2) = 3.200 m Governing Load Case : # 101

Width (W_2) = 3.200 m Governing Load Case : # 101

Depth (D_2) = 0.408 m Governing Load Case : # 101

$$\text{Area } (A_2) = 10.243 \text{ m}^2$$

Pressures at Four Corner



Load Case	Pressure at corner 1 (q_1) (kN/m ²)	Pressure at corner 2 (q_2) (kN/m ²)	Pressure at corner 3 (q_3) (kN/m ²)	Pressure at corner 4 (q_4) (kN/m ²)	Area of footing in uplift (A_u) (m ²)
101	189.0748	188.5099	188.0663	188.6312	0.000
101	189.0748	188.5099	188.0663	188.6312	0.000
101	189.0748	188.5099	188.0663	188.6312	0.000
101	189.0748	188.5099	188.0663	188.6312	0.000

If A_u is zero, there is no uplift and no pressure adjustment is necessary. Otherwise, to account for uplift, areas of negative pressure will be set to zero and the pressure will be redistributed to remaining corners.

Summary of adjusted Pressures at Four Corner

Load Case	Pressure at corner 1 (q_1) (kN/m ²)	Pressure at corner 2 (q_2) (kN/m ²)	Pressure at corner 3 (q_3) (kN/m ²)	Pressure at corner 4 (q_4) (kN/m ²)
101	189.0748	188.5099	188.0663	188.6312
101	189.0748	188.5099	188.0663	188.6312
101	189.0748	188.5099	188.0663	188.6312
101	189.0748	188.5099	188.0663	188.6312

Details of Out-of-Contact Area (If Any)

Governing load case = N/A

Plan area of footing = 10.243 sq.m

Area not in contact with soil = 0.000 sq.m

% of total area not in contact = 0.000%

Check For Stability Against Overturning And Sliding

-	Factor of safety against sliding		Factor of safety against overturning	
Load Case No.	Along X-Direction	Along Z-Direction	About X-Direction	About Z-Direction
1	1173.485	1513.229	3220.478	2501.423
2	878.405	1090.495	2357.348	1898.376
3	929.470	1184.773	2533.577	1989.455
101	898.415	1145.188	2448.928	1922.986
102	910.061	1160.032	2480.671	1947.912

Critical Load Case And The Governing Factor Of Safety For Overturning and Sliding X Direction

Critical Load Case for Sliding along X-Direction : 2

Governing Disturbing Force : -0.127 kN

Governing Restoring Force : 111.601 kN

Minimum Sliding Ratio for the Critical Load Case : 878.405

Critical Load Case for Overturning about X-Direction : 2

Governing Overturning Moment : -0.152 kNm

Governing Resisting Moment : 357.162 kNm

Minimum Overturning Ratio for the Critical Load Case : 2357.348

Critical Load Case And The Governing Factor Of Safety For Overturning and Sliding Z Direction

Critical Load Case for Sliding along Z-Direction : 2

Governing Disturbing Force : -0.102 kN

Governing Restoring Force : 111.601 kN

Minimum Sliding Ratio for the Critical Load Case : 1090.495

Critical Load Case for Overturning about Z-Direction : 2

Governing Overturning Moment : 0.188 kNm

Governing Resisting Moment : 357.162 kNm

Minimum Overturning Ratio for the Critical Load Case : 1898.376

Moment CalculationCheck Trial Depth against moment (w.r.t. X Axis)**Critical Load Case = #3**

Effective Depth = $D - (cc + 0.5 \times d_b) = 0.328 \text{ m}$

Governing moment (M_u) = 330.972 kNm

As Per IS 456 2000 ANNEX G G-1.1C

Limiting Factor1 (K_{umax}) = $\frac{700}{(1100 + 0.87 \times f_y)} = 0.479483$

Limiting Factor2 (R_{umax}) = $0.36 \times f_{ck} \times k_{umax} \times (1 - 0.42 \times k_{umax}) = 3801.834636 \text{ kN/m}^2$

Limit Moment Of Resistance (M_{umax}) = $R_{umax} \times B \times d_e^2 = 1310.589440 \text{ kNm}$

$M_u \leq M_{umax}$ hence, safe

Check Trial Depth against moment (w.r.t. Z Axis)

Critical Load Case = #3

$$\text{Effective Depth} = D - (cc + 0.5 \times d_b) = 0.328 \text{ m}$$

$$\text{Governing moment } (M_u) = 319.341 \text{ kNm}$$

As Per IS 456 2000 ANNEX G G-1.1C

$$\text{Limiting Factor1 } (K_{umax}) = \frac{700}{(1100 + 0.87 \times f_y)} = 0.479483$$

$$\text{Limiting Factor2 } (R_{umax}) = \frac{0.36 \times f_{ck} \times k_{umax} \times (1 - 0.42 \times k_{umax})}{k_{umax}} = 3801.834636 \text{ kN/m}^2$$

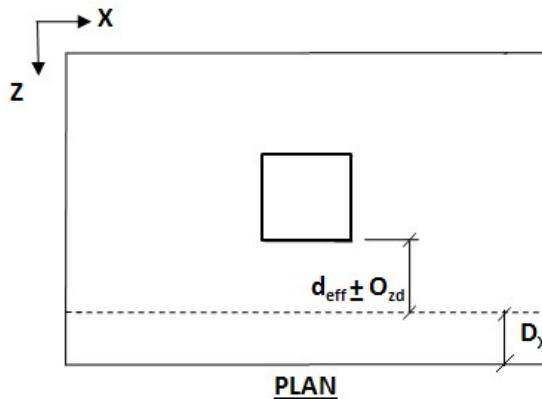
$$\text{Limit Moment Of Resistance } (M_{umax}) = \frac{R_{umax} \times B \times d_e^2}{k_{umax}} = 1310.589440 \text{ kNm}$$

$M_u \leq M_{umax}$ hence, safe

Shear Calculation

Check Trial Depth for one way shear (Along X Axis)

(Shear Plane Parallel to X Axis)



Critical Load Case = #3

$$D_X = 0.328 \text{ m}$$

$$\text{Shear Force}(S) = 361.926 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 344.569240 \text{ kN/m}^2$$

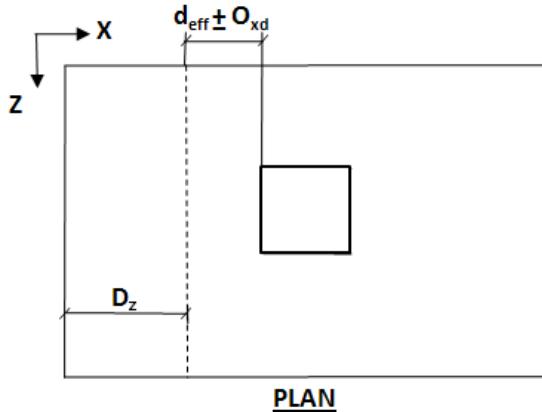
$$\text{Percentage Of Steel}(P_t) = 0.2682$$

As Per IS 456 2000 Clause 40 Table 19

$$\text{Shear Strength Of Concrete}(T_c) = 378.463 \text{ kN/m}^2$$

$T_v < T_c$ hence, safe

Check Trial Depth for one way shear (Along Z Axis)
(Shear Plane Parallel to Z Axis)



Critical Load Case = #3

$$D_z = 0.328 \text{ m}$$

$$\text{Shear Force}(S) = 353.573 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 336.616937 \text{ kN/m}^2$$

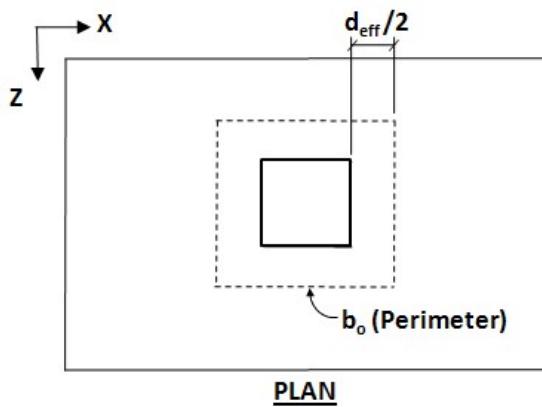
$$\text{Percentage Of Steel}(P_t) = 0.2784$$

As Per IS 456 2000 Clause 40 Table 19

$$\text{Shear Strength Of Concrete}(T_c) = 384.669 \text{ kN/m}^2$$

$T_v < T_c$ hence, safe

Check Trial Depth for two way shear



Critical Load Case = #3

$$\text{Shear Force}(S) = 1019.853 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 1031.405 \text{ kN/m}^2$$

As Per IS 456 2000 Clause 31.6.3.1

$$K_s = \min[(0.5 + \beta), 1] = 1.000$$

$$\text{Shear Strength}(T_c) = 0.25 \times \sqrt{f_{ck}} = 1312.8936 \text{ kN/m}^2$$

$$K_s \times T_c = 1312.8936 \text{ kN/m}^2$$

$$T_v \leq K_s \times T_c \text{ hence, safe}$$

Reinforcement Calculation

Calculation of Maximum Bar Size

Along X Axis

Bar diameter corresponding to max bar size (d_b) = 32 mm

As Per IS 456 2000 Clause 26.2.1

$$\text{Development Length}(l_d) = \frac{d_b \times 0.87 \times f_y}{4 \times \gamma_{bd}} = 1.224 \text{ m}$$

$$\text{Allowable Length}(l_{db}) = \left[\frac{(B - b)}{2} - cc \right] = 1.299 \text{ m}$$

$$l_{db} \geq l_d \text{ hence, safe}$$

Along Z Axis

Bar diameter corresponding to max bar size(d_b) = 32 mm

As Per IS 456 2000 Clause 26.2.1

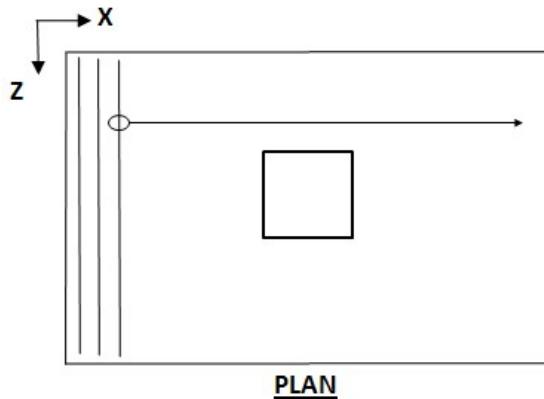
$$\text{Development Length}(l_d) = \frac{d_b \times 0.87 \times f_y}{4 \times \gamma_{bd}} = 1.224 \text{ m}$$

$$\text{Allowable Length}(l_{db}) = \left[\frac{(H - h)}{2} - cc \right] = 1.324 \text{ m}$$

$$l_{db} \geq l_d \text{ hence, safe}$$

Bottom Reinforcement Design

Along Z Axis



For moment w.r.t. X Axis (M_x)

As Per IS 456 2000 Clause 26.5.2.1

Critical Load Case = #3

Minimum Area of Steel ($A_{st,min}$) = 1568.452 mm²

Calculated Area of Steel (A_{st}) = 2924.124 mm²

Provided Area of Steel ($A_{st,Provided}$) = 2924.124 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.048 m

Selected spacing (S) = 0.052 m

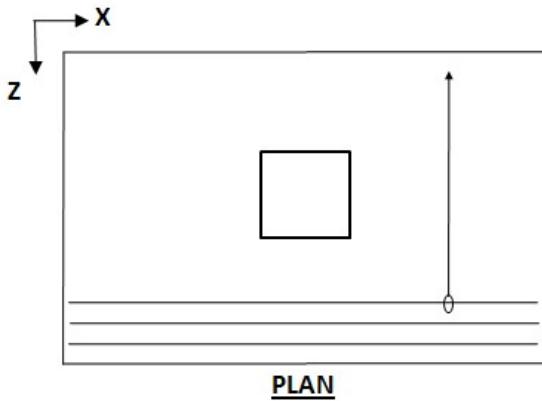
$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0.050 m o.c.

Along X Axis



For moment w.r.t. Z Axis (M_z)

As Per IS 456 2000 Clause 26.5.2.1

Critical Load Case = #3

Minimum Area of Steel ($A_{st,min}$) = 1568.452 mm²

Calculated Area of Steel (A_{st}) = 2816.865 mm²

Provided Area of Steel ($A_{st,Provided}$) = 2816.865 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.054 m

$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

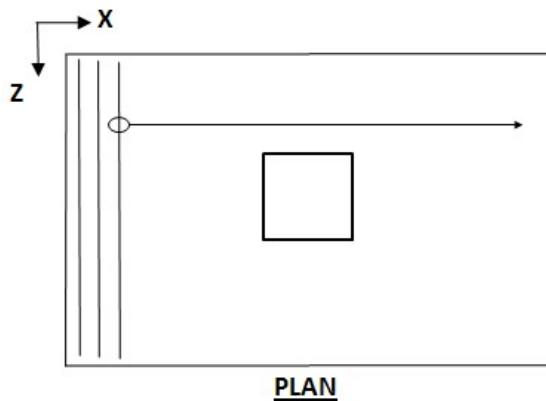
The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0.050 m o.c.

[Top Reinforcement Design](#)

[Along Z Axis](#)



Minimum Area of Steel ($A_{st,min}$) = 1568.452 mm²

Calculated Area of Steel (A_{st}) = 1564.611 mm²

Provided Area of Steel ($A_{st,Provided}$) = 1568.452 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Governing Moment = 33.464 kNm

Selected bar Size (d_b) = Ø6

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.055 m

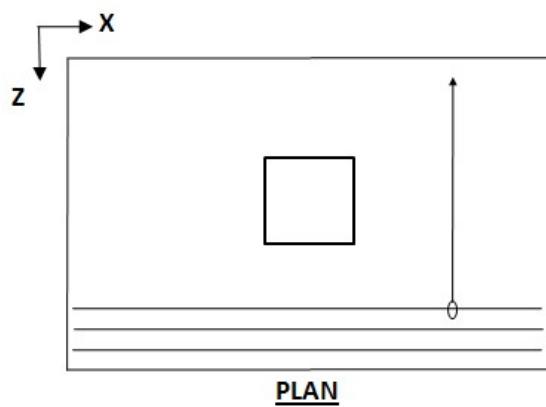
$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø6 @ 0 m o.c.

Along X Axis



Minimum Area of Steel ($A_{st,min}$) = 1568.452 mm²

Calculated Area of Steel (A_{st}) = 2816.865 mm²

Provided Area of Steel ($A_{st,Provided}$) = 2816.865 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Governing Moment = 32.279 kNm

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.054 m

$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0 m o.c.

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 796.824 kN

Critical Applied Moment Along X Direction: 15.936 kNm

Critical Applied Moment Along Z Direction: 15.936 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.182 m

Position Of Neutral Axis Along Z Direction: 0.182 m

Pedestal Moment Capacity Along X Direction: 110.801 kNm

Pedestal Moment Capacity Along Z Direction: 125.969 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 577.848 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m
Position Of Neutral Axis Along Z Direction: 0.137 m
Pedestal Moment Capacity Along X Direction: 93.412 kNm
Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²
Pedestal Main/Compression Reinforcement: 16 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 783.137 kN
Critical Applied Moment Along X Direction: 15.662 kNm
Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m
Position Of Neutral Axis Along Z Direction: 0.180 m
Pedestal Moment Capacity Along X Direction: 110.061 kNm
Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²
Pedestal Main/Compression Reinforcement: 12 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN
Critical Applied Moment Along X Direction: 21.591 kNm
Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m
Position Of Neutral Axis Along Z Direction: 0.235 m
Pedestal Moment Capacity Along X Direction: 116.443 kNm
Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²
Pedestal Main/Compression Reinforcement: 28 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1108.293 kN

Critical Applied Moment Along X Direction: 22.165 kNm

Critical Applied Moment Along Z Direction: 22.165 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.224 kNm

Pedestal Moment Capacity Along Z Direction: 133.768 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 803.721 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1079.582 kN

Critical Applied Moment Along X Direction: 21.591 kNm

Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m

Position Of Neutral Axis Along Z Direction: 0.235 m

Pedestal Moment Capacity Along X Direction: 116.443 kNm

Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²

Pedestal Main/Compression Reinforcement: 28 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m

Position Of Neutral Axis Along Z Direction: 0.180 m

Pedestal Moment Capacity Along X Direction: 110.061 kNm

Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 802.558 kN

Critical Applied Moment Along X Direction: 16.051 kNm

Critical Applied Moment Along Z Direction: 16.051 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.183 m

Position Of Neutral Axis Along Z Direction: 0.183 m

Pedestal Moment Capacity Along X Direction: 111.028 kNm

Pedestal Moment Capacity Along Z Direction: 126.226 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 590.780 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1106.751 kN

Critical Applied Moment Along X Direction: 22.135 kNm

Critical Applied Moment Along Z Direction: 22.135 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.240 kNm

Pedestal Moment Capacity Along Z Direction: 133.790 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 802.604 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1137.123 kN

Critical Applied Moment Along X Direction: 22.742 kNm

Critical Applied Moment Along Z Direction: 22.742 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.244 m

Position Of Neutral Axis Along Z Direction: 0.244 m

Pedestal Moment Capacity Along X Direction: 117.002 kNm

Pedestal Moment Capacity Along Z Direction: 133.264 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 824.628 mm²

Pedestal Main/Compression Reinforcement: 32 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1106.751 kN

Critical Applied Moment Along X Direction: 22.135 kNm

Critical Applied Moment Along Z Direction: 22.135 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.240 kNm

Pedestal Moment Capacity Along Z Direction: 133.790 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 802.604 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 802.558 kN

Critical Applied Moment Along X Direction: 16.051 kNm

Critical Applied Moment Along Z Direction: 16.051 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.183 m

Position Of Neutral Axis Along Z Direction: 0.183 m

Pedestal Moment Capacity Along X Direction: 111.028 kNm

Pedestal Moment Capacity Along Z Direction: 126.226 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 590.780 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m
Position Of Neutral Axis Along Z Direction: 0.180 m
Pedestal Moment Capacity Along X Direction: 110.061 kNm
Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²
Pedestal Main/Compression Reinforcement: 12 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN
Critical Applied Moment Along X Direction: 21.591 kNm
Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m
Position Of Neutral Axis Along Z Direction: 0.235 m
Pedestal Moment Capacity Along X Direction: 116.443 kNm
Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²
Pedestal Main/Compression Reinforcement: 28 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m
Critical load Case : 3
Critical Applied Axial Load: 1108.293 kN
Critical Applied Moment Along X Direction: 22.165 kNm
Critical Applied Moment Along Z Direction: 22.165 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m
Position Of Neutral Axis Along Z Direction: 0.239 m
Pedestal Moment Capacity Along X Direction: 117.224 kNm
Pedestal Moment Capacity Along Z Direction: 133.768 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 803.721 mm²
Pedestal Main/Compression Reinforcement: 16 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m
Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN

Critical Applied Moment Along X Direction: 21.591 kNm

Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m

Position Of Neutral Axis Along Z Direction: 0.235 m

Pedestal Moment Capacity Along X Direction: 116.443 kNm

Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²

Pedestal Main/Compression Reinforcement: 28 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m

Position Of Neutral Axis Along Z Direction: 0.180 m

Pedestal Moment Capacity Along X Direction: 110.061 kNm

Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 796.824 kN

Critical Applied Moment Along X Direction: 15.936 kNm

Critical Applied Moment Along Z Direction: 15.936 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.182 m

Position Of Neutral Axis Along Z Direction: 0.182 m

Pedestal Moment Capacity Along X Direction: 110.801 kNm

Pedestal Moment Capacity Along Z Direction: 125.969 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 577.848 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

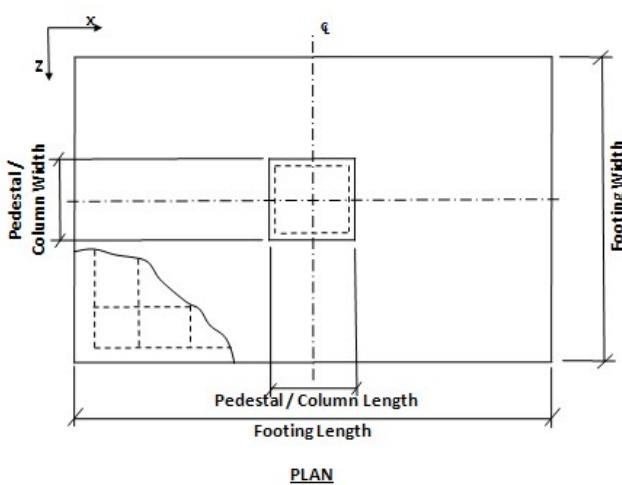
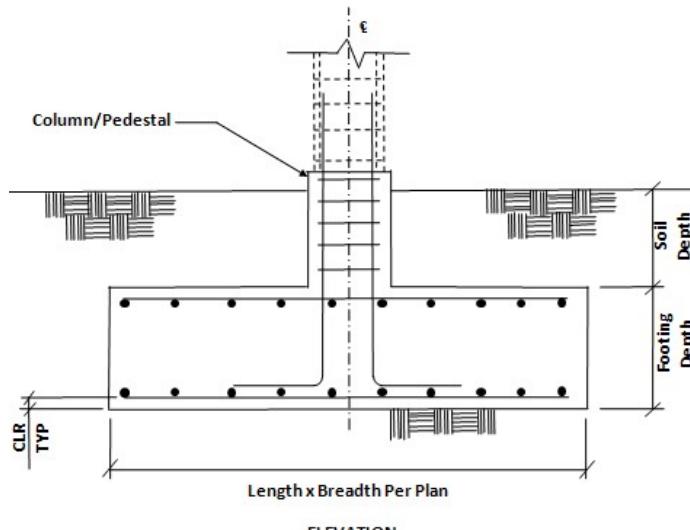
Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Isolated Footing 33



Input Values

Footing Geomtry

Design Type : Calculate Dimension
 Footing Thickness (Ft) : 12.000 in
 Footing Length - X (Fl) : 40.000 in
 Footing Width - Z (Fw) : 40.000 in
 Eccentricity along X (Oxd) : 0.000 in
 Eccentricity along Z (Ozd) : 0.000 in

Column Dimensions

Column Shape : Rectangular
 Column Length - X (Pl) : 0.450 m
 Column Width - Z (Pw) : 0.400 m

Pedestal

Include Pedestal? Yes

Pedestal Shape : Rectangular

Pedestal Height (Ph) : 0.015 m

Pedestal Length - X (Pl) : 0.450 m

Pedestal Width - Z (Pw) : 0.400 m

Design ParametersConcrete and Rebar Properties

Unit Weight of Concrete : 150.000 lb/ft³

Strength of Concrete : 4.000 ksi

Yield Strength of Steel : 60.000 ksi

Minimum Bar Size : Ø6

Maximum Bar Size : Ø32

Minimum Bar Spacing : 2.000 in

Maximum Bar Spacing : 18.000 in

Pedestal Clear Cover (P, CL) : 3.000 in

Footing Clear Cover (F, CL) : 3.000 in

Soil Properties

Soil Type : UnDrained

Unit Weight : 112.000 lb/ft³

Soil Bearing Capacity : 4.000 kip/ft²

Soil Surcharge : 0.000 kip/in²

Depth of Soil above Footing : 0.000 in

Undrained Shear Strength : 0.000 kip/in²

Min Percentage of Slab : 0.000

Sliding and Overturning

Coefficient of Friction : 0.500

Factor of Safety Against Sliding : 1.500

Factor of Safety Against Overturning : 1.500

Load Combination/s- Service Stress Level	
Load Combination Number	Load Combination Title
1	DEAD
2	LIVE
3	COMBINATION LOAD CASE 3
101	1.000 x DL+1.000 x DL+1.000 x DL

102	0.800 x DL+0.800 x DL+0.800 x DL
Load Combination/s- Strength Level	
Load Combination Number	Load Combination Title
1	DEAD
2	LIVE
3	COMBINATION LOAD CASE 3

Applied Loads - Service Stress Level					
LC	Axial (kN)	Shear X (kN)	Shear Z (kN)	Moment X (kNm)	Moment Z (kNm)
1	608.433	0.000	-0.239	-0.258	0.000
2	130.429	0.000	-0.109	-0.115	0.000
3	1108.293	0.000	-0.522	-0.560	0.000
101	1847.154	0.000	-0.869	-0.933	0.000
102	1477.724	0.000	-0.695	-0.746	0.000

Applied Loads - Strength Level					
LC	Axial (kN)	Shear X (kN)	Shear Z (kN)	Moment X (kNm)	Moment Z (kNm)
1	608.433	0.000	-0.239	-0.258	0.000
2	130.429	0.000	-0.109	-0.115	0.000
3	1108.293	0.000	-0.522	-0.560	0.000

Design Calculations

Footing Size

Initial Length (L_o) = 1.016 m

Initial Width (W_o) = 1.016 m

Uplift force due to buoyancy = 0.000 kN

Effect due to adhesion = 0.000 kN

Area from initial length and width, $A_o = L_o \times W_o = 1.032 \text{ m}^2$

Min. area required from bearing pressure, $A_{\min} = P / q_{\max} = 10.159 \text{ m}^2$

Note: A_{\min} is an initial estimation.

P = Critical Factored Axial Load (without self weight/buoyancy/soil).

q_{\max} = Respective Factored Bearing Capacity.

Final Footing Size

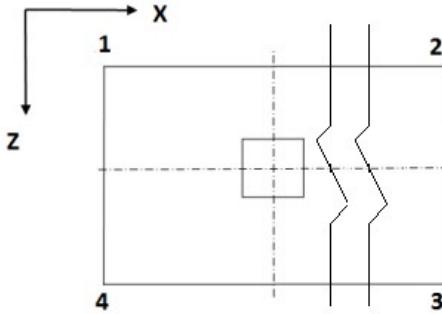
Length (L_2) = 3.200 m Governing Load Case : # 1

Width (W_2) = 3.200 m Governing Load Case : # 1

Depth (D_2) = 0.408 m Governing Load Case : # 1

$$\text{Area } (A_2) = 10.243 \text{ m}^2$$

Pressures at Four Corner



Load Case	Pressure at corner 1 (q_1) (kN/m ²)	Pressure at corner 2 (q_2) (kN/m ²)	Pressure at corner 3 (q_3) (kN/m ²)	Pressure at corner 4 (q_4) (kN/m ²)	Area of footing in uplift (A_u) (m ²)
101	190.1853	190.1853	189.7094	189.7094	0.000
101	190.1853	190.1853	189.7094	189.7094	0.000
101	190.1853	190.1853	189.7094	189.7094	0.000
101	190.1853	190.1853	189.7094	189.7094	0.000

If A_u is zero, there is no uplift and no pressure adjustment is necessary. Otherwise, to account for uplift, areas of negative pressure will be set to zero and the pressure will be redistributed to remaining corners.

Summary of adjusted Pressures at Four Corner

Load Case	Pressure at corner 1 (q_1) (kN/m ²)	Pressure at corner 2 (q_2) (kN/m ²)	Pressure at corner 3 (q_3) (kN/m ²)	Pressure at corner 4 (q_4) (kN/m ²)
101	190.1853	190.1853	189.7094	189.7094
101	190.1853	190.1853	189.7094	189.7094
101	190.1853	190.1853	189.7094	189.7094
101	190.1853	190.1853	189.7094	189.7094

Details of Out-of-Contact Area (If Any)

Governing load case = N/A

Plan area of footing = 10.243 sq.m

Area not in contact with soil = 0.000 sq.m

% of total area not in contact = 0.000%

Check For Stability Against Overturning And Sliding

-	Factor of safety against sliding		Factor of safety against overturning	
Load Case No.	Along X-Direction	Along Z-Direction	About X-Direction	About Z-Direction
1	N/A	1479.699	3151.795	N/A
2	N/A	1051.126	2272.965	N/A
3	N/A	1156.870	2475.772	N/A
101	N/A	1119.138	2395.022	N/A
102	N/A	1133.287	2425.303	N/A

Critical Load Case And The Governing Factor Of Safety For Overturning and Sliding X Direction

Critical Load Case for Sliding along X-Direction : 1

Governing Disturbing Force : 0.000 kN

Governing Restoring Force : 353.413 kN

Minimum Sliding Ratio for the Critical Load Case : 0.000

Critical Load Case for Overturning about X-Direction : 2

Governing Overturning Moment : -0.161 kNm

Governing Resisting Moment : 366.154 kNm

Minimum Overturning Ratio for the Critical Load Case : 2272.965

Critical Load Case And The Governing Factor Of Safety For Overturning and Sliding Z Direction

Critical Load Case for Sliding along Z-Direction : 2

Governing Disturbing Force : -0.109 kN

Governing Restoring Force : 114.411 kN

Minimum Sliding Ratio for the Critical Load Case : 1051.126

Critical Load Case for Overturning about Z-Direction : 1

Governing Overturning Moment : 0.000 kNm

Governing Resisting Moment : 1131.041 kNm

Minimum Overturning Ratio for the Critical Load Case : 0.000

Moment CalculationCheck Trial Depth against moment (w.r.t. X Axis)**Critical Load Case = #3**

$$\text{Effective Depth} = D - (cc + 0.5 \times d_b) = 0.328 \text{ m}$$

$$\text{Governing moment (M}_u\text{)} = 339.780 \text{ kNm}$$

As Per IS 456 2000 ANNEX G G-1.1C

$$\text{Limiting Factor1 (K}_{u\max}\text{)} = \frac{700}{(1100 + 0.87 \times f_y)} = 0.479483$$

$$\text{Limiting Factor2 (R}_{u\max}\text{)} = \frac{0.36 \times f_{ck} \times k_{u\max} \times (1 - 0.42 \times k_{u\max})}{B} = 3801.834636 \text{ kN/m}^2$$

$$\text{Limit Moment Of Resistance (M}_{u\max}\text{)} = \frac{R_{u\max} \times B \times d_e^2}{2} = 1310.589440 \text{ kNm}$$

$M_u \leq M_{umax}$ hence, safe

Check Trial Depth against moment (w.r.t. Z Axis)

Critical Load Case = #3

$$\text{Effective Depth} = D - (cc + 0.5 \times d_b) = 0.328 \text{ m}$$

$$\text{Governing moment } (M_u) = 327.449 \text{ kNm}$$

As Per IS 456 2000 ANNEX G G-1.1C

$$\text{Limiting Factor1 } (K_{umax}) = \frac{700}{(1100 + 0.87 \times f_y)} = 0.479483$$

$$\text{Limiting Factor2 } (R_{umax}) = \frac{0.36 \times f_{ck} \times k_{umax} \times (1 - 0.42 \times k_{umax})}{k_{umax}} = 3801.834636 \text{ kN/m}^2$$

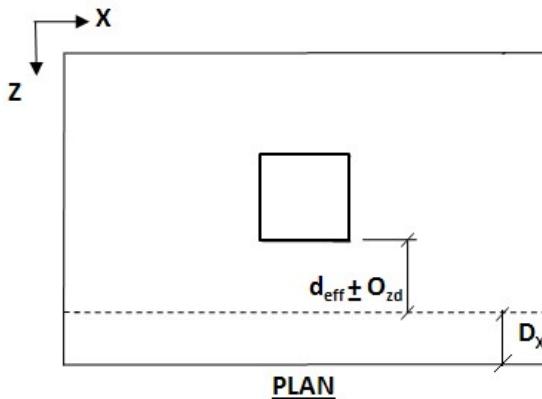
$$\text{Limit Moment Of Resistance } (M_{umax}) = \frac{R_{umax} \times B \times d_e^2}{4} = 1310.589440 \text{ kNm}$$

$M_u \leq M_{umax}$ hence, safe

Shear Calculation

Check Trial Depth for one way shear (Along X Axis)

(Shear Plane Parallel to X Axis)



Critical Load Case = #3

$$D_X = 0.328 \text{ m}$$

$$\text{Shear Force}(S) = 371.557 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 353.739203 \text{ kN/m}^2$$

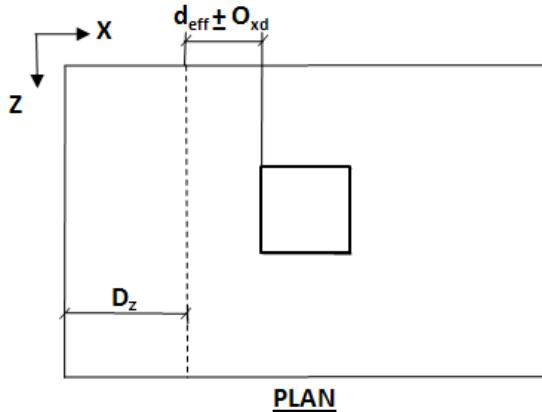
$$\text{Percentage Of Steel}(P_t) = 0.2753$$

As Per IS 456 2000 Clause 40 Table 19

$$\text{Shear Strength Of Concrete}(T_c) = 382.803 \text{ kN/m}^2$$

$T_v < T_c$ hence, safe

Check Trial Depth for one way shear (Along Z Axis)
(Shear Plane Parallel to Z Axis)



Critical Load Case = #3

$$D_z = 0.327 \text{ m}$$

$$\text{Shear Force}(S) = 362.921 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 346.572507 \text{ kN/m}^2$$

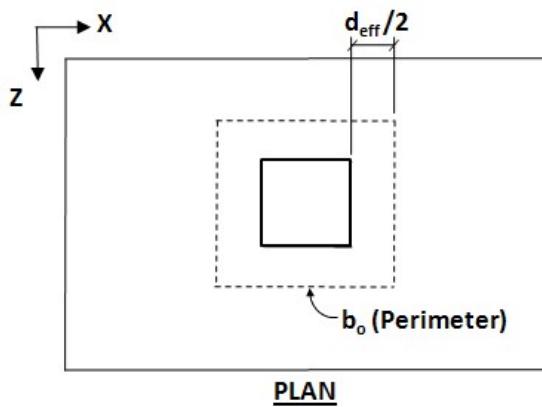
$$\text{Percentage Of Steel}(P_t) = 0.2880$$

As Per IS 456 2000 Clause 40 Table 19

$$\text{Shear Strength Of Concrete}(T_c) = 390.355 \text{ kN/m}^2$$

$T_v < T_c$ hence, safe

Check Trial Depth for two way shear



Critical Load Case = #3

$$\text{Shear Force}(S) = 1047.138 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 1063.647 \text{ kN/m}^2$$

As Per IS 456 2000 Clause 31.6.3.1

$$K_s = \min[(0.5 + \beta), 1] = 1.000$$

$$\text{Shear Strength}(T_c) = 0.25 \times \sqrt{f_{ck}} = 1312.8936 \text{ kN/m}^2$$

$$K_s \times T_c = 1312.8936 \text{ kN/m}^2$$

$$T_v \leq K_s \times T_c \text{ hence, safe}$$

Reinforcement Calculation

Calculation of Maximum Bar Size

Along X Axis

Bar diameter corresponding to max bar size (d_b) = 32 mm

As Per IS 456 2000 Clause 26.2.1

$$\text{Development Length}(l_d) = \frac{d_b \times 0.87 \times f_y}{4 \times \gamma_{bd}} = 1.224 \text{ m}$$

$$\text{Allowable Length}(l_{db}) = \left[\frac{(B - b)}{2} - cc \right] = 1.299 \text{ m}$$

$$l_{db} \geq l_d \text{ hence, safe}$$

Along Z Axis

Bar diameter corresponding to max bar size(d_b) = 32 mm

As Per IS 456 2000 Clause 26.2.1

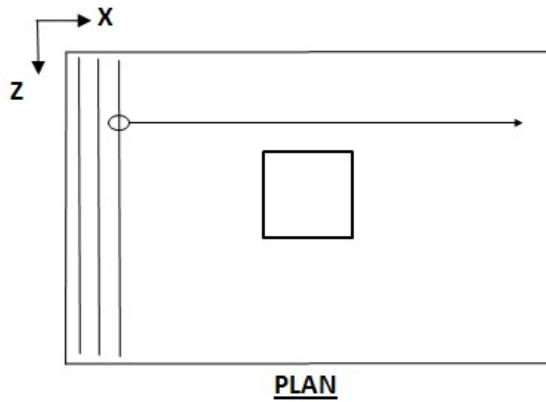
$$\text{Development Length}(l_d) = \frac{d_b \times 0.87 \times f_y}{4 \times \gamma_{bd}} = 1.224 \text{ m}$$

$$\text{Allowable Length}(l_{db}) = \left[\frac{(H - h)}{2} - cc \right] = 1.324 \text{ m}$$

$$l_{db} \geq l_d \text{ hence, safe}$$

Bottom Reinforcement Design

Along Z Axis



For moment w.r.t. X Axis (M_x)

As Per IS 456 2000 Clause 26.5.2.1

Critical Load Case = #3

Minimum Area of Steel ($A_{st,min}$) = 1568.452 mm²

Calculated Area of Steel (A_{st}) = 3005.596 mm²

Provided Area of Steel ($A_{st,Provided}$) = 3005.596 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.048 m

Selected spacing (S) = 0.052 m

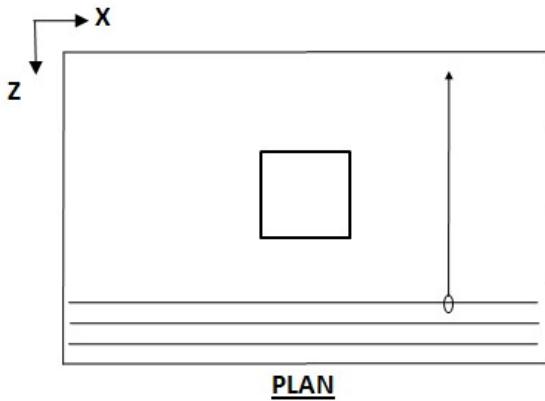
$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0.050 m o.c.

[Along X Axis](#)



For moment w.r.t. Z Axis (M_z)

As Per IS 456 2000 Clause 26.5.2.1

Critical Load Case = #3

Minimum Area of Steel ($A_{st,min}$) = 1568.452 mm²

Calculated Area of Steel (A_{st}) = 2891.603 mm²

Provided Area of Steel ($A_{st,Provided}$) = 2891.603 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.053 m

$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

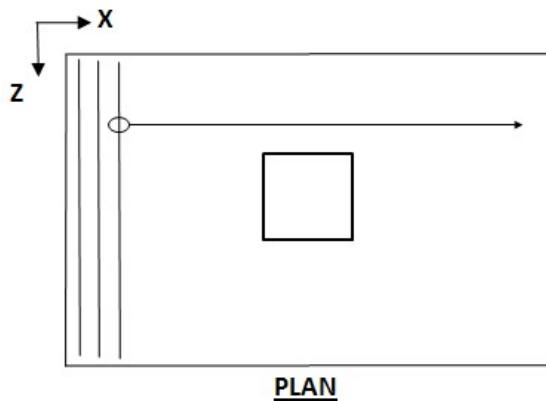
The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0.050 m o.c.

[Top Reinforcement Design](#)

[Along Z Axis](#)



Minimum Area of Steel ($A_{st,min}$) = 1568.452 mm²

Calculated Area of Steel (A_{st}) = 1564.611 mm²

Provided Area of Steel ($A_{st,Provided}$) = 1568.452 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Governing Moment = 33.464 kNm

Selected bar Size (d_b) = Ø6

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.055 m

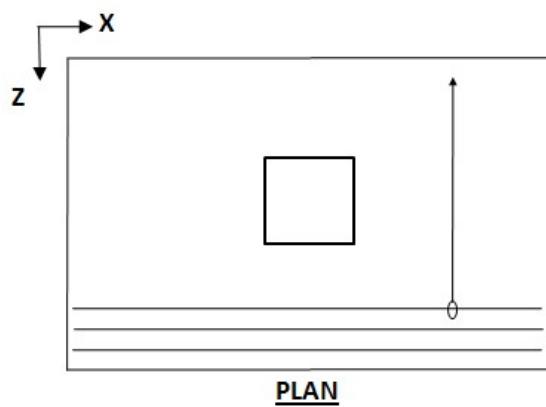
$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø6 @ 0 m o.c.

Along X Axis



Minimum Area of Steel ($A_{st,min}$) = 1568.452 mm²

Calculated Area of Steel (A_{st}) = 2891.603 mm²

Provided Area of Steel ($A_{st,Provided}$) = 2891.603 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Governing Moment = 32.279 kNm

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.053 m

$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0 m o.c.

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 796.824 kN

Critical Applied Moment Along X Direction: 15.936 kNm

Critical Applied Moment Along Z Direction: 15.936 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.182 m

Position Of Neutral Axis Along Z Direction: 0.182 m

Pedestal Moment Capacity Along X Direction: 110.801 kNm

Pedestal Moment Capacity Along Z Direction: 125.969 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 577.848 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m
Position Of Neutral Axis Along Z Direction: 0.137 m
Pedestal Moment Capacity Along X Direction: 93.412 kNm
Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²
Pedestal Main/Compression Reinforcement: 16 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 783.137 kN
Critical Applied Moment Along X Direction: 15.662 kNm
Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m
Position Of Neutral Axis Along Z Direction: 0.180 m
Pedestal Moment Capacity Along X Direction: 110.061 kNm
Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²
Pedestal Main/Compression Reinforcement: 12 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN
Critical Applied Moment Along X Direction: 21.591 kNm
Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m
Position Of Neutral Axis Along Z Direction: 0.235 m
Pedestal Moment Capacity Along X Direction: 116.443 kNm
Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²
Pedestal Main/Compression Reinforcement: 28 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1108.293 kN

Critical Applied Moment Along X Direction: 22.165 kNm

Critical Applied Moment Along Z Direction: 22.165 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.224 kNm

Pedestal Moment Capacity Along Z Direction: 133.768 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 803.721 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1079.582 kN

Critical Applied Moment Along X Direction: 21.591 kNm

Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m

Position Of Neutral Axis Along Z Direction: 0.235 m

Pedestal Moment Capacity Along X Direction: 116.443 kNm

Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²

Pedestal Main/Compression Reinforcement: 28 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m

Position Of Neutral Axis Along Z Direction: 0.180 m

Pedestal Moment Capacity Along X Direction: 110.061 kNm

Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 802.558 kN

Critical Applied Moment Along X Direction: 16.051 kNm

Critical Applied Moment Along Z Direction: 16.051 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.183 m

Position Of Neutral Axis Along Z Direction: 0.183 m

Pedestal Moment Capacity Along X Direction: 111.028 kNm

Pedestal Moment Capacity Along Z Direction: 126.226 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 590.780 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1106.751 kN

Critical Applied Moment Along X Direction: 22.135 kNm

Critical Applied Moment Along Z Direction: 22.135 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.240 kNm

Pedestal Moment Capacity Along Z Direction: 133.790 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 802.604 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1137.123 kN

Critical Applied Moment Along X Direction: 22.742 kNm

Critical Applied Moment Along Z Direction: 22.742 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.244 m

Position Of Neutral Axis Along Z Direction: 0.244 m

Pedestal Moment Capacity Along X Direction: 117.002 kNm

Pedestal Moment Capacity Along Z Direction: 133.264 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 824.628 mm²

Pedestal Main/Compression Reinforcement: 32 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1106.751 kN

Critical Applied Moment Along X Direction: 22.135 kNm

Critical Applied Moment Along Z Direction: 22.135 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.240 kNm

Pedestal Moment Capacity Along Z Direction: 133.790 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 802.604 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 802.558 kN

Critical Applied Moment Along X Direction: 16.051 kNm

Critical Applied Moment Along Z Direction: 16.051 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.183 m

Position Of Neutral Axis Along Z Direction: 0.183 m

Pedestal Moment Capacity Along X Direction: 111.028 kNm

Pedestal Moment Capacity Along Z Direction: 126.226 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 590.780 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m
Position Of Neutral Axis Along Z Direction: 0.180 m
Pedestal Moment Capacity Along X Direction: 110.061 kNm
Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²
Pedestal Main/Compression Reinforcement: 12 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN
Critical Applied Moment Along X Direction: 21.591 kNm
Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m
Position Of Neutral Axis Along Z Direction: 0.235 m
Pedestal Moment Capacity Along X Direction: 116.443 kNm
Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²
Pedestal Main/Compression Reinforcement: 28 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m
Critical load Case : 3
Critical Applied Axial Load: 1108.293 kN
Critical Applied Moment Along X Direction: 22.165 kNm
Critical Applied Moment Along Z Direction: 22.165 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m
Position Of Neutral Axis Along Z Direction: 0.239 m
Pedestal Moment Capacity Along X Direction: 117.224 kNm
Pedestal Moment Capacity Along Z Direction: 133.768 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 803.721 mm²
Pedestal Main/Compression Reinforcement: 16 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m
Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN

Critical Applied Moment Along X Direction: 21.591 kNm

Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m

Position Of Neutral Axis Along Z Direction: 0.235 m

Pedestal Moment Capacity Along X Direction: 116.443 kNm

Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²

Pedestal Main/Compression Reinforcement: 28 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m

Position Of Neutral Axis Along Z Direction: 0.180 m

Pedestal Moment Capacity Along X Direction: 110.061 kNm

Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 796.824 kN

Critical Applied Moment Along X Direction: 15.936 kNm

Critical Applied Moment Along Z Direction: 15.936 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.182 m

Position Of Neutral Axis Along Z Direction: 0.182 m

Pedestal Moment Capacity Along X Direction: 110.801 kNm

Pedestal Moment Capacity Along Z Direction: 125.969 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 577.848 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

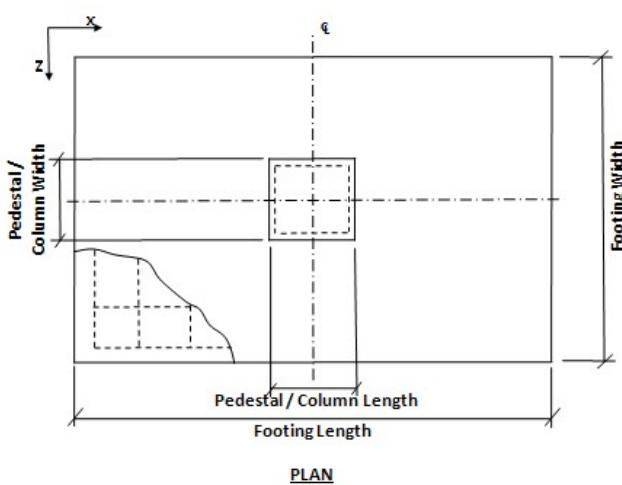
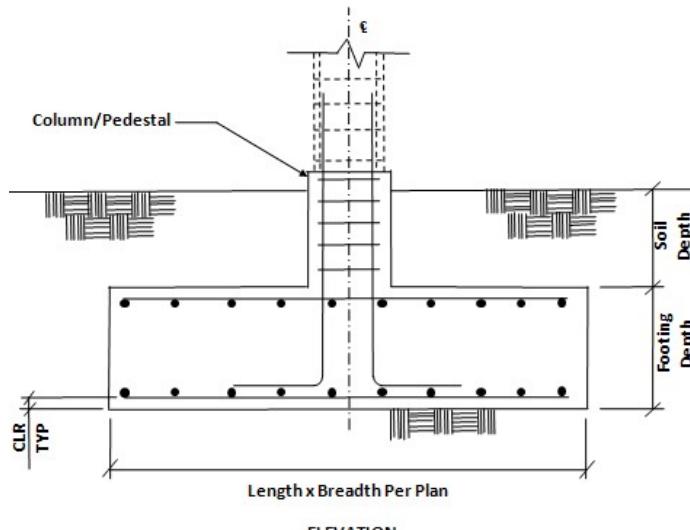
Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Isolated Footing 34



Input Values

Footing Geomtry

Design Type : Calculate Dimension
 Footing Thickness (Ft) : 12.000 in
 Footing Length - X (Fl) : 40.000 in
 Footing Width - Z (Fw) : 40.000 in
 Eccentricity along X (Oxd) : 0.000 in
 Eccentricity along Z (Ozd) : 0.000 in

Column Dimensions

Column Shape : Rectangular
 Column Length - X (Pl) : 0.450 m
 Column Width - Z (Pw) : 0.400 m

Pedestal

Include Pedestal? Yes
 Pedestal Shape : Rectangular
 Pedestal Height (Ph) : 0.015 m
 Pedestal Length - X (Pl) : 0.450 m
 Pedestal Width - Z (Pw) : 0.400 m

Design Parameters

Concrete and Rebar Properties

Unit Weight of Concrete : 150.000 lb/ft³
 Strength of Concrete : 4.000 ksi
 Yield Strength of Steel : 60.000 ksi
 Minimum Bar Size : Ø6
 Maximum Bar Size : Ø32
 Minimum Bar Spacing : 2.000 in
 Maximum Bar Spacing : 18.000 in
 Pedestal Clear Cover (P, CL) : 3.000 in
 Footing Clear Cover (F, CL) : 3.000 in

Soil Properties

Soil Type : UnDrained
 Unit Weight : 112.000 lb/ft³
 Soil Bearing Capacity : 4.000 kip/ft²
 Soil Surcharge : 0.000 kip/in²
 Depth of Soil above Footing : 0.000 in
 Undrained Shear Strength : 0.000 kip/in²
 Min Percentage of Slab : 0.000

Sliding and Overturning

Coefficient of Friction : 0.500
 Factor of Safety Against Sliding : 1.500
 Factor of Safety Against Overturning : 1.500

Load Combination/s- Service Stress Level	
Load Combination Number	Load Combination Title
1	DEAD
2	LIVE
3	COMBINATION LOAD CASE 3
101	1.000 x DL+1.000 x DL+1.000 x DL

102	0.800 x DL+0.800 x DL+0.800 x DL
Load Combination/s- Strength Level	
Load Combination Number	Load Combination Title
1	DEAD
2	LIVE
3	COMBINATION LOAD CASE 3

Applied Loads - Service Stress Level					
LC	Axial (kN)	Shear X (kN)	Shear Z (kN)	Moment X (kNm)	Moment Z (kNm)
1	594.911	0.295	-0.229	-0.248	-0.319
2	124.810	0.127	-0.102	-0.108	-0.134
3	1079.582	0.634	-0.497	-0.534	-0.680
101	1799.303	1.056	-0.829	-0.890	-1.133
102	1439.443	0.845	-0.663	-0.712	-0.906

Applied Loads - Strength Level					
LC	Axial (kN)	Shear X (kN)	Shear Z (kN)	Moment X (kNm)	Moment Z (kNm)
1	594.911	0.295	-0.229	-0.248	-0.319
2	124.810	0.127	-0.102	-0.108	-0.134
3	1079.582	0.634	-0.497	-0.534	-0.680

Design Calculations

Footing Size

Initial Length (L_o) = 1.016 m

Initial Width (W_o) = 1.016 m

Uplift force due to buoyancy = 0.000 kN

Effect due to adhesion = 0.000 kN

Area from initial length and width, $A_o = L_o \times W_o = 1.032 \text{ m}^2$

Min. area required from bearing pressure, $A_{\min} = P / q_{\max} = 9.893 \text{ m}^2$

Note: A_{\min} is an initial estimation.

P = Critical Factored Axial Load (without self weight/buoyancy/soil).

q_{\max} = Respective Factored Bearing Capacity.

Final Footing Size

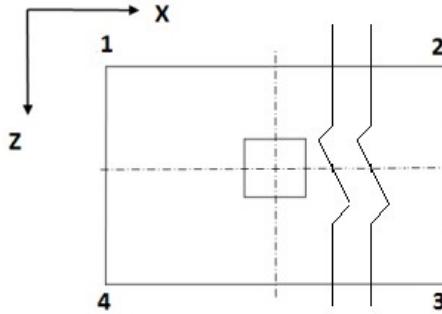
Length (L_2) = 3.200 m Governing Load Case : # 101

Width (W_2) = 3.200 m Governing Load Case : # 101

Depth (D_2) = 0.408 m Governing Load Case : # 101

$$\text{Area } (A_2) = 10.243 \text{ m}^2$$

Pressures at Four Corner



Load Case	Pressure at corner 1 (q_1) (kN/m ²)	Pressure at corner 2 (q_2) (kN/m ²)	Pressure at corner 3 (q_3) (kN/m ²)	Pressure at corner 4 (q_4) (kN/m ²)	Area of footing in uplift (A_u) (m ²)
101	188.5099	189.0748	188.6312	188.0663	0.000
101	188.5099	189.0748	188.6312	188.0663	0.000
101	188.5099	189.0748	188.6312	188.0663	0.000
101	188.5099	189.0748	188.6312	188.0663	0.000

If A_u is zero, there is no uplift and no pressure adjustment is necessary. Otherwise, to account for uplift, areas of negative pressure will be set to zero and the pressure will be redistributed to remaining corners.

Summary of adjusted Pressures at Four Corner

Load Case	Pressure at corner 1 (q_1) (kN/m ²)	Pressure at corner 2 (q_2) (kN/m ²)	Pressure at corner 3 (q_3) (kN/m ²)	Pressure at corner 4 (q_4) (kN/m ²)
101	188.5099	189.0748	188.6312	188.0663
101	188.5099	189.0748	188.6312	188.0663
101	188.5099	189.0748	188.6312	188.0663
101	188.5099	189.0748	188.6312	188.0663

Details of Out-of-Contact Area (If Any)

Governing load case = N/A

Plan area of footing = 10.243 sq.m

Area not in contact with soil = 0.000 sq.m

% of total area not in contact = 0.000%

Check For Stability Against Overturning And Sliding

-	Factor of safety against sliding		Factor of safety against overturning	
Load Case No.	Along X-Direction	Along Z-Direction	About X-Direction	About Z-Direction
1	1173.481	1513.229	3220.478	2501.415
2	878.404	1090.495	2357.348	1898.376
3	929.468	1184.773	2533.577	1989.452
101	898.414	1145.188	2448.928	1922.983
102	910.059	1160.032	2480.671	1947.909

Critical Load Case And The Governing Factor Of Safety For Overturning and Sliding X Direction

Critical Load Case for Sliding along X-Direction : 2

Governing Disturbing Force : 0.127 kN

Governing Restoring Force : 111.601 kN

Minimum Sliding Ratio for the Critical Load Case : 878.404

Critical Load Case for Overturning about X-Direction : 2

Governing Overturning Moment : -0.152 kNm

Governing Resisting Moment : 357.162 kNm

Minimum Overturning Ratio for the Critical Load Case : 2357.348

Critical Load Case And The Governing Factor Of Safety For Overturning and Sliding Z Direction

Critical Load Case for Sliding along Z-Direction : 2

Governing Disturbing Force : -0.102 kN

Governing Restoring Force : 111.601 kN

Minimum Sliding Ratio for the Critical Load Case : 1090.495

Critical Load Case for Overturning about Z-Direction : 2

Governing Overturning Moment : -0.188 kNm

Governing Resisting Moment : 357.162 kNm

Minimum Overturning Ratio for the Critical Load Case : 1898.376

Moment CalculationCheck Trial Depth against moment (w.r.t. X Axis)**Critical Load Case = #3**

Effective Depth = $D - (cc + 0.5 \times d_b) = 0.328 \text{ m}$

Governing moment (M_u) = 330.972 kNm

As Per IS 456 2000 ANNEX G G-1.1C

Limiting Factor1 (K_{umax}) = $\frac{700}{(1100 + 0.87 \times f_y)} = 0.479483$

Limiting Factor2 (R_{umax}) = $0.36 \times f_{ck} \times k_{umax} \times (1 - 0.42 \times k_{umax}) = 3801.834636 \text{ kN/m}^2$

Limit Moment Of Resistance (M_{umax}) = $R_{umax} \times B \times d_e^2 = 1310.589440 \text{ kNm}$

$M_u \leq M_{umax}$ hence, safe

Check Trial Depth against moment (w.r.t. Z Axis)

Critical Load Case = #3

$$\text{Effective Depth} = D - (cc + 0.5 \times d_b) = 0.328 \text{ m}$$

$$\text{Governing moment } (M_u) = 319.342 \text{ kNm}$$

As Per IS 456 2000 ANNEX G G-1.1C

$$\text{Limiting Factor1 } (K_{umax}) = \frac{700}{(1100 + 0.87 \times f_y)} = 0.479483$$

$$\text{Limiting Factor2 } (R_{umax}) = \frac{0.36 \times f_{ck} \times k_{umax} \times (1 - 0.42 \times k_{umax})}{k_{umax}} = 3801.834636 \text{ kN/m}^2$$

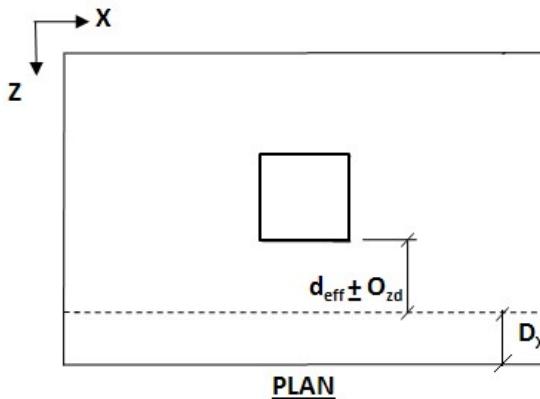
$$\text{Limit Moment Of Resistance } (M_{umax}) = \frac{R_{umax} \times B \times d_e^2}{4} = 1310.589440 \text{ kNm}$$

$M_u \leq M_{umax}$ hence, safe

Shear Calculation

Check Trial Depth for one way shear (Along X Axis)

(Shear Plane Parallel to X Axis)



Critical Load Case = #3

$$D_X = 0.328 \text{ m}$$

$$\text{Shear Force}(S) = 361.926 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 344.569240 \text{ kN/m}^2$$

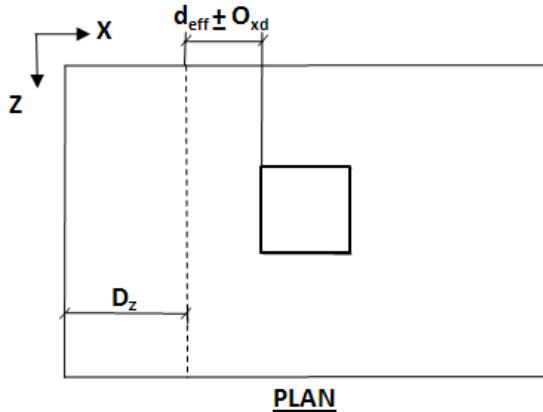
$$\text{Percentage Of Steel}(P_t) = 0.2682$$

As Per IS 456 2000 Clause 40 Table 19

$$\text{Shear Strength Of Concrete}(T_c) = 378.463 \text{ kN/m}^2$$

$T_v < T_c$ hence, safe

Check Trial Depth for one way shear (Along Z Axis)
(Shear Plane Parallel to Z Axis)



Critical Load Case = #3

$$D_z = 0.328 \text{ m}$$

$$\text{Shear Force}(S) = 353.573 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 336.616937 \text{ kN/m}^2$$

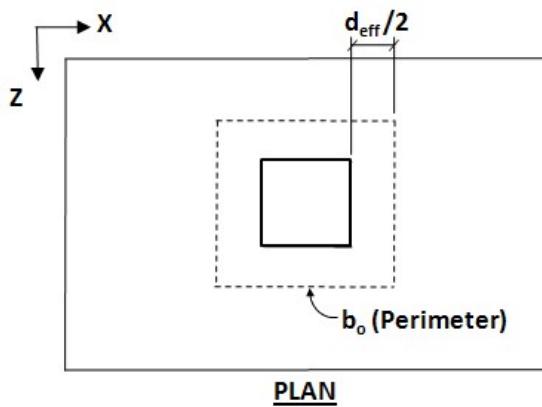
$$\text{Percentage Of Steel}(P_t) = 0.2784$$

As Per IS 456 2000 Clause 40 Table 19

$$\text{Shear Strength Of Concrete}(T_c) = 384.669 \text{ kN/m}^2$$

$T_v < T_c$ hence, safe

Check Trial Depth for two way shear



Critical Load Case = #3

$$\text{Shear Force}(S) = 1019.853 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 1031.405 \text{ kN/m}^2$$

As Per IS 456 2000 Clause 31.6.3.1

$$K_s = \min[(0.5 + \beta), 1] = 1.000$$

$$\text{Shear Strength}(T_c) = 0.25 \times \sqrt{f_{ck}} = 1312.8936 \text{ kN/m}^2$$

$$K_s \times T_c = 1312.8936 \text{ kN/m}^2$$

$$T_v \leq K_s \times T_c \text{ hence, safe}$$

Reinforcement Calculation

Calculation of Maximum Bar Size

Along X Axis

Bar diameter corresponding to max bar size (d_b) = 32 mm

As Per IS 456 2000 Clause 26.2.1

$$\text{Development Length}(l_d) = \frac{d_b \times 0.87 \times f_y}{4 \times \gamma_{bd}} = 1.224 \text{ m}$$

$$\text{Allowable Length}(l_{db}) = \left[\frac{(B - b)}{2} - cc \right] = 1.299 \text{ m}$$

$$l_{db} \geq l_d \text{ hence, safe}$$

Along Z Axis

Bar diameter corresponding to max bar size (d_b) = 32 mm

As Per IS 456 2000 Clause 26.2.1

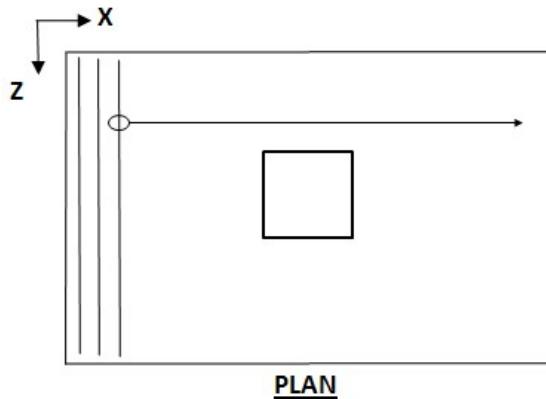
$$\text{Development Length}(l_d) = \frac{d_b \times 0.87 \times f_y}{4 \times \gamma_{bd}} = 1.224 \text{ m}$$

$$\text{Allowable Length}(l_{db}) = \left[\frac{(H - h)}{2} - cc \right] = 1.324 \text{ m}$$

$$l_{db} \geq l_d \text{ hence, safe}$$

Bottom Reinforcement Design

Along Z Axis



For moment w.r.t. X Axis (M_x)

As Per IS 456 2000 Clause 26.5.2.1

Critical Load Case = #3

Minimum Area of Steel ($A_{st,min}$) = 1568.452 mm²

Calculated Area of Steel (A_{st}) = 2924.124 mm²

Provided Area of Steel ($A_{st,Provided}$) = 2924.124 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.048 m

Selected spacing (S) = 0.052 m

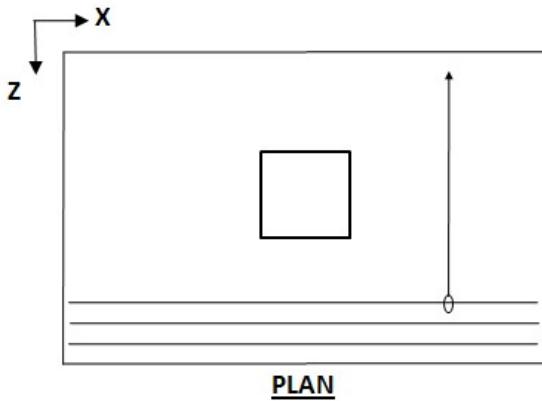
$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0.050 m o.c.

[Along X Axis](#)



For moment w.r.t. Z Axis (M_z)

As Per IS 456 2000 Clause 26.5.2.1

Critical Load Case = #3

Minimum Area of Steel ($A_{st,min}$) = 1568.452 mm²

Calculated Area of Steel (A_{st}) = 2816.869 mm²

Provided Area of Steel ($A_{st,Provided}$) = 2816.869 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.054 m

$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

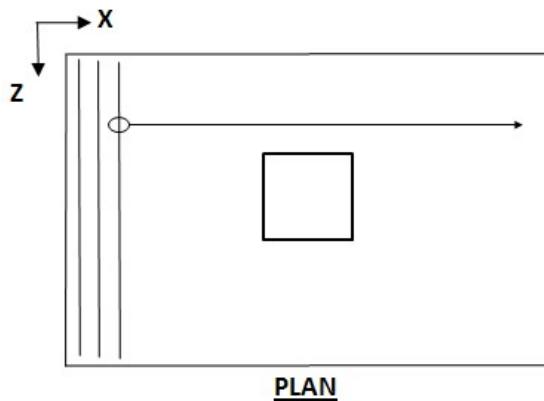
The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0.050 m o.c.

[Top Reinforcement Design](#)

[Along Z Axis](#)



Minimum Area of Steel ($A_{st,min}$) = 1568.452 mm²

Calculated Area of Steel (A_{st}) = 1564.611 mm²

Provided Area of Steel ($A_{st,Provided}$) = 1568.452 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Governing Moment = 33.464 kNm

Selected bar Size (d_b) = Ø6

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.055 m

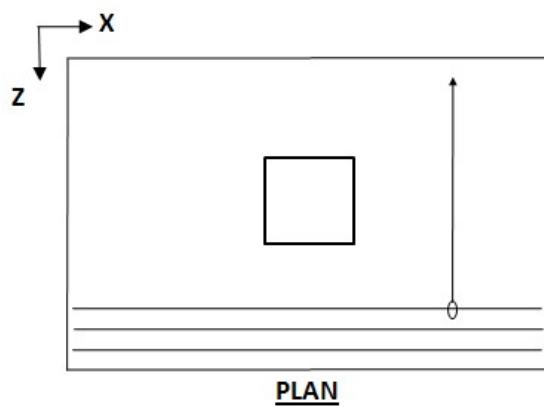
$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø6 @ 0 m o.c.

Along X Axis



Minimum Area of Steel ($A_{st,min}$) = 1568.452 mm²

Calculated Area of Steel (A_{st}) = 2816.869 mm²

Provided Area of Steel ($A_{st,Provided}$) = 2816.869 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Governing Moment = 32.279 kNm

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.054 m

$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0 m o.c.

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 796.824 kN

Critical Applied Moment Along X Direction: 15.936 kNm

Critical Applied Moment Along Z Direction: 15.936 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.182 m

Position Of Neutral Axis Along Z Direction: 0.182 m

Pedestal Moment Capacity Along X Direction: 110.801 kNm

Pedestal Moment Capacity Along Z Direction: 125.969 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 577.848 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m
Position Of Neutral Axis Along Z Direction: 0.137 m
Pedestal Moment Capacity Along X Direction: 93.412 kNm
Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²
Pedestal Main/Compression Reinforcement: 16 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 783.137 kN
Critical Applied Moment Along X Direction: 15.662 kNm
Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m
Position Of Neutral Axis Along Z Direction: 0.180 m
Pedestal Moment Capacity Along X Direction: 110.061 kNm
Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²
Pedestal Main/Compression Reinforcement: 12 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN
Critical Applied Moment Along X Direction: 21.591 kNm
Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m
Position Of Neutral Axis Along Z Direction: 0.235 m
Pedestal Moment Capacity Along X Direction: 116.443 kNm
Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²
Pedestal Main/Compression Reinforcement: 28 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1108.293 kN

Critical Applied Moment Along X Direction: 22.165 kNm

Critical Applied Moment Along Z Direction: 22.165 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.224 kNm

Pedestal Moment Capacity Along Z Direction: 133.768 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 803.721 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1079.582 kN

Critical Applied Moment Along X Direction: 21.591 kNm

Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m

Position Of Neutral Axis Along Z Direction: 0.235 m

Pedestal Moment Capacity Along X Direction: 116.443 kNm

Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²

Pedestal Main/Compression Reinforcement: 28 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m

Position Of Neutral Axis Along Z Direction: 0.180 m

Pedestal Moment Capacity Along X Direction: 110.061 kNm

Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 802.558 kN

Critical Applied Moment Along X Direction: 16.051 kNm

Critical Applied Moment Along Z Direction: 16.051 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.183 m

Position Of Neutral Axis Along Z Direction: 0.183 m

Pedestal Moment Capacity Along X Direction: 111.028 kNm

Pedestal Moment Capacity Along Z Direction: 126.226 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 590.780 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1106.751 kN

Critical Applied Moment Along X Direction: 22.135 kNm

Critical Applied Moment Along Z Direction: 22.135 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.240 kNm

Pedestal Moment Capacity Along Z Direction: 133.790 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 802.604 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1137.123 kN

Critical Applied Moment Along X Direction: 22.742 kNm

Critical Applied Moment Along Z Direction: 22.742 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.244 m

Position Of Neutral Axis Along Z Direction: 0.244 m

Pedestal Moment Capacity Along X Direction: 117.002 kNm

Pedestal Moment Capacity Along Z Direction: 133.264 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 824.628 mm²

Pedestal Main/Compression Reinforcement: 32 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1106.751 kN

Critical Applied Moment Along X Direction: 22.135 kNm

Critical Applied Moment Along Z Direction: 22.135 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.240 kNm

Pedestal Moment Capacity Along Z Direction: 133.790 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 802.604 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 802.558 kN

Critical Applied Moment Along X Direction: 16.051 kNm

Critical Applied Moment Along Z Direction: 16.051 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.183 m

Position Of Neutral Axis Along Z Direction: 0.183 m

Pedestal Moment Capacity Along X Direction: 111.028 kNm

Pedestal Moment Capacity Along Z Direction: 126.226 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 590.780 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m
Position Of Neutral Axis Along Z Direction: 0.180 m
Pedestal Moment Capacity Along X Direction: 110.061 kNm
Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²
Pedestal Main/Compression Reinforcement: 12 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN
Critical Applied Moment Along X Direction: 21.591 kNm
Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m
Position Of Neutral Axis Along Z Direction: 0.235 m
Pedestal Moment Capacity Along X Direction: 116.443 kNm
Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²
Pedestal Main/Compression Reinforcement: 28 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1108.293 kN
Critical Applied Moment Along X Direction: 22.165 kNm
Critical Applied Moment Along Z Direction: 22.165 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m
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Pedestal Moment Capacity Along X Direction: 117.224 kNm
Pedestal Moment Capacity Along Z Direction: 133.768 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 803.721 mm²
Pedestal Main/Compression Reinforcement: 16 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN

Critical Applied Moment Along X Direction: 21.591 kNm

Critical Applied Moment Along Z Direction: 21.591 kNm

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Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²

Pedestal Main/Compression Reinforcement: 28 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m

Position Of Neutral Axis Along Z Direction: 0.180 m

Pedestal Moment Capacity Along X Direction: 110.061 kNm

Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 796.824 kN

Critical Applied Moment Along X Direction: 15.936 kNm

Critical Applied Moment Along Z Direction: 15.936 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.182 m

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Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 577.848 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

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Required Main Reinforcement: 563.143 mm²

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Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

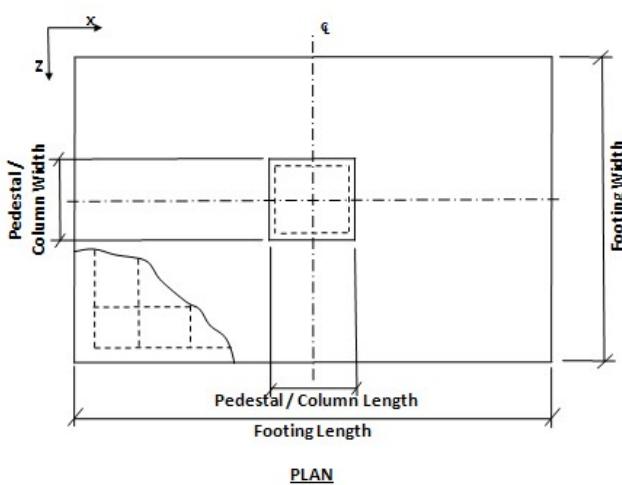
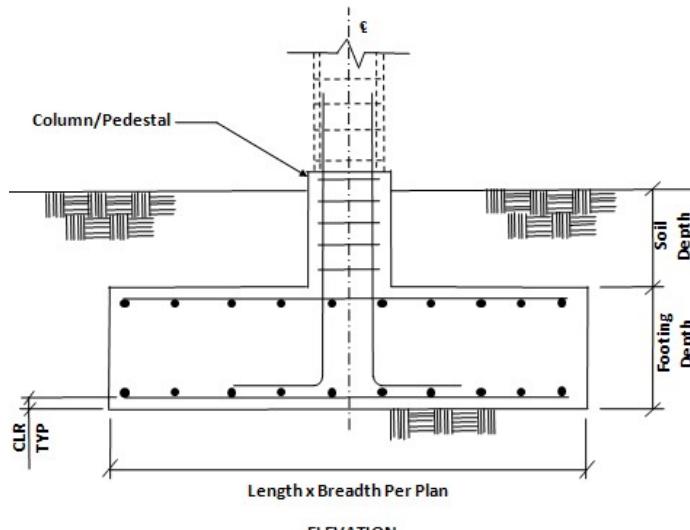
Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Isolated Footing 35



Input Values

Footing Geomtry

Design Type : Calculate Dimension
 Footing Thickness (Ft) : 12.000 in
 Footing Length - X (Fl) : 40.000 in
 Footing Width - Z (Fw) : 40.000 in
 Eccentricity along X (Oxd) : 0.000 in
 Eccentricity along Z (Ozd) : 0.000 in

Column Dimensions

Column Shape : Rectangular
 Column Length - X (Pl) : 0.450 m
 Column Width - Z (Pw) : 0.400 m

Pedestal

Include Pedestal? Yes

Pedestal Shape : Rectangular

Pedestal Height (Ph) : 0.015 m

Pedestal Length - X (Pl) : 0.450 m

Pedestal Width - Z (Pw) : 0.400 m

Design ParametersConcrete and Rebar Properties

Unit Weight of Concrete : 150.000 lb/ft³

Strength of Concrete : 4.000 ksi

Yield Strength of Steel : 60.000 ksi

Minimum Bar Size : Ø6

Maximum Bar Size : Ø32

Minimum Bar Spacing : 2.000 in

Maximum Bar Spacing : 18.000 in

Pedestal Clear Cover (P, CL) : 3.000 in

Footing Clear Cover (F, CL) : 3.000 in

Soil Properties

Soil Type : UnDrained

Unit Weight : 112.000 lb/ft³

Soil Bearing Capacity : 4.000 kip/ft²

Soil Surcharge : 0.000 kip/in²

Depth of Soil above Footing : 0.000 in

Undrained Shear Strength : 0.000 kip/in²

Min Percentage of Slab : 0.000

Sliding and Overturning

Coefficient of Friction : 0.500

Factor of Safety Against Sliding : 1.500

Factor of Safety Against Overturning : 1.500

Load Combination/s- Service Stress Level	
Load Combination Number	Load Combination Title
1	DEAD
2	LIVE
3	COMBINATION LOAD CASE 3
101	1.000 x DL+1.000 x DL+1.000 x DL

102	0.800 x DL+0.800 x DL+0.800 x DL
Load Combination/s- Strength Level	
Load Combination Number	Load Combination Title
1	DEAD
2	LIVE
3	COMBINATION LOAD CASE 3

Applied Loads - Service Stress Level					
LC	Axial (kN)	Shear X (kN)	Shear Z (kN)	Moment X (kNm)	Moment Z (kNm)
1	452.071	2.556	-0.166	-0.181	-2.535
2	70.021	0.842	-0.061	-0.064	-0.836
3	783.137	5.096	-0.340	-0.368	-5.056
101	1305.229	8.494	-0.567	-0.613	-8.427
102	1044.183	6.795	-0.454	-0.491	-6.742

Applied Loads - Strength Level					
LC	Axial (kN)	Shear X (kN)	Shear Z (kN)	Moment X (kNm)	Moment Z (kNm)
1	452.071	2.556	-0.166	-0.181	-2.535
2	70.021	0.842	-0.061	-0.064	-0.836
3	783.137	5.096	-0.340	-0.368	-5.056

Design Calculations

Footing Size

Initial Length (L_o) = 1.016 m

Initial Width (W_o) = 1.016 m

Uplift force due to buoyancy = 0.000 kN

Effect due to adhesion = 0.000 kN

Area from initial length and width, $A_o = L_o \times W_o = 1.032 \text{ m}^2$

Min. area required from bearing pressure, $A_{\min} = P / q_{\max} = 6.855 \text{ m}^2$

Note: A_{\min} is an initial estimation.

P = Critical Factored Axial Load (without self weight/buoyancy/soil).

q_{\max} = Respective Factored Bearing Capacity.

Final Footing Size

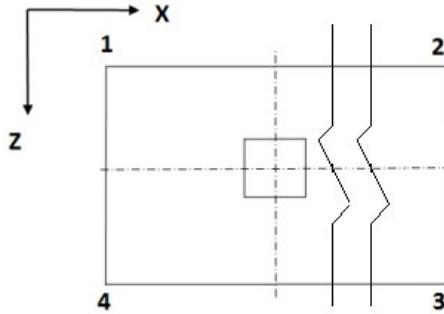
Length (L_2) = 2.692 m Governing Load Case : # 101

Width (W_2) = 2.692 m Governing Load Case : # 101

Depth (D_2) = 0.306 m Governing Load Case : # 101

$$\text{Area } (A_2) = 7.249 \text{ m}^2$$

Pressures at Four Corner



Load Case	Pressure at corner 1 (q_1) (kN/m ²)	Pressure at corner 2 (q_2) (kN/m ²)	Pressure at corner 3 (q_3) (kN/m ²)	Pressure at corner 4 (q_4) (kN/m ²)	Area of footing in uplift (A_u) (m ²)
101	184.0651	190.9181	190.4293	183.5763	0.000
101	184.0651	190.9181	190.4293	183.5763	0.000
101	184.0651	190.9181	190.4293	183.5763	0.000
101	184.0651	190.9181	190.4293	183.5763	0.000

If A_u is zero, there is no uplift and no pressure adjustment is necessary. Otherwise, to account for uplift, areas of negative pressure will be set to zero and the pressure will be redistributed to remaining corners.

Summary of adjusted Pressures at Four Corner

Load Case	Pressure at corner 1 (q_1) (kN/m ²)	Pressure at corner 2 (q_2) (kN/m ²)	Pressure at corner 3 (q_3) (kN/m ²)	Pressure at corner 4 (q_4) (kN/m ²)
101	184.0651	190.9181	190.4293	183.5763
101	184.0651	190.9181	190.4293	183.5763
101	184.0651	190.9181	190.4293	183.5763
101	184.0651	190.9181	190.4293	183.5763

Details of Out-of-Contact Area (If Any)

Governing load case = N/A

Plan area of footing = 7.249 sq.m

Area not in contact with soil = 0.000 sq.m

% of total area not in contact = 0.000%

Check For Stability Against Overturning And Sliding

-	Factor of safety against sliding		Factor of safety against overturning	
Load Case No.	Along X-Direction	Along Z-Direction	About X-Direction	About Z-Direction
1	98.633	1515.470	2893.412	202.407
2	72.576	1009.187	1971.411	148.819
3	81.950	1227.229	2357.330	168.139
101	79.904	1196.593	2298.480	163.941
102	80.671	1208.082	2320.548	165.515

Critical Load Case And The Governing Factor Of Safety For Overturning and Sliding X Direction

Critical Load Case for Sliding along X-Direction : 2

Governing Disturbing Force : 0.842 kN

Governing Restoring Force : 61.075 kN

Minimum Sliding Ratio for the Critical Load Case : 72.576

Critical Load Case for Overturning about X-Direction : 2

Governing Overturning Moment : -0.083 kNm

Governing Resisting Moment : 164.435 kNm

Minimum Overturning Ratio for the Critical Load Case : 1971.411

Critical Load Case And The Governing Factor Of Safety For Overturning and Sliding Z Direction

Critical Load Case for Sliding along Z-Direction : 2

Governing Disturbing Force : -0.061 kN

Governing Restoring Force : 61.075 kN

Minimum Sliding Ratio for the Critical Load Case : 1009.187

Critical Load Case for Overturning about Z-Direction : 2

Governing Overturning Moment : -1.105 kNm

Governing Resisting Moment : 164.435 kNm

Minimum Overturning Ratio for the Critical Load Case : 148.819

Moment CalculationCheck Trial Depth against moment (w.r.t. X Axis)**Critical Load Case = #3**

$$\text{Effective Depth} = D - (cc + 0.5 \times d_b) = 0.226 \text{ m}$$

$$\text{Governing moment (M}_u\text{)} = 191.251 \text{ kNm}$$

As Per IS 456 2000 ANNEX G G-1.1C

$$\text{Limiting Factor1 (K}_{u\max}\text{)} = \frac{700}{(1100 + 0.87 \times f_y)} = 0.479483$$

$$\text{Limiting Factor2 (R}_{u\max}\text{)} = \frac{0.36 \times f_{ck} \times k_{u\max} \times (1 - 0.42 \times k_{u\max})}{B} = 3801.834636 \text{ kN/m}^2$$

$$\text{Limit Moment Of Resistance (M}_{u\max}\text{)} = \frac{R_{u\max} \times B \times d_e^2}{2} = 520.958387 \text{ kNm}$$

$$M_u \leq M_{umax} \text{ hence, safe}$$

Check Trial Depth against moment (w.r.t. Z Axis)

Critical Load Case = #3

$$\text{Effective Depth} = D - (c_c + 0.5 \times d_b) = 0.226 \text{ m}$$

$$\text{Governing moment } (M_u) = 185.337 \text{ kNm}$$

As Per IS 456 2000 ANNEX G G-1.1C

$$\text{Limiting Factor1 } (K_{umax}) = \frac{700}{(1100 + 0.87 \times f_y)} = 0.479483$$

$$\text{Limiting Factor2 } (R_{umax}) = \frac{0.36 \times f_{ck} \times k_{umax} \times (1 - 0.42 \times k_{umax})}{k_{umax}} = 3801.834636 \text{ kN/m}^2$$

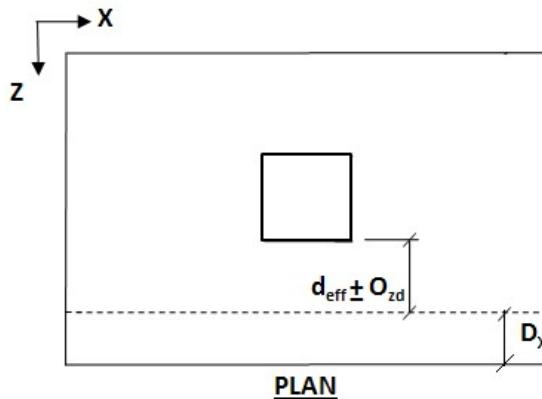
$$\text{Limit Moment Of Resistance } (M_{umax}) = \frac{R_{umax} \times B \times d_e^2}{4} = 520.958387 \text{ kNm}$$

$$M_u \leq M_{umax} \text{ hence, safe}$$

Shear Calculation

Check Trial Depth for one way shear (Along X Axis)

(Shear Plane Parallel to X Axis)



Critical Load Case = #3

$$D_X = 0.226 \text{ m}$$

$$\text{Shear Force}(S) = 268.014 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 441.243797 \text{ kN/m}^2$$

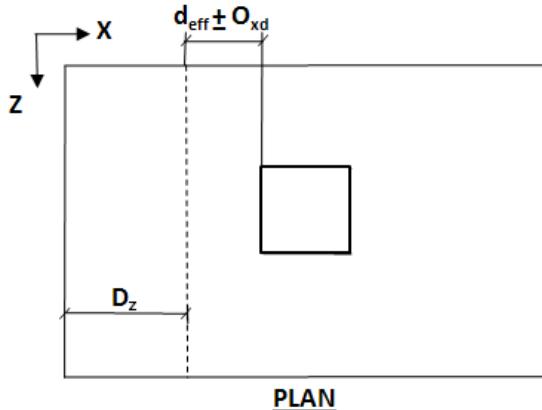
$$\text{Percentage Of Steel}(P_t) = 0.3998$$

As Per IS 456 2000 Clause 40 Table 19

$$\text{Shear Strength Of Concrete}(T_c) = 449.189 \text{ kN/m}^2$$

$T_v < T_c$ hence, safe

Check Trial Depth for one way shear (Along Z Axis)
(Shear Plane Parallel to Z Axis)



Critical Load Case = #3

$$D_z = 0.226 \text{ m}$$

$$\text{Shear Force}(S) = 263.811 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 434.324956 \text{ kN/m}^2$$

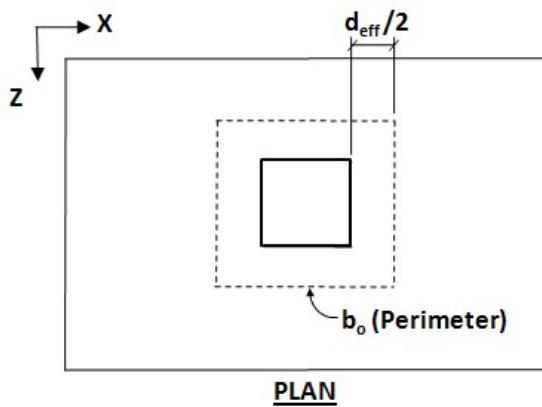
$$\text{Percentage Of Steel}(P_t) = 0.4134$$

As Per IS 456 2000 Clause 40 Table 19

$$\text{Shear Strength Of Concrete}(T_c) = 455.592 \text{ kN/m}^2$$

$T_v < T_c$ hence, safe

Check Trial Depth for two way shear



Critical Load Case = #3

$$\text{Shear Force}(S) = 737.477 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 1256.133 \text{ kN/m}^2$$

As Per IS 456 2000 Clause 31.6.3.1

$$K_s = \min[(0.5 + \beta), 1] = 1.000$$

$$\text{Shear Strength}(T_c) = 0.25 \times \sqrt{f_{ck}} = 1312.8936 \text{ kN/m}^2$$

$$K_s \times T_c = 1312.8936 \text{ kN/m}^2$$

$$T_v \leq K_s \times T_c \text{ hence, safe}$$

Reinforcement Calculation

Calculation of Maximum Bar Size

Along X Axis

Bar diameter corresponding to max bar size (d_b) = 25 mm

As Per IS 456 2000 Clause 26.2.1

$$\text{Development Length}(l_d) = \frac{d_b \times 0.87 \times f_y}{4 \times \gamma_{bd}} = 0.956 \text{ m}$$

$$\text{Allowable Length}(l_{db}) = \left[\frac{(B - b)}{2} - cc \right] = 1.045 \text{ m}$$

$$l_{db} \geq l_d \text{ hence, safe}$$

Along Z Axis

Bar diameter corresponding to max bar size(d_b) = 25 mm

As Per IS 456 2000 Clause 26.2.1

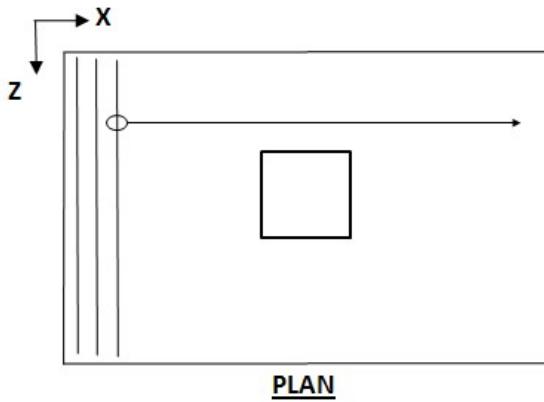
$$\text{Development Length}(l_d) = \frac{d_b \times 0.87 \times f_y}{4 \times \gamma_{bd}} = 0.956 \text{ m}$$

$$\text{Allowable Length}(l_{db}) = \left[\frac{(H - h)}{2} - cc \right] = 1.070 \text{ m}$$

$$l_{db} \geq l_d \text{ hence, safe}$$

Bottom Reinforcement Design

Along Z Axis



For moment w.r.t. X Axis (M_x)

As Per IS 456 2000 Clause 26.5.2.1

Critical Load Case = #3

Minimum Area of Steel ($A_{st,min}$) = 988.003 mm²

Calculated Area of Steel (A_{st}) = 2511.233 mm²

Provided Area of Steel ($A_{st,Provided}$) = 2511.233 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.048 m

Selected spacing (S) = 0.052 m

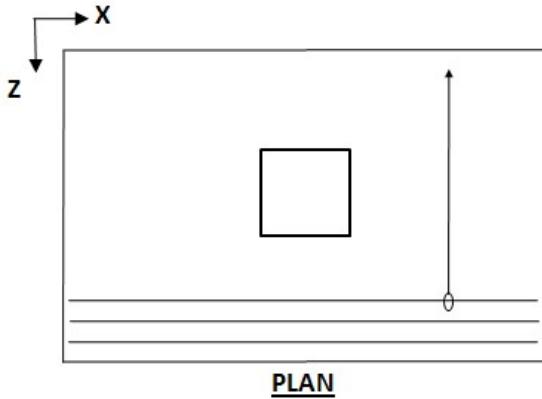
$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0.050 m o.c.

[Along X Axis](#)



For moment w.r.t. Z Axis (M_z)

As Per IS 456 2000 Clause 26.5.2.1

Critical Load Case = #3

Minimum Area of Steel ($A_{st,min}$) = 988.003 mm²

Calculated Area of Steel (A_{st}) = 2428.273 mm²

Provided Area of Steel ($A_{st,Provided}$) = 2428.273 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.053 m

$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

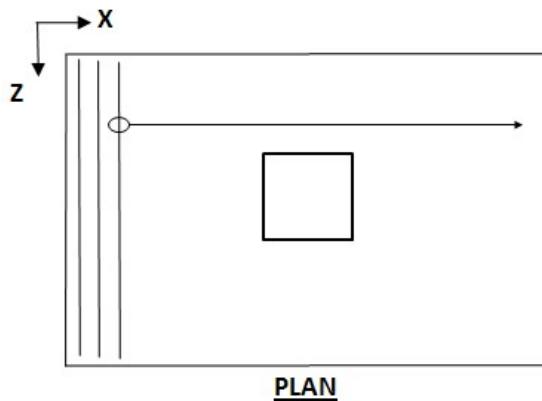
The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0.050 m o.c.

[Top Reinforcement Design](#)

[Along Z Axis](#)



Minimum Area of Steel ($A_{st,min}$) = 988.003 mm²

Calculated Area of Steel (A_{st}) = 984.772 mm²

Provided Area of Steel ($A_{st,Provided}$) = 988.003 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Governing Moment = 14.114 kNm

Selected bar Size (d_b) = Ø6

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.075 m

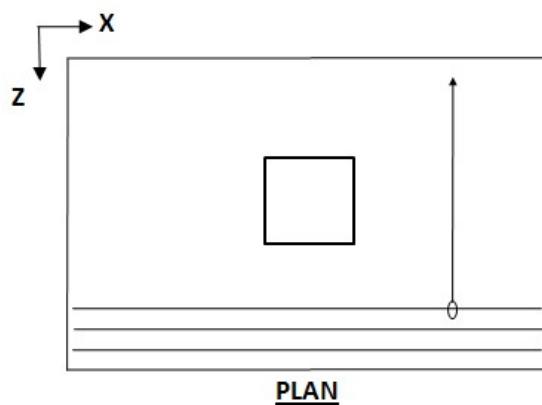
$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø6 @ 0 m o.c.

Along X Axis



Minimum Area of Steel ($A_{st,min}$) = 988.003 mm²

Calculated Area of Steel (A_{st}) = 2428.273 mm²

Provided Area of Steel ($A_{st,Provided}$) = 2428.273 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Governing Moment = 13.505 kNm

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.053 m

$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0 m o.c.

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 796.824 kN

Critical Applied Moment Along X Direction: 15.936 kNm

Critical Applied Moment Along Z Direction: 15.936 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.182 m

Position Of Neutral Axis Along Z Direction: 0.182 m

Pedestal Moment Capacity Along X Direction: 110.801 kNm

Pedestal Moment Capacity Along Z Direction: 125.969 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 577.848 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m
Position Of Neutral Axis Along Z Direction: 0.137 m
Pedestal Moment Capacity Along X Direction: 93.412 kNm
Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²
Pedestal Main/Compression Reinforcement: 16 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 783.137 kN
Critical Applied Moment Along X Direction: 15.662 kNm
Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m
Position Of Neutral Axis Along Z Direction: 0.180 m
Pedestal Moment Capacity Along X Direction: 110.061 kNm
Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²
Pedestal Main/Compression Reinforcement: 12 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN
Critical Applied Moment Along X Direction: 21.591 kNm
Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m
Position Of Neutral Axis Along Z Direction: 0.235 m
Pedestal Moment Capacity Along X Direction: 116.443 kNm
Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²
Pedestal Main/Compression Reinforcement: 28 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1108.293 kN

Critical Applied Moment Along X Direction: 22.165 kNm

Critical Applied Moment Along Z Direction: 22.165 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.224 kNm

Pedestal Moment Capacity Along Z Direction: 133.768 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 803.721 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1079.582 kN

Critical Applied Moment Along X Direction: 21.591 kNm

Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m

Position Of Neutral Axis Along Z Direction: 0.235 m

Pedestal Moment Capacity Along X Direction: 116.443 kNm

Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²

Pedestal Main/Compression Reinforcement: 28 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m

Position Of Neutral Axis Along Z Direction: 0.180 m

Pedestal Moment Capacity Along X Direction: 110.061 kNm

Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 802.558 kN

Critical Applied Moment Along X Direction: 16.051 kNm

Critical Applied Moment Along Z Direction: 16.051 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.183 m

Position Of Neutral Axis Along Z Direction: 0.183 m

Pedestal Moment Capacity Along X Direction: 111.028 kNm

Pedestal Moment Capacity Along Z Direction: 126.226 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 590.780 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1106.751 kN

Critical Applied Moment Along X Direction: 22.135 kNm

Critical Applied Moment Along Z Direction: 22.135 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.240 kNm

Pedestal Moment Capacity Along Z Direction: 133.790 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 802.604 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1137.123 kN

Critical Applied Moment Along X Direction: 22.742 kNm

Critical Applied Moment Along Z Direction: 22.742 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.244 m

Position Of Neutral Axis Along Z Direction: 0.244 m

Pedestal Moment Capacity Along X Direction: 117.002 kNm

Pedestal Moment Capacity Along Z Direction: 133.264 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 824.628 mm²

Pedestal Main/Compression Reinforcement: 32 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1106.751 kN

Critical Applied Moment Along X Direction: 22.135 kNm

Critical Applied Moment Along Z Direction: 22.135 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.240 kNm

Pedestal Moment Capacity Along Z Direction: 133.790 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 802.604 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 802.558 kN

Critical Applied Moment Along X Direction: 16.051 kNm

Critical Applied Moment Along Z Direction: 16.051 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.183 m

Position Of Neutral Axis Along Z Direction: 0.183 m

Pedestal Moment Capacity Along X Direction: 111.028 kNm

Pedestal Moment Capacity Along Z Direction: 126.226 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 590.780 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m
Position Of Neutral Axis Along Z Direction: 0.180 m
Pedestal Moment Capacity Along X Direction: 110.061 kNm
Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²
Pedestal Main/Compression Reinforcement: 12 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN
Critical Applied Moment Along X Direction: 21.591 kNm
Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m
Position Of Neutral Axis Along Z Direction: 0.235 m
Pedestal Moment Capacity Along X Direction: 116.443 kNm
Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²
Pedestal Main/Compression Reinforcement: 28 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m
Critical load Case : 3
Critical Applied Axial Load: 1108.293 kN
Critical Applied Moment Along X Direction: 22.165 kNm
Critical Applied Moment Along Z Direction: 22.165 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m
Position Of Neutral Axis Along Z Direction: 0.239 m
Pedestal Moment Capacity Along X Direction: 117.224 kNm
Pedestal Moment Capacity Along Z Direction: 133.768 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 803.721 mm²
Pedestal Main/Compression Reinforcement: 16 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m
Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN

Critical Applied Moment Along X Direction: 21.591 kNm

Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m

Position Of Neutral Axis Along Z Direction: 0.235 m

Pedestal Moment Capacity Along X Direction: 116.443 kNm

Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²

Pedestal Main/Compression Reinforcement: 28 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m

Position Of Neutral Axis Along Z Direction: 0.180 m

Pedestal Moment Capacity Along X Direction: 110.061 kNm

Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 796.824 kN

Critical Applied Moment Along X Direction: 15.936 kNm

Critical Applied Moment Along Z Direction: 15.936 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.182 m

Position Of Neutral Axis Along Z Direction: 0.182 m

Pedestal Moment Capacity Along X Direction: 110.801 kNm

Pedestal Moment Capacity Along Z Direction: 125.969 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 577.848 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

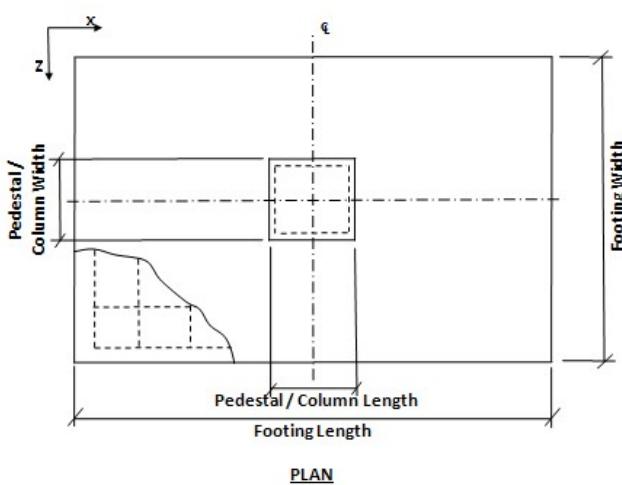
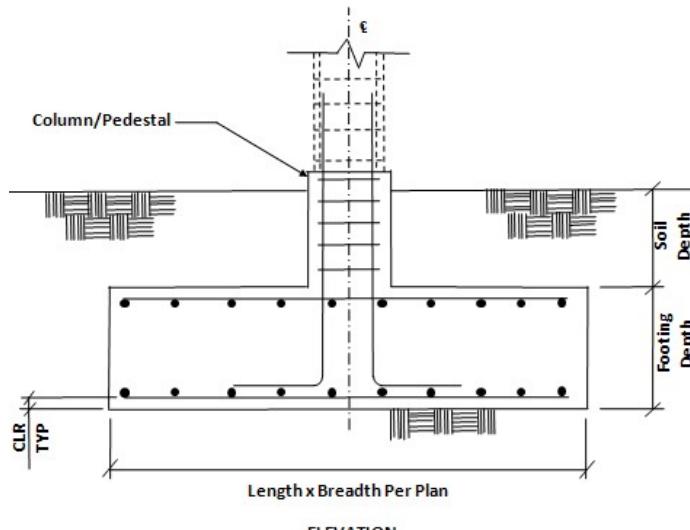
Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Isolated Footing 61



Input Values

Footing Geomtry

Design Type : Calculate Dimension
 Footing Thickness (Ft) : 12.000 in
 Footing Length - X (Fl) : 40.000 in
 Footing Width - Z (Fw) : 40.000 in
 Eccentricity along X (Oxd) : 0.000 in
 Eccentricity along Z (Ozd) : 0.000 in

Column Dimensions

Column Shape : Rectangular
 Column Length - X (Pl) : 0.450 m
 Column Width - Z (Pw) : 0.400 m

Pedestal

Include Pedestal? Yes
 Pedestal Shape : Rectangular
 Pedestal Height (Ph) : 0.015 m
 Pedestal Length - X (Pl) : 0.450 m
 Pedestal Width - Z (Pw) : 0.400 m

Design Parameters

Concrete and Rebar Properties

Unit Weight of Concrete : 150.000 lb/ft³
 Strength of Concrete : 4.000 ksi
 Yield Strength of Steel : 60.000 ksi
 Minimum Bar Size : Ø6
 Maximum Bar Size : Ø32
 Minimum Bar Spacing : 2.000 in
 Maximum Bar Spacing : 18.000 in
 Pedestal Clear Cover (P, CL) : 3.000 in
 Footing Clear Cover (F, CL) : 3.000 in

Soil Properties

Soil Type : UnDrained
 Unit Weight : 112.000 lb/ft³
 Soil Bearing Capacity : 4.000 kip/ft²
 Soil Surcharge : 0.000 kip/in²
 Depth of Soil above Footing : 0.000 in
 Undrained Shear Strength : 0.000 kip/in²
 Min Percentage of Slab : 0.000

Sliding and Overturning

Coefficient of Friction : 0.500
 Factor of Safety Against Sliding : 1.500
 Factor of Safety Against Overturning : 1.500

Load Combination/s- Service Stress Level	
Load Combination Number	Load Combination Title
1	DEAD
2	LIVE
3	COMBINATION LOAD CASE 3
101	1.000 x DL+1.000 x DL+1.000 x DL

102	0.800 x DL+0.800 x DL+0.800 x DL
Load Combination/s- Strength Level	
Load Combination Number	Load Combination Title
1	DEAD
2	LIVE
3	COMBINATION LOAD CASE 3

Applied Loads - Service Stress Level					
LC	Axial (kN)	Shear X (kN)	Shear Z (kN)	Moment X (kNm)	Moment Z (kNm)
1	461.702	-2.592	0.000	0.000	2.571
2	73.337	-0.865	0.000	0.000	0.860
3	802.558	-5.185	0.000	0.000	5.147
101	1337.597	-8.642	0.000	0.000	8.578
102	1070.077	-6.914	0.000	0.000	6.862

Applied Loads - Strength Level					
LC	Axial (kN)	Shear X (kN)	Shear Z (kN)	Moment X (kNm)	Moment Z (kNm)
1	461.702	-2.592	0.000	0.000	2.571
2	73.337	-0.865	0.000	0.000	0.860
3	802.558	-5.185	0.000	0.000	5.147

Design Calculations

Footing Size

Initial Length (L_o) = 1.016 m

Initial Width (W_o) = 1.016 m

Uplift force due to buoyancy = 0.000 kN

Effect due to adhesion = 0.000 kN

Area from initial length and width, $A_o = L_o \times W_o = 1.032 \text{ m}^2$

Min. area required from bearing pressure, $A_{\min} = P / q_{\max} = 7.024 \text{ m}^2$

Note: A_{\min} is an initial estimation.

P = Critical Factored Axial Load (without self weight/buoyancy/soil).

q_{\max} = Respective Factored Bearing Capacity.

Final Footing Size

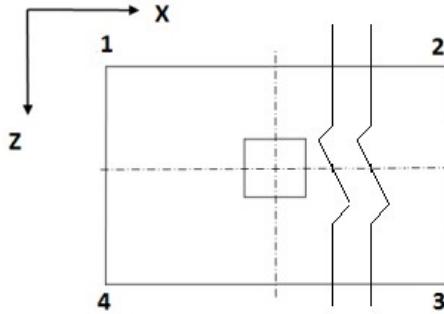
Length (L_2) = 2.743 m Governing Load Case : # 101

Width (W_2) = 2.743 m Governing Load Case : # 101

Depth (D_2) = 0.306 m Governing Load Case : # 101

$$\text{Area } (A_2) = 7.525 \text{ m}^2$$

Pressures at Four Corner



Load Case	Pressure at corner 1 (q_1) (kN/m ²)	Pressure at corner 2 (q_2) (kN/m ²)	Pressure at corner 3 (q_3) (kN/m ²)	Pressure at corner 4 (q_4) (kN/m ²)	Area of footing in uplift (A_u) (m ²)
101	188.2383	181.6440	181.6440	188.2383	0.000
101	188.2383	181.6440	181.6440	188.2383	0.000
101	188.2383	181.6440	181.6440	188.2383	0.000
101	188.2383	181.6440	181.6440	188.2383	0.000

If A_u is zero, there is no uplift and no pressure adjustment is necessary. Otherwise, to account for uplift, areas of negative pressure will be set to zero and the pressure will be redistributed to remaining corners.

Summary of adjusted Pressures at Four Corner

Load Case	Pressure at corner 1 (q_1) (kN/m ²)	Pressure at corner 2 (q_2) (kN/m ²)	Pressure at corner 3 (q_3) (kN/m ²)	Pressure at corner 4 (q_4) (kN/m ²)
101	188.2383	181.6440	181.6440	188.2383
101	188.2383	181.6440	181.6440	188.2383
101	188.2383	181.6440	181.6440	188.2383
101	188.2383	181.6440	181.6440	188.2383

Details of Out-of-Contact Area (If Any)

Governing load case = N/A

Plan area of footing = 7.525 sq.m

Area not in contact with soil = 0.000 sq.m

% of total area not in contact = 0.000%

Check For Stability Against Overturning And Sliding

-	Factor of safety against sliding		Factor of safety against overturning	
Load Case No.	Along X-Direction	Along Z-Direction	About X-Direction	About Z-Direction
1	99.517	N/A	N/A	208.030
2	73.644	N/A	N/A	153.797
3	82.605	N/A	N/A	172.635
101	80.518	N/A	N/A	168.274
102	81.300	N/A	N/A	169.909

Critical Load Case And The Governing Factor Of Safety For Overturning and Sliding X Direction

Critical Load Case for Sliding along X-Direction : 2

Governing Disturbing Force : -0.865 kN

Governing Restoring Force : 63.724 kN

Minimum Sliding Ratio for the Critical Load Case : 73.644

Critical Load Case for Overturning about X-Direction : 1

Governing Overturning Moment : 0.000 kNm

Governing Resisting Moment : 707.478 kNm

Minimum Overturning Ratio for the Critical Load Case : 0.000

Critical Load Case And The Governing Factor Of Safety For Overturning and Sliding Z Direction

Critical Load Case for Sliding along Z-Direction : 1

Governing Disturbing Force : 0.000 kN

Governing Restoring Force : 257.907 kN

Minimum Sliding Ratio for the Critical Load Case : 0.000

Critical Load Case for Overturning about Z-Direction : 2

Governing Overturning Moment : 1.137 kNm

Governing Resisting Moment : 174.806 kNm

Minimum Overturning Ratio for the Critical Load Case : 153.797

Moment Calculation

Check Trial Depth against moment (w.r.t. X Axis)

Critical Load Case = #3

$$\text{Effective Depth} = D - (cc + 0.5 \times d_b) = 0.226 \text{ m}$$

$$\text{Governing moment (M}_u\text{)} = 200.789 \text{ kNm}$$

As Per IS 456 2000 ANNEX G G-1.1C

$$\text{Limiting Factor1 (K}_{u\max}\text{)} = \frac{700}{(1100 + 0.87 \times f_y)} = 0.479483$$

$$\text{Limiting Factor2 (R}_{u\max}\text{)} = \frac{0.36 \times f_{ck} \times k_{u\max} \times (1 - 0.42 \times k_{u\max})}{B} = 3801.834636 \text{ kN/m}^2$$

$$\text{Limit Moment Of Resistance (M}_{u\max}\text{)} = \frac{R_{u\max} \times B \times d_e^2}{2} = 530.787790 \text{ kNm}$$

$M_u \leq M_{umax}$ hence, safe

Check Trial Depth against moment (w.r.t. Z Axis)

Critical Load Case = #3

$$\text{Effective Depth} = D - (cc + 0.5 \times d_b) = 0.226 \text{ m}$$

$$\text{Governing moment } (M_u) = 194.884 \text{ kNm}$$

As Per IS 456 2000 ANNEX G G-1.1C

$$\text{Limiting Factor1 } (K_{umax}) = \frac{700}{(1100 + 0.87 \times f_y)} = 0.479483$$

$$\text{Limiting Factor2 } (R_{umax}) = \frac{0.36 \times f_{ck} \times k_{umax} \times (1 - 0.42 \times k_{umax})}{k_{umax}} = 3801.834636 \text{ kN/m}^2$$

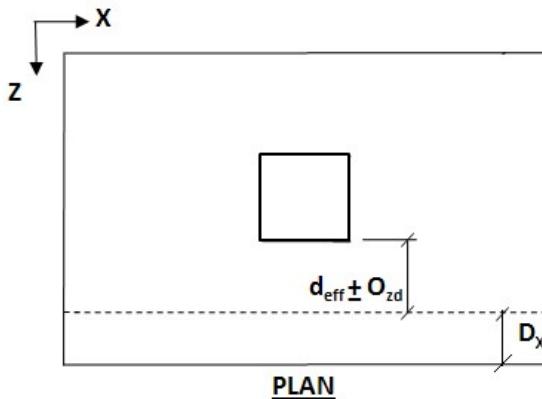
$$\text{Limit Moment Of Resistance } (M_{umax}) = \frac{R_{umax} \times B \times d_e^2}{4} = 530.787790 \text{ kNm}$$

$M_u \leq M_{umax}$ hence, safe

Shear Calculation

Check Trial Depth for one way shear (Along X Axis)

(Shear Plane Parallel to X Axis)



Critical Load Case = #3

$$D_X = 0.226 \text{ m}$$

$$\text{Shear Force}(S) = 276.764 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 447.212279 \text{ kN/m}^2$$

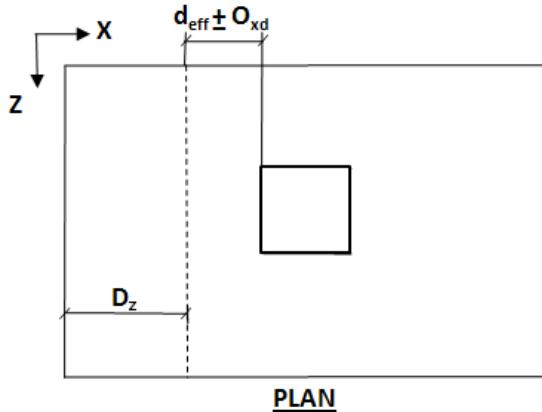
$$\text{Percentage Of Steel}(P_t) = 0.4135$$

As Per IS 456 2000 Clause 40 Table 19

$$\text{Shear Strength Of Concrete}(T_c) = 455.617 \text{ kN/m}^2$$

$T_v < T_c$ hence, safe

Check Trial Depth for one way shear (Along Z Axis)
(Shear Plane Parallel to Z Axis)



Critical Load Case = #3

$$D_z = 0.226 \text{ m}$$

$$\text{Shear Force}(S) = 272.770 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 440.758549 \text{ kN/m}^2$$

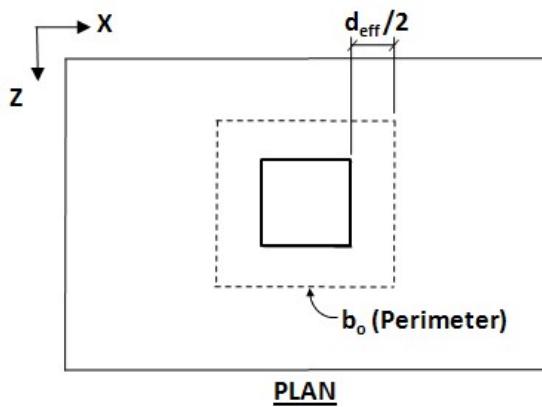
$$\text{Percentage Of Steel}(P_t) = 0.4269$$

As Per IS 456 2000 Clause 40 Table 19

$$\text{Shear Strength Of Concrete}(T_c) = 461.784 \text{ kN/m}^2$$

$T_v < T_c$ hence, safe

Check Trial Depth for two way shear



Critical Load Case = #3

$$\text{Shear Force}(S) = 757.482 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 1290.208 \text{ kN/m}^2$$

As Per IS 456 2000 Clause 31.6.3.1

$$K_s = \min[(0.5 + \beta), 1] = 1.000$$

$$\text{Shear Strength}(T_c) = 0.25 \times \sqrt{f_{ck}} = 1312.8936 \text{ kN/m}^2$$

$$K_s \times T_c = 1312.8936 \text{ kN/m}^2$$

$$T_v \leq K_s \times T_c \text{ hence, safe}$$

Reinforcement Calculation

Calculation of Maximum Bar Size

Along X Axis

Bar diameter corresponding to max bar size (d_b) = 25 mm

As Per IS 456 2000 Clause 26.2.1

$$\text{Development Length}(l_d) = \frac{d_b \times 0.87 \times f_y}{4 \times \gamma_{bd}} = 0.956 \text{ m}$$

$$\text{Allowable Length}(l_{db}) = \left[\frac{(B - b)}{2} - cc \right] = 1.070 \text{ m}$$

$$l_{db} \geq l_d \text{ hence, safe}$$

Along Z Axis

Bar diameter corresponding to max bar size(d_b) = 25 mm

As Per IS 456 2000 Clause 26.2.1

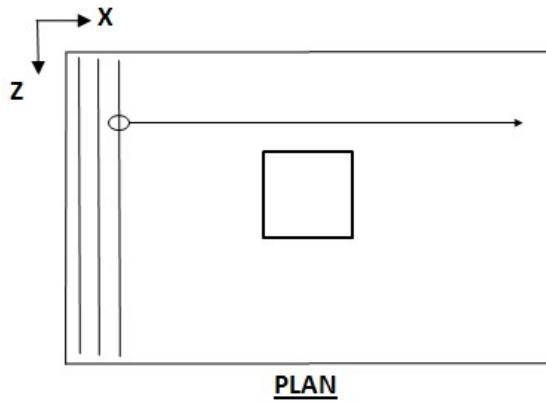
$$\text{Development Length}(l_d) = \frac{d_b \times 0.87 \times f_y}{4 \times \gamma_{bd}} = 0.956 \text{ m}$$

$$\text{Allowable Length}(l_{db}) = \left[\frac{(H - h)}{2} - cc \right] = 1.095 \text{ m}$$

$$l_{db} \geq l_d \text{ hence, safe}$$

Bottom Reinforcement Design

Along Z Axis



For moment w.r.t. X Axis (M_x)

As Per IS 456 2000 Clause 26.5.2.1

Critical Load Case = #3

Minimum Area of Steel ($A_{st,min}$) = 1009.936 mm²

Calculated Area of Steel (A_{st}) = 2642.180 mm²

Provided Area of Steel ($A_{st,Provided}$) = 2642.180 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Selected bar Size (d_b) = Ø10

Minimum spacing allowed (S_{min}) = 0.050 m

Selected spacing (S) = 0.078 m

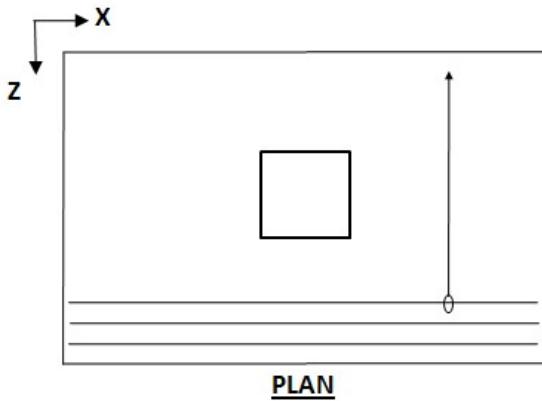
$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø10 @ 0.075 m o.c.

[Along X Axis](#)



For moment w.r.t. Z Axis (M_z)

As Per IS 456 2000 Clause 26.5.2.1

Critical Load Case = #3

Minimum Area of Steel ($A_{st,min}$) = 1006.645 mm²

Calculated Area of Steel (A_{st}) = 2558.960 mm²

Provided Area of Steel ($A_{st,Provided}$) = 2558.960 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.052 m

$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

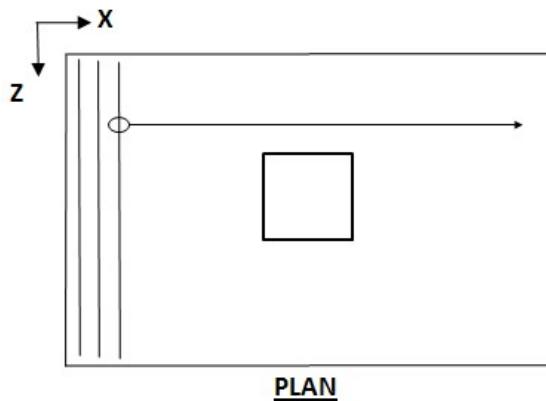
The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0.050 m o.c.

[Top Reinforcement Design](#)

[Along Z Axis](#)



Minimum Area of Steel ($A_{st,min}$) = 1009.936 mm²

Calculated Area of Steel (A_{st}) = 1003.353 mm²

Provided Area of Steel ($A_{st,Provided}$) = 1009.936 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Governing Moment = 15.024 kNm

Selected bar Size (d_b) = Ø6

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.074 m

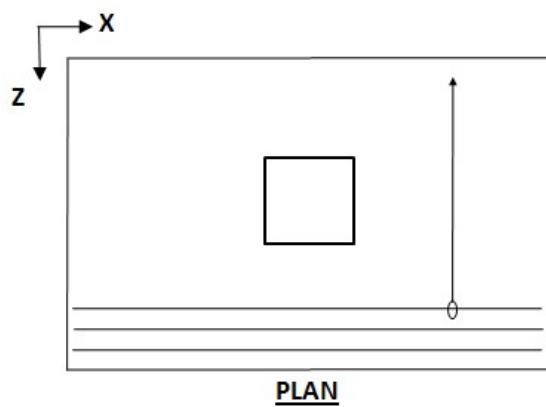
$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø6 @ 0 m o.c.

Along X Axis



Minimum Area of Steel ($A_{st,min}$) = 1006.645 mm²

Calculated Area of Steel (A_{st}) = 2558.960 mm²

Provided Area of Steel ($A_{st,Provided}$) = 2558.960 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Governing Moment = 14.390 kNm

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.052 m

$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0 m o.c.

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 796.824 kN

Critical Applied Moment Along X Direction: 15.936 kNm

Critical Applied Moment Along Z Direction: 15.936 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.182 m

Position Of Neutral Axis Along Z Direction: 0.182 m

Pedestal Moment Capacity Along X Direction: 110.801 kNm

Pedestal Moment Capacity Along Z Direction: 125.969 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 577.848 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m
Position Of Neutral Axis Along Z Direction: 0.137 m
Pedestal Moment Capacity Along X Direction: 93.412 kNm
Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²
Pedestal Main/Compression Reinforcement: 16 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 783.137 kN
Critical Applied Moment Along X Direction: 15.662 kNm
Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m
Position Of Neutral Axis Along Z Direction: 0.180 m
Pedestal Moment Capacity Along X Direction: 110.061 kNm
Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²
Pedestal Main/Compression Reinforcement: 12 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN
Critical Applied Moment Along X Direction: 21.591 kNm
Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m
Position Of Neutral Axis Along Z Direction: 0.235 m
Pedestal Moment Capacity Along X Direction: 116.443 kNm
Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²
Pedestal Main/Compression Reinforcement: 28 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1108.293 kN

Critical Applied Moment Along X Direction: 22.165 kNm

Critical Applied Moment Along Z Direction: 22.165 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.224 kNm

Pedestal Moment Capacity Along Z Direction: 133.768 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 803.721 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1079.582 kN

Critical Applied Moment Along X Direction: 21.591 kNm

Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m

Position Of Neutral Axis Along Z Direction: 0.235 m

Pedestal Moment Capacity Along X Direction: 116.443 kNm

Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²

Pedestal Main/Compression Reinforcement: 28 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m

Position Of Neutral Axis Along Z Direction: 0.180 m

Pedestal Moment Capacity Along X Direction: 110.061 kNm

Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 802.558 kN

Critical Applied Moment Along X Direction: 16.051 kNm

Critical Applied Moment Along Z Direction: 16.051 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.183 m

Position Of Neutral Axis Along Z Direction: 0.183 m

Pedestal Moment Capacity Along X Direction: 111.028 kNm

Pedestal Moment Capacity Along Z Direction: 126.226 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 590.780 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1106.751 kN

Critical Applied Moment Along X Direction: 22.135 kNm

Critical Applied Moment Along Z Direction: 22.135 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.240 kNm

Pedestal Moment Capacity Along Z Direction: 133.790 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 802.604 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1137.123 kN

Critical Applied Moment Along X Direction: 22.742 kNm

Critical Applied Moment Along Z Direction: 22.742 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.244 m

Position Of Neutral Axis Along Z Direction: 0.244 m

Pedestal Moment Capacity Along X Direction: 117.002 kNm

Pedestal Moment Capacity Along Z Direction: 133.264 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 824.628 mm²

Pedestal Main/Compression Reinforcement: 32 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1106.751 kN

Critical Applied Moment Along X Direction: 22.135 kNm

Critical Applied Moment Along Z Direction: 22.135 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.240 kNm

Pedestal Moment Capacity Along Z Direction: 133.790 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 802.604 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 802.558 kN

Critical Applied Moment Along X Direction: 16.051 kNm

Critical Applied Moment Along Z Direction: 16.051 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.183 m

Position Of Neutral Axis Along Z Direction: 0.183 m

Pedestal Moment Capacity Along X Direction: 111.028 kNm

Pedestal Moment Capacity Along Z Direction: 126.226 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 590.780 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m
Position Of Neutral Axis Along Z Direction: 0.180 m
Pedestal Moment Capacity Along X Direction: 110.061 kNm
Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²
Pedestal Main/Compression Reinforcement: 12 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN
Critical Applied Moment Along X Direction: 21.591 kNm
Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m
Position Of Neutral Axis Along Z Direction: 0.235 m
Pedestal Moment Capacity Along X Direction: 116.443 kNm
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Minimum longitudinal pedestal reinforcement is calculated based on
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Required Main Reinforcement: 782.901 mm²
Pedestal Main/Compression Reinforcement: 28 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m
Critical load Case : 3
Critical Applied Axial Load: 1108.293 kN
Critical Applied Moment Along X Direction: 22.165 kNm
Critical Applied Moment Along Z Direction: 22.165 kNm

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Required Main Reinforcement: 803.721 mm²
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Critical load Case : 3
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Critical Applied Moment Along Z Direction: 21.591 kNm

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Critical load Case : 3

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Critical Applied Moment Along Z Direction: 15.662 kNm

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Position Of Neutral Axis Along Z Direction: 0.180 m

Pedestal Moment Capacity Along X Direction: 110.061 kNm

Pedestal Moment Capacity Along Z Direction: 125.303 kNm

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Required Main Reinforcement: 567.922 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 796.824 kN

Critical Applied Moment Along X Direction: 15.936 kNm

Critical Applied Moment Along Z Direction: 15.936 kNm

Pedestal design is performed in accordance with IS 456 Section 39

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Minimum longitudinal pedestal reinforcement is calculated based on

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Required Main Reinforcement: 577.848 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

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Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

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Critical Applied Moment Along X Direction: 11.460 kNm

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Pedestal design is performed in accordance with IS 456 Section 39

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Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

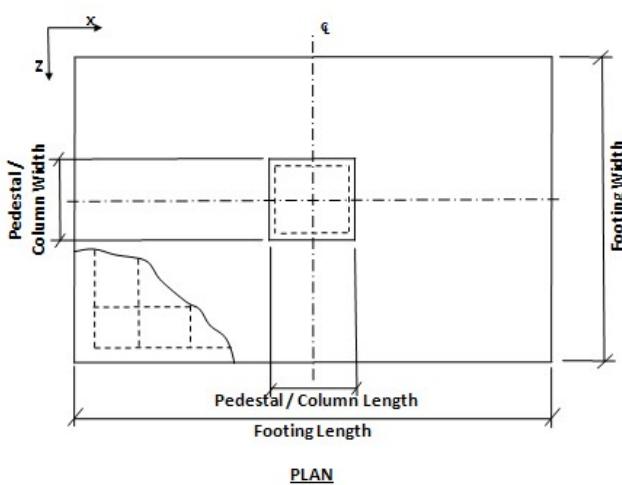
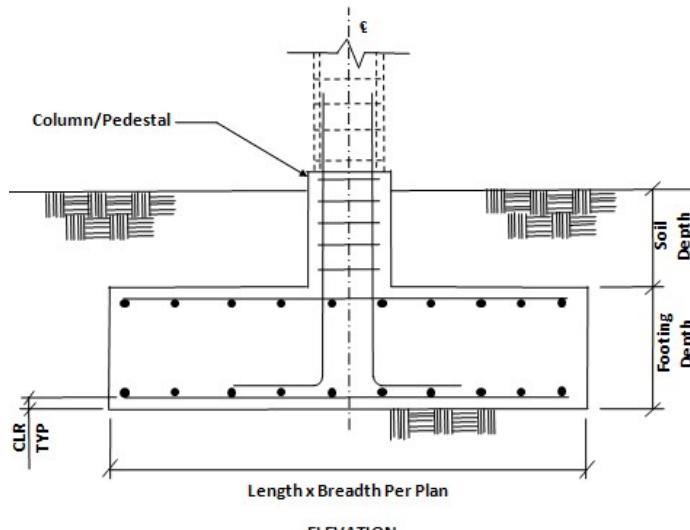
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IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Isolated Footing 62



Input Values

Footing Geomtry

Design Type : Calculate Dimension
 Footing Thickness (Ft) : 12.000 in
 Footing Length - X (Fl) : 40.000 in
 Footing Width - Z (Fw) : 40.000 in
 Eccentricity along X (Oxd) : 0.000 in
 Eccentricity along Z (Ozd) : 0.000 in

Column Dimensions

Column Shape : Rectangular
 Column Length - X (Pl) : 0.450 m
 Column Width - Z (Pw) : 0.400 m

Pedestal

Include Pedestal? Yes
 Pedestal Shape : Rectangular
 Pedestal Height (Ph) : 0.015 m
 Pedestal Length - X (Pl) : 0.450 m
 Pedestal Width - Z (Pw) : 0.400 m

Design Parameters

Concrete and Rebar Properties

Unit Weight of Concrete : 150.000 lb/ft³
 Strength of Concrete : 4.000 ksi
 Yield Strength of Steel : 60.000 ksi
 Minimum Bar Size : Ø6
 Maximum Bar Size : Ø32
 Minimum Bar Spacing : 2.000 in
 Maximum Bar Spacing : 18.000 in
 Pedestal Clear Cover (P, CL) : 3.000 in
 Footing Clear Cover (F, CL) : 3.000 in

Soil Properties

Soil Type : UnDrained
 Unit Weight : 112.000 lb/ft³
 Soil Bearing Capacity : 4.000 kip/ft²
 Soil Surcharge : 0.000 kip/in²
 Depth of Soil above Footing : 0.000 in
 Undrained Shear Strength : 0.000 kip/in²
 Min Percentage of Slab : 0.000

Sliding and Overturning

Coefficient of Friction : 0.500
 Factor of Safety Against Sliding : 1.500
 Factor of Safety Against Overturning : 1.500

Load Combination/s- Service Stress Level	
Load Combination Number	Load Combination Title
1	DEAD
2	LIVE
3	COMBINATION LOAD CASE 3
101	1.000 x DL+1.000 x DL+1.000 x DL

102	0.800 x DL+0.800 x DL+0.800 x DL
Load Combination/s- Strength Level	
Load Combination Number	Load Combination Title
1	DEAD
2	LIVE
3	COMBINATION LOAD CASE 3

Applied Loads - Service Stress Level					
LC	Axial (kN)	Shear X (kN)	Shear Z (kN)	Moment X (kNm)	Moment Z (kNm)
1	607.642	-0.307	0.000	0.000	0.330
2	130.192	-0.135	0.000	0.000	0.142
3	1106.751	-0.662	0.000	0.000	0.709
101	1844.586	-1.103	0.000	0.000	1.182
102	1475.669	-0.882	0.000	0.000	0.945

Applied Loads - Strength Level					
LC	Axial (kN)	Shear X (kN)	Shear Z (kN)	Moment X (kNm)	Moment Z (kNm)
1	607.642	-0.307	0.000	0.000	0.330
2	130.192	-0.135	0.000	0.000	0.142
3	1106.751	-0.662	0.000	0.000	0.709

Design Calculations

Footing Size

Initial Length (L_o) = 1.016 m

Initial Width (W_o) = 1.016 m

Uplift force due to buoyancy = 0.000 kN

Effect due to adhesion = 0.000 kN

Area from initial length and width, $A_o = L_o \times W_o = 1.032 \text{ m}^2$

Min. area required from bearing pressure, $A_{\min} = P / q_{\max} = 10.146 \text{ m}^2$

Note: A_{\min} is an initial estimation.

P = Critical Factored Axial Load (without self weight/buoyancy/soil).

q_{\max} = Respective Factored Bearing Capacity.

Final Footing Size

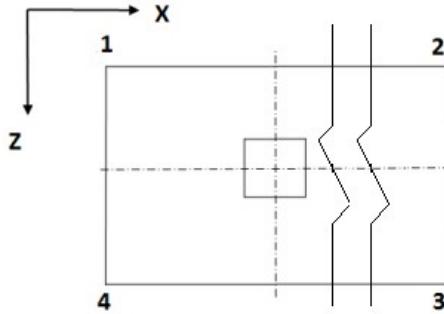
Length (L_2) = 3.200 m Governing Load Case : # 1

Width (W_2) = 3.200 m Governing Load Case : # 1

Depth (D_2) = 0.408 m Governing Load Case : # 1

$$\text{Area } (A_2) = 10.243 \text{ m}^2$$

Pressures at Four Corner



Load Case	Pressure at corner 1 (q_1) (kN/m ²)	Pressure at corner 2 (q_2) (kN/m ²)	Pressure at corner 3 (q_3) (kN/m ²)	Pressure at corner 4 (q_4) (kN/m ²)	Area of footing in uplift (A_u) (m ²)
101	189.9982	189.3949	189.3949	189.9982	0.000
101	189.9982	189.3949	189.3949	189.9982	0.000
101	189.9982	189.3949	189.3949	189.9982	0.000
101	189.9982	189.3949	189.3949	189.9982	0.000

If A_u is zero, there is no uplift and no pressure adjustment is necessary. Otherwise, to account for uplift, areas of negative pressure will be set to zero and the pressure will be redistributed to remaining corners.

Summary of adjusted Pressures at Four Corner

Load Case	Pressure at corner 1 (q_1) (kN/m ²)	Pressure at corner 2 (q_2) (kN/m ²)	Pressure at corner 3 (q_3) (kN/m ²)	Pressure at corner 4 (q_4) (kN/m ²)
101	189.9982	189.3949	189.3949	189.9982
101	189.9982	189.3949	189.3949	189.9982
101	189.9982	189.3949	189.3949	189.9982
101	189.9982	189.3949	189.3949	189.9982

Details of Out-of-Contact Area (If Any)

Governing load case = N/A

Plan area of footing = 10.243 sq.m

Area not in contact with soil = 0.000 sq.m

% of total area not in contact = 0.000%

Check For Stability Against Overturning And Sliding

-	Factor of safety against sliding		Factor of safety against overturning	
Load Case No.	Along X-Direction	Along Z-Direction	About X-Direction	About Z-Direction
1	1151.413	N/A	N/A	2455.930
2	849.694	N/A	N/A	1836.700
3	910.700	N/A	N/A	1950.374
101	880.959	N/A	N/A	1886.680
102	892.112	N/A	N/A	1910.566

Critical Load Case And The Governing Factor Of Safety For Overturning and Sliding X Direction

Critical Load Case for Sliding along X-Direction : 2

Governing Disturbing Force : -0.135 kN

Governing Restoring Force : 114.292 kN

Minimum Sliding Ratio for the Critical Load Case : 849.694

Critical Load Case for Overturning about X-Direction : 1

Governing Overturning Moment : 0.000 kNm

Governing Resisting Moment : 1129.776 kNm

Minimum Overturning Ratio for the Critical Load Case : 0.000

Critical Load Case And The Governing Factor Of Safety For Overturning and Sliding Z Direction

Critical Load Case for Sliding along Z-Direction : 1

Governing Disturbing Force : 0.000 kN

Governing Restoring Force : 353.017 kN

Minimum Sliding Ratio for the Critical Load Case : 0.000

Critical Load Case for Overturning about Z-Direction : 2

Governing Overturning Moment : 0.199 kNm

Governing Resisting Moment : 365.774 kNm

Minimum Overturning Ratio for the Critical Load Case : 1836.700

Moment CalculationCheck Trial Depth against moment (w.r.t. X Axis)**Critical Load Case = #3**

$$\text{Effective Depth} = D - (cc + 0.5 \times d_b) = 0.328 \text{ m}$$

$$\text{Governing moment (M}_u\text{)} = 338.991 \text{ kNm}$$

As Per IS 456 2000 ANNEX G G-1.1C

$$\text{Limiting Factor1 (K}_{u\max}\text{)} = \frac{700}{(1100 + 0.87 \times f_y)} = 0.479483$$

$$\text{Limiting Factor2 (R}_{u\max}\text{)} = \frac{0.36 \times f_{ck} \times k_{u\max} \times (1 - 0.42 \times k_{u\max})}{B \times d_e^2} = 3801.834636 \text{ kN/m}^2$$

$$\text{Limit Moment Of Resistance (M}_{u\max}\text{)} = \frac{R_{u\max} \times B \times d_e^2}{2} = 1310.589440 \text{ kNm}$$

$M_u \leq M_{umax}$ hence, safe

Check Trial Depth against moment (w.r.t. Z Axis)

Critical Load Case = #3

$$\text{Effective Depth} = D - (cc + 0.5 \times d_b) = 0.328 \text{ m}$$

$$\text{Governing moment } (M_u) = 327.385 \text{ kNm}$$

As Per IS 456 2000 ANNEX G G-1.1C

$$\text{Limiting Factor1 } (K_{umax}) = \frac{700}{(1100 + 0.87 \times f_y)} = 0.479483$$

$$\text{Limiting Factor2 } (R_{umax}) = \frac{0.36 \times f_{ck} \times k_{umax} \times (1 - 0.42 \times k_{umax})}{k_{umax}} = 3801.834636 \text{ kN/m}^2$$

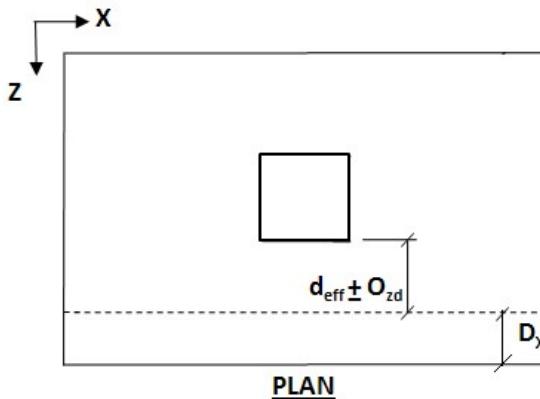
$$\text{Limit Moment Of Resistance } (M_{umax}) = \frac{R_{umax} \times B \times d_e^2}{4} = 1310.589440 \text{ kNm}$$

$M_u \leq M_{umax}$ hence, safe

Shear Calculation

Check Trial Depth for one way shear (Along X Axis)

(Shear Plane Parallel to X Axis)



Critical Load Case = #3

$$D_X = 0.328 \text{ m}$$

$$\text{Shear Force}(S) = 370.716 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 352.937646 \text{ kN/m}^2$$

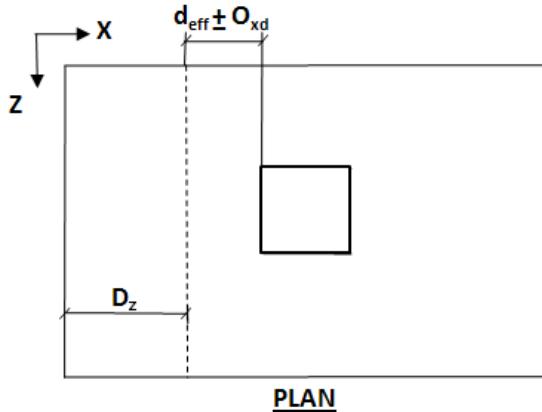
$$\text{Percentage Of Steel}(P_t) = 0.2752$$

As Per IS 456 2000 Clause 40 Table 19

$$\text{Shear Strength Of Concrete}(T_c) = 382.768 \text{ kN/m}^2$$

$T_v < T_c$ hence, safe

Check Trial Depth for one way shear (Along Z Axis)
(Shear Plane Parallel to Z Axis)



Critical Load Case = #3

$$D_z = 0.327 \text{ m}$$

$$\text{Shear Force}(S) = 362.796 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 346.453671 \text{ kN/m}^2$$

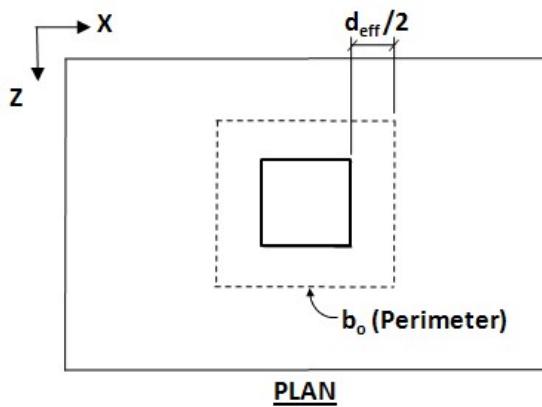
$$\text{Percentage Of Steel}(P_t) = 0.2873$$

As Per IS 456 2000 Clause 40 Table 19

$$\text{Shear Strength Of Concrete}(T_c) = 389.955 \text{ kN/m}^2$$

$T_v < T_c$ hence, safe

Check Trial Depth for two way shear



Critical Load Case = #3

$$\text{Shear Force}(S) = 1045.682 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 1062.168 \text{ kN/m}^2$$

As Per IS 456 2000 Clause 31.6.3.1

$$K_s = \min[(0.5 + \beta), 1] = 1.000$$

$$\text{Shear Strength}(T_c) = 0.25 \times \sqrt{f_{ck}} = 1312.8936 \text{ kN/m}^2$$

$$K_s \times T_c = 1312.8936 \text{ kN/m}^2$$

$$T_v \leq K_s \times T_c \text{ hence, safe}$$

Reinforcement Calculation

Calculation of Maximum Bar Size

Along X Axis

Bar diameter corresponding to max bar size (d_b) = 32 mm

As Per IS 456 2000 Clause 26.2.1

$$\text{Development Length}(l_d) = \frac{d_b \times 0.87 \times f_y}{4 \times \gamma_{bd}} = 1.224 \text{ m}$$

$$\text{Allowable Length}(l_{db}) = \left[\frac{(B - b)}{2} - cc \right] = 1.299 \text{ m}$$

$$l_{db} \geq l_d \text{ hence, safe}$$

Along Z Axis

Bar diameter corresponding to max bar size(d_b) = 32 mm

As Per IS 456 2000 Clause 26.2.1

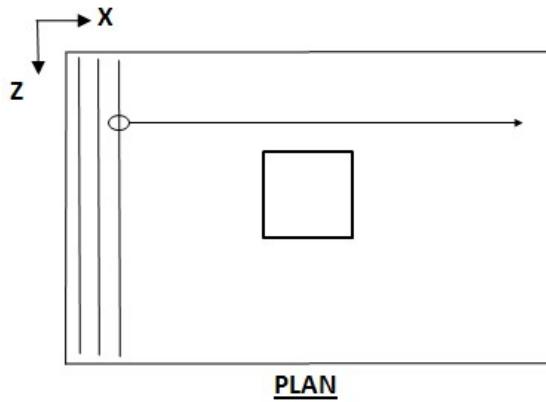
$$\text{Development Length}(l_d) = \frac{d_b \times 0.87 \times f_y}{4 \times \gamma_{bd}} = 1.224 \text{ m}$$

$$\text{Allowable Length}(l_{db}) = \left[\frac{(H - h)}{2} - cc \right] = 1.324 \text{ m}$$

$$l_{db} \geq l_d \text{ hence, safe}$$

Bottom Reinforcement Design

Along Z Axis



For moment w.r.t. X Axis (M_x)

As Per IS 456 2000 Clause 26.5.2.1

Critical Load Case = #3

Minimum Area of Steel ($A_{st,min}$) = 1568.452 mm²

Calculated Area of Steel (A_{st}) = 2998.289 mm²

Provided Area of Steel ($A_{st,Provided}$) = 2998.289 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.048 m

Selected spacing (S) = 0.052 m

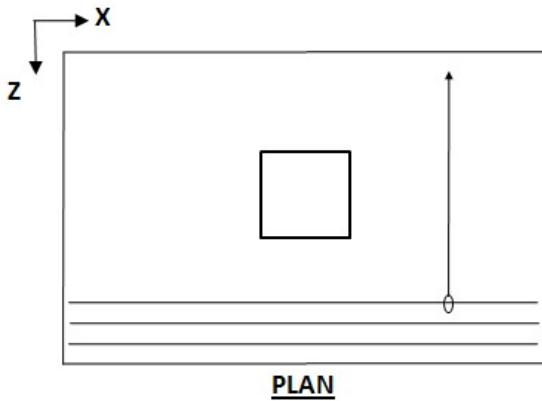
$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0.050 m o.c.

[Along X Axis](#)



For moment w.r.t. Z Axis (M_z)

As Per IS 456 2000 Clause 26.5.2.1

Critical Load Case = #3

Minimum Area of Steel ($A_{st,min}$) = 1568.452 mm²

Calculated Area of Steel (A_{st}) = 2891.006 mm²

Provided Area of Steel ($A_{st,Provided}$) = 2891.006 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.053 m

$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

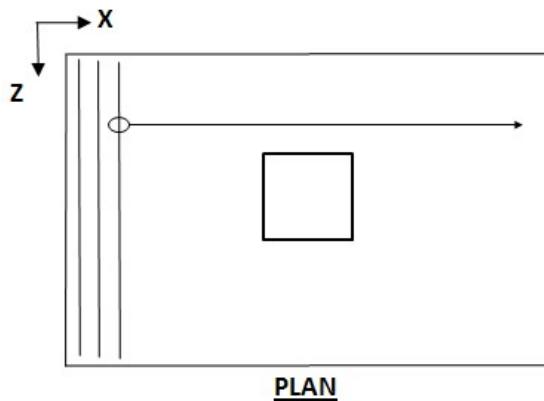
The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0.050 m o.c.

[Top Reinforcement Design](#)

[Along Z Axis](#)



Minimum Area of Steel ($A_{st,min}$) = 1568.452 mm²

Calculated Area of Steel (A_{st}) = 1564.611 mm²

Provided Area of Steel ($A_{st,Provided}$) = 1568.452 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Governing Moment = 33.464 kNm

Selected bar Size (d_b) = Ø6

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.055 m

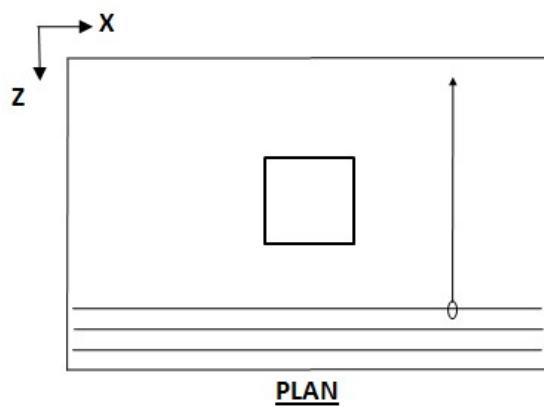
$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø6 @ 0 m o.c.

Along X Axis



Minimum Area of Steel ($A_{st,min}$) = 1568.452 mm²

Calculated Area of Steel (A_{st}) = 2891.006 mm²

Provided Area of Steel ($A_{st,Provided}$) = 2891.006 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Governing Moment = 32.279 kNm

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.053 m

$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0 m o.c.

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 796.824 kN

Critical Applied Moment Along X Direction: 15.936 kNm

Critical Applied Moment Along Z Direction: 15.936 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.182 m

Position Of Neutral Axis Along Z Direction: 0.182 m

Pedestal Moment Capacity Along X Direction: 110.801 kNm

Pedestal Moment Capacity Along Z Direction: 125.969 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 577.848 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m
Position Of Neutral Axis Along Z Direction: 0.137 m
Pedestal Moment Capacity Along X Direction: 93.412 kNm
Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²
Pedestal Main/Compression Reinforcement: 16 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 783.137 kN
Critical Applied Moment Along X Direction: 15.662 kNm
Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m
Position Of Neutral Axis Along Z Direction: 0.180 m
Pedestal Moment Capacity Along X Direction: 110.061 kNm
Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²
Pedestal Main/Compression Reinforcement: 12 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN
Critical Applied Moment Along X Direction: 21.591 kNm
Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m
Position Of Neutral Axis Along Z Direction: 0.235 m
Pedestal Moment Capacity Along X Direction: 116.443 kNm
Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²
Pedestal Main/Compression Reinforcement: 28 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1108.293 kN

Critical Applied Moment Along X Direction: 22.165 kNm

Critical Applied Moment Along Z Direction: 22.165 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.224 kNm

Pedestal Moment Capacity Along Z Direction: 133.768 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 803.721 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1079.582 kN

Critical Applied Moment Along X Direction: 21.591 kNm

Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m

Position Of Neutral Axis Along Z Direction: 0.235 m

Pedestal Moment Capacity Along X Direction: 116.443 kNm

Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²

Pedestal Main/Compression Reinforcement: 28 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m

Position Of Neutral Axis Along Z Direction: 0.180 m

Pedestal Moment Capacity Along X Direction: 110.061 kNm

Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 802.558 kN

Critical Applied Moment Along X Direction: 16.051 kNm

Critical Applied Moment Along Z Direction: 16.051 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.183 m

Position Of Neutral Axis Along Z Direction: 0.183 m

Pedestal Moment Capacity Along X Direction: 111.028 kNm

Pedestal Moment Capacity Along Z Direction: 126.226 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 590.780 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1106.751 kN

Critical Applied Moment Along X Direction: 22.135 kNm

Critical Applied Moment Along Z Direction: 22.135 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.240 kNm

Pedestal Moment Capacity Along Z Direction: 133.790 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 802.604 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1137.123 kN

Critical Applied Moment Along X Direction: 22.742 kNm

Critical Applied Moment Along Z Direction: 22.742 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.244 m

Position Of Neutral Axis Along Z Direction: 0.244 m

Pedestal Moment Capacity Along X Direction: 117.002 kNm

Pedestal Moment Capacity Along Z Direction: 133.264 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 824.628 mm²

Pedestal Main/Compression Reinforcement: 32 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1106.751 kN

Critical Applied Moment Along X Direction: 22.135 kNm

Critical Applied Moment Along Z Direction: 22.135 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.240 kNm

Pedestal Moment Capacity Along Z Direction: 133.790 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 802.604 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 802.558 kN

Critical Applied Moment Along X Direction: 16.051 kNm

Critical Applied Moment Along Z Direction: 16.051 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.183 m

Position Of Neutral Axis Along Z Direction: 0.183 m

Pedestal Moment Capacity Along X Direction: 111.028 kNm

Pedestal Moment Capacity Along Z Direction: 126.226 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 590.780 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m
Position Of Neutral Axis Along Z Direction: 0.180 m
Pedestal Moment Capacity Along X Direction: 110.061 kNm
Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²
Pedestal Main/Compression Reinforcement: 12 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN
Critical Applied Moment Along X Direction: 21.591 kNm
Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m
Position Of Neutral Axis Along Z Direction: 0.235 m
Pedestal Moment Capacity Along X Direction: 116.443 kNm
Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²
Pedestal Main/Compression Reinforcement: 28 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m
Critical load Case : 3
Critical Applied Axial Load: 1108.293 kN
Critical Applied Moment Along X Direction: 22.165 kNm
Critical Applied Moment Along Z Direction: 22.165 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m
Position Of Neutral Axis Along Z Direction: 0.239 m
Pedestal Moment Capacity Along X Direction: 117.224 kNm
Pedestal Moment Capacity Along Z Direction: 133.768 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 803.721 mm²
Pedestal Main/Compression Reinforcement: 16 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m
Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN

Critical Applied Moment Along X Direction: 21.591 kNm

Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m

Position Of Neutral Axis Along Z Direction: 0.235 m

Pedestal Moment Capacity Along X Direction: 116.443 kNm

Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²

Pedestal Main/Compression Reinforcement: 28 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m

Position Of Neutral Axis Along Z Direction: 0.180 m

Pedestal Moment Capacity Along X Direction: 110.061 kNm

Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 796.824 kN

Critical Applied Moment Along X Direction: 15.936 kNm

Critical Applied Moment Along Z Direction: 15.936 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.182 m

Position Of Neutral Axis Along Z Direction: 0.182 m

Pedestal Moment Capacity Along X Direction: 110.801 kNm

Pedestal Moment Capacity Along Z Direction: 125.969 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 577.848 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

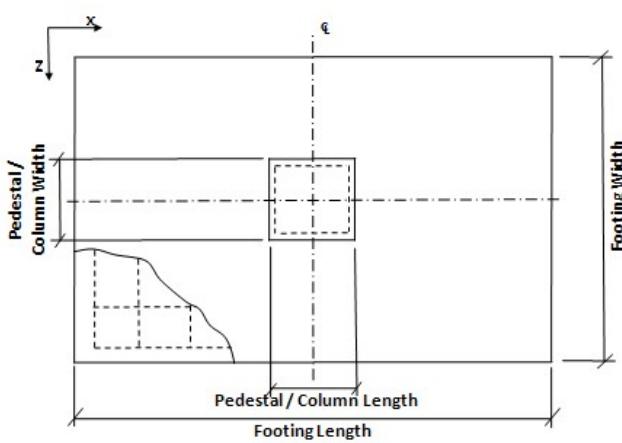
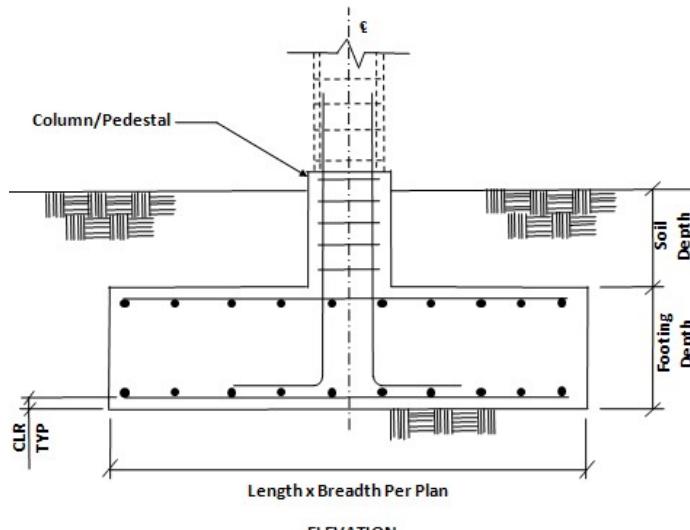
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Isolated Footing 63



Input Values

Footing Geomtry

Design Type : Calculate Dimension
 Footing Thickness (Ft) : 12.000 in
 Footing Length - X (Fl) : 40.000 in
 Footing Width - Z (Fw) : 40.000 in
 Eccentricity along X (Oxd) : 0.000 in
 Eccentricity along Z (Ozd) : 0.000 in

Column Dimensions

Column Shape : Rectangular
 Column Length - X (Pl) : 0.450 m
 Column Width - Z (Pw) : 0.400 m

Pedestal

Include Pedestal? Yes
 Pedestal Shape : Rectangular
 Pedestal Height (Ph) : 0.015 m
 Pedestal Length - X (Pl) : 0.450 m
 Pedestal Width - Z (Pw) : 0.400 m

Design Parameters

Concrete and Rebar Properties

Unit Weight of Concrete : 150.000 lb/ft³
 Strength of Concrete : 4.000 ksi
 Yield Strength of Steel : 60.000 ksi
 Minimum Bar Size : Ø6
 Maximum Bar Size : Ø32
 Minimum Bar Spacing : 2.000 in
 Maximum Bar Spacing : 18.000 in
 Pedestal Clear Cover (P, CL) : 3.000 in
 Footing Clear Cover (F, CL) : 3.000 in

Soil Properties

Soil Type : UnDrained
 Unit Weight : 112.000 lb/ft³
 Soil Bearing Capacity : 4.000 kip/ft²
 Soil Surcharge : 0.000 kip/in²
 Depth of Soil above Footing : 0.000 in
 Undrained Shear Strength : 0.000 kip/in²
 Min Percentage of Slab : 0.000

Sliding and Overturning

Coefficient of Friction : 0.500
 Factor of Safety Against Sliding : 1.500
 Factor of Safety Against Overturning : 1.500

Load Combination/s- Service Stress Level	
Load Combination Number	Load Combination Title
1	DEAD
2	LIVE
3	COMBINATION LOAD CASE 3
101	1.000 x DL+1.000 x DL+1.000 x DL

102	0.800 x DL+0.800 x DL+0.800 x DL
Load Combination/s- Strength Level	
Load Combination Number	Load Combination Title
1	DEAD
2	LIVE
3	COMBINATION LOAD CASE 3

Applied Loads - Service Stress Level					
LC	Axial (kN)	Shear X (kN)	Shear Z (kN)	Moment X (kNm)	Moment Z (kNm)
1	621.828	0.000	0.000	0.000	0.000
2	136.254	0.000	0.000	0.000	0.000
3	1137.123	0.000	0.000	0.000	0.000
101	1895.205	0.000	0.000	0.000	0.000
102	1516.164	0.000	0.000	0.000	0.000

Applied Loads - Strength Level					
LC	Axial (kN)	Shear X (kN)	Shear Z (kN)	Moment X (kNm)	Moment Z (kNm)
1	621.828	0.000	0.000	0.000	0.000
2	136.254	0.000	0.000	0.000	0.000
3	1137.123	0.000	0.000	0.000	0.000

Design Calculations

Footing Size

Initial Length (L_o) = 1.016 m

Initial Width (W_o) = 1.016 m

Uplift force due to buoyancy = 0.000 kN

Effect due to adhesion = 0.000 kN

Area from initial length and width, $A_o = L_o \times W_o = 1.032 \text{ m}^2$

Min. area required from bearing pressure, $A_{\min} = P / q_{\max} = 10.426 \text{ m}^2$

Note: A_{\min} is an initial estimation.

P = Critical Factored Axial Load (without self weight/buoyancy/soil).

q_{\max} = Respective Factored Bearing Capacity.

Final Footing Size

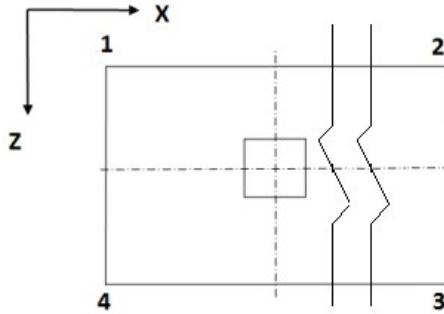
Length (L_2) = 3.251 m Governing Load Case : # 1

Width (W_2) = 3.251 m Governing Load Case : # 1

Depth (D_2) = 0.408 m Governing Load Case : # 1

$$\text{Area } (A_2) = 10.570 \text{ m}^2$$

Pressures at Four Corner



Load Case	Pressure at corner 1 (q_1) (kN/m ²)	Pressure at corner 2 (q_2) (kN/m ²)	Pressure at corner 3 (q_3) (kN/m ²)	Pressure at corner 4 (q_4) (kN/m ²)	Area of footing in uplift (A_u) (m ²)
101	188.9013	188.9013	188.9013	188.9013	0.000
101	188.9013	188.9013	188.9013	188.9013	0.000
101	188.9013	188.9013	188.9013	188.9013	0.000
101	188.9013	188.9013	188.9013	188.9013	0.000

If A_u is zero, there is no uplift and no pressure adjustment is necessary. Otherwise, to account for uplift, areas of negative pressure will be set to zero and the pressure will be redistributed to remaining corners.

Summary of adjusted Pressures at Four Corner

Load Case	Pressure at corner 1 (q_1) (kN/m ²)	Pressure at corner 2 (q_2) (kN/m ²)	Pressure at corner 3 (q_3) (kN/m ²)	Pressure at corner 4 (q_4) (kN/m ²)
101	188.9013	188.9013	188.9013	188.9013
101	188.9013	188.9013	188.9013	188.9013
101	188.9013	188.9013	188.9013	188.9013
101	188.9013	188.9013	188.9013	188.9013

Details of Out-of-Contact Area (If Any)

Governing load case = N/A

Plan area of footing = 10.570 sq.m

Area not in contact with soil = 0.000 sq.m

% of total area not in contact = 0.000%

Check For Stability Against Overturning And Sliding

-	Factor of safety against sliding		Factor of safety against overturning	
Load Case No.	Along X-Direction	Along Z-Direction	About X-Direction	About Z-Direction
1	N/A	N/A	N/A	N/A
2	N/A	N/A	N/A	N/A
3	N/A	N/A	N/A	N/A
101	N/A	N/A	N/A	N/A
102	N/A	N/A	N/A	N/A

Critical Load Case And The Governing Factor Of Safety For Overturning and Sliding X Direction

Critical Load Case for Sliding along X-Direction : 1

Governing Disturbing Force : 0.000 kN

Governing Restoring Force : 361.683 kN

Minimum Sliding Ratio for the Critical Load Case : 0.000

Critical Load Case for Overturning about X-Direction : 1

Governing Overturning Moment : 0.000 kNm

Governing Resisting Moment : 1175.884 kNm

Minimum Overturning Ratio for the Critical Load Case : 0.000

Critical Load Case And The Governing Factor Of Safety For Overturning and Sliding Z Direction

Critical Load Case for Sliding along Z-Direction : 1

Governing Disturbing Force : 0.000 kN

Governing Restoring Force : 361.683 kN

Minimum Sliding Ratio for the Critical Load Case : 0.000

Critical Load Case for Overturning about Z-Direction : 1

Governing Overturning Moment : 0.000 kNm

Governing Resisting Moment : 1175.884 kNm

Minimum Overturning Ratio for the Critical Load Case : 0.000

Moment CalculationCheck Trial Depth against moment (w.r.t. X Axis)**Critical Load Case = #3**

Effective Depth = $D - (cc + 0.5 \times d_b) = 0.328 \text{ m}$

Governing moment (M_u) = 355.403 kNm

As Per IS 456 2000 ANNEX G G-1.1C

Limiting Factor1 (K_{umax}) = $\frac{700}{(1100 + 0.87 \times f_y)} = 0.479483$

Limiting Factor2 (R_{umax}) = $0.36 \times f_{ck} \times k_{umax} \times (1 - 0.42 \times k_{umax}) = 3801.834636 \text{ kN/m}^2$

Limit Moment Of Resistance (M_{umax}) = $R_{umax} \times B \times d_e^2 = 1331.392447 \text{ kNm}$

$M_u \leq M_{umax}$ hence, safe

Check Trial Depth against moment (w.r.t. Z Axis)

Critical Load Case = #3

$$\text{Effective Depth} = D - (cc + 0.5 \times d_b) = 0.328 \text{ m}$$

$$\text{Governing moment } (M_u) = 343.047 \text{ kNm}$$

As Per IS 456 2000 ANNEX G G-1.1C

$$\text{Limiting Factor1 } (K_{umax}) = \frac{700}{(1100 + 0.87 \times f_y)} = 0.479483$$

$$\text{Limiting Factor2 } (R_{umax}) = \frac{0.36 \times f_{ck} \times k_{umax} \times (1 - 0.42 \times k_{umax})}{k_{umax}} = 3801.834636 \text{ kN/m}^2$$

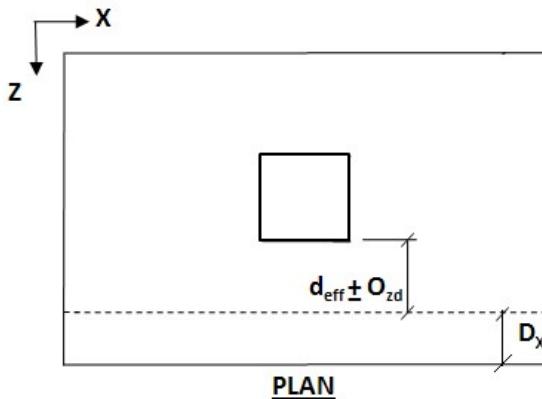
$$\text{Limit Moment Of Resistance } (M_{umax}) = \frac{R_{umax} \times B \times d_e^2}{4} = 1331.392447 \text{ kNm}$$

$M_u \leq M_{umax}$ hence, safe

Shear Calculation

Check Trial Depth for one way shear (Along X Axis)

(Shear Plane Parallel to X Axis)



Critical Load Case = #3

$$D_X = 0.328 \text{ m}$$

$$\text{Shear Force}(S) = 383.821 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 359.705047 \text{ kN/m}^2$$

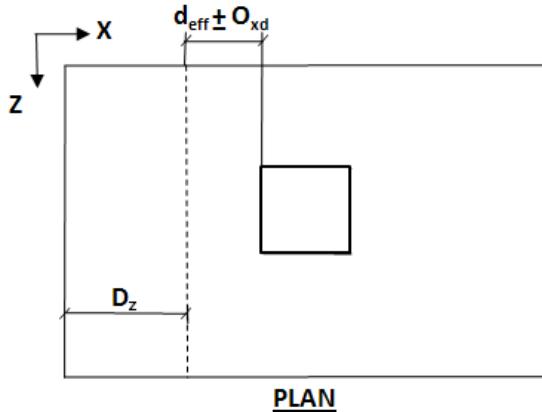
$$\text{Percentage Of Steel}(P_t) = 0.2843$$

As Per IS 456 2000 Clause 40 Table 19

$$\text{Shear Strength Of Concrete}(T_c) = 388.195 \text{ kN/m}^2$$

$T_v < T_c$ hence, safe

Check Trial Depth for one way shear (Along Z Axis)
(Shear Plane Parallel to Z Axis)



Critical Load Case = #3

$$D_z = 0.327 \text{ m}$$

$$\text{Shear Force}(S) = 375.427 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 352.913660 \text{ kN/m}^2$$

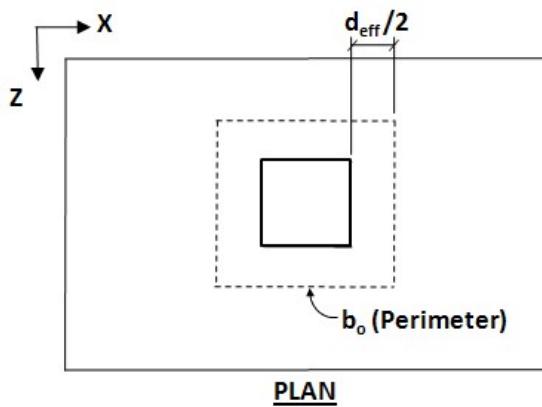
$$\text{Percentage Of Steel}(P_t) = 0.2969$$

As Per IS 456 2000 Clause 40 Table 19

$$\text{Shear Strength Of Concrete}(T_c) = 395.575 \text{ kN/m}^2$$

$T_v < T_c$ hence, safe

Check Trial Depth for two way shear



Critical Load Case = #3

$$\text{Shear Force}(S) = 1076.322 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 1093.292 \text{ kN/m}^2$$

As Per IS 456 2000 Clause 31.6.3.1

$$K_s = \min[(0.5 + \beta), 1] = 1.000$$

$$\text{Shear Strength}(T_c) = 0.25 \times \sqrt{f_{ck}} = 1312.8936 \text{ kN/m}^2$$

$$K_s \times T_c = 1312.8936 \text{ kN/m}^2$$

$$T_v \leq K_s \times T_c \text{ hence, safe}$$

Reinforcement Calculation

Calculation of Maximum Bar Size

Along X Axis

Bar diameter corresponding to max bar size (d_b) = 32 mm

As Per IS 456 2000 Clause 26.2.1

$$\text{Development Length}(l_d) = \frac{d_b \times 0.87 \times f_y}{4 \times \gamma_{bd}} = 1.224 \text{ m}$$

$$\text{Allowable Length}(l_{db}) = \left[\frac{(B - b)}{2} - cc \right] = 1.324 \text{ m}$$

$$l_{db} \geq l_d \text{ hence, safe}$$

Along Z Axis

Bar diameter corresponding to max bar size (d_b) = 32 mm

As Per IS 456 2000 Clause 26.2.1

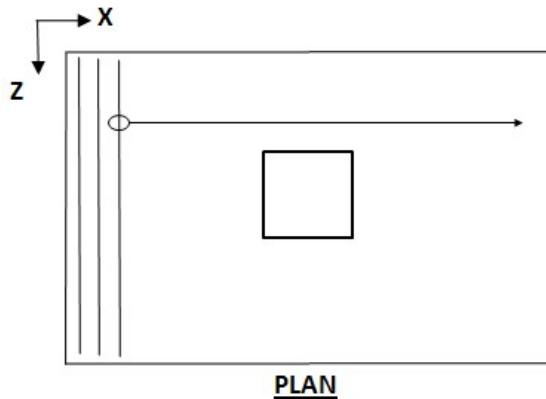
$$\text{Development Length}(l_d) = \frac{d_b \times 0.87 \times f_y}{4 \times \gamma_{bd}} = 1.224 \text{ m}$$

$$\text{Allowable Length}(l_{db}) = \left[\frac{(H - h)}{2} - cc \right] = 1.349 \text{ m}$$

$$l_{db} \geq l_d \text{ hence, safe}$$

Bottom Reinforcement Design

Along Z Axis



For moment w.r.t. X Axis (M_x)

As Per IS 456 2000 Clause 26.5.2.1

Critical Load Case = #3

Minimum Area of Steel ($A_{st,min}$) = 1597.249 mm²

Calculated Area of Steel (A_{st}) = 3148.179 mm²

Provided Area of Steel ($A_{st,Provided}$) = 3148.179 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Selected bar Size (d_b) = Ø10

Minimum spacing allowed (S_{min}) = 0.050 m

Selected spacing (S) = 0.077 m

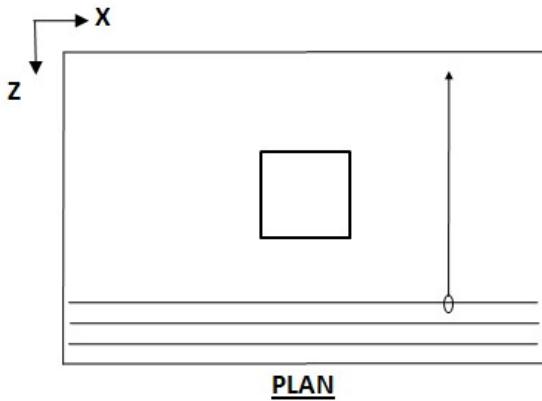
$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø10 @ 0.075 m o.c.

[Along X Axis](#)



For moment w.r.t. Z Axis (M_z)

As Per IS 456 2000 Clause 26.5.2.1

Critical Load Case = #3

Minimum Area of Steel ($A_{st,min}$) = 1593.348 mm²

Calculated Area of Steel (A_{st}) = 3033.620 mm²

Provided Area of Steel ($A_{st,Provided}$) = 3033.620 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.052 m

$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

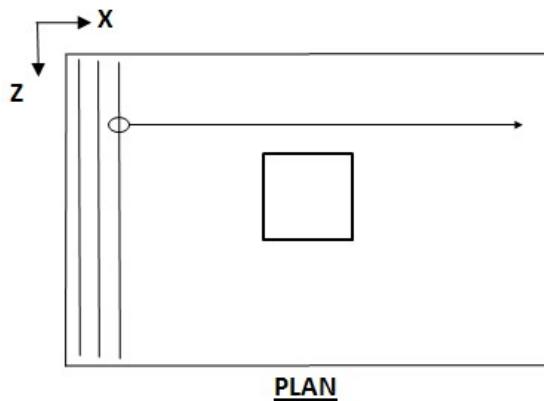
The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0.050 m o.c.

[Top Reinforcement Design](#)

[Along Z Axis](#)



Minimum Area of Steel ($A_{st,min}$) = 1597.249 mm²

Calculated Area of Steel (A_{st}) = 1589.447 mm²

Provided Area of Steel ($A_{st,Provided}$) = 1597.249 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Governing Moment = 35.239 kNm

Selected bar Size (d_b) = Ø6

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.055 m

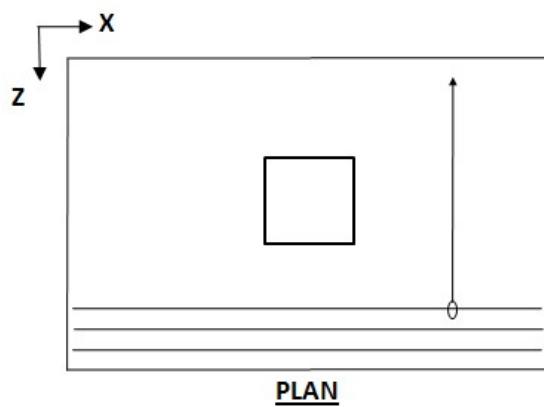
$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø6 @ 0 m o.c.

Along X Axis



Minimum Area of Steel ($A_{st,min}$) = 1593.348 mm²

Calculated Area of Steel (A_{st}) = 3033.620 mm²

Provided Area of Steel ($A_{st,Provided}$) = 3033.620 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Governing Moment = 34.014 kNm

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.052 m

$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0 m o.c.

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 796.824 kN

Critical Applied Moment Along X Direction: 15.936 kNm

Critical Applied Moment Along Z Direction: 15.936 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.182 m

Position Of Neutral Axis Along Z Direction: 0.182 m

Pedestal Moment Capacity Along X Direction: 110.801 kNm

Pedestal Moment Capacity Along Z Direction: 125.969 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 577.848 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m
Position Of Neutral Axis Along Z Direction: 0.137 m
Pedestal Moment Capacity Along X Direction: 93.412 kNm
Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²
Pedestal Main/Compression Reinforcement: 16 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 783.137 kN
Critical Applied Moment Along X Direction: 15.662 kNm
Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m
Position Of Neutral Axis Along Z Direction: 0.180 m
Pedestal Moment Capacity Along X Direction: 110.061 kNm
Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²
Pedestal Main/Compression Reinforcement: 12 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN
Critical Applied Moment Along X Direction: 21.591 kNm
Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m
Position Of Neutral Axis Along Z Direction: 0.235 m
Pedestal Moment Capacity Along X Direction: 116.443 kNm
Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²
Pedestal Main/Compression Reinforcement: 28 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1108.293 kN

Critical Applied Moment Along X Direction: 22.165 kNm

Critical Applied Moment Along Z Direction: 22.165 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.224 kNm

Pedestal Moment Capacity Along Z Direction: 133.768 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 803.721 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1079.582 kN

Critical Applied Moment Along X Direction: 21.591 kNm

Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m

Position Of Neutral Axis Along Z Direction: 0.235 m

Pedestal Moment Capacity Along X Direction: 116.443 kNm

Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²

Pedestal Main/Compression Reinforcement: 28 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m

Position Of Neutral Axis Along Z Direction: 0.180 m

Pedestal Moment Capacity Along X Direction: 110.061 kNm

Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 802.558 kN

Critical Applied Moment Along X Direction: 16.051 kNm

Critical Applied Moment Along Z Direction: 16.051 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.183 m

Position Of Neutral Axis Along Z Direction: 0.183 m

Pedestal Moment Capacity Along X Direction: 111.028 kNm

Pedestal Moment Capacity Along Z Direction: 126.226 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 590.780 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 1106.751 kN

Critical Applied Moment Along X Direction: 22.135 kNm

Critical Applied Moment Along Z Direction: 22.135 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.240 kNm

Pedestal Moment Capacity Along Z Direction: 133.790 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 802.604 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 1137.123 kN

Critical Applied Moment Along X Direction: 22.742 kNm

Critical Applied Moment Along Z Direction: 22.742 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.244 m

Position Of Neutral Axis Along Z Direction: 0.244 m

Pedestal Moment Capacity Along X Direction: 117.002 kNm

Pedestal Moment Capacity Along Z Direction: 133.264 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 824.628 mm²

Pedestal Main/Compression Reinforcement: 32 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1106.751 kN

Critical Applied Moment Along X Direction: 22.135 kNm

Critical Applied Moment Along Z Direction: 22.135 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.240 kNm

Pedestal Moment Capacity Along Z Direction: 133.790 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 802.604 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 802.558 kN

Critical Applied Moment Along X Direction: 16.051 kNm

Critical Applied Moment Along Z Direction: 16.051 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.183 m

Position Of Neutral Axis Along Z Direction: 0.183 m

Pedestal Moment Capacity Along X Direction: 111.028 kNm

Pedestal Moment Capacity Along Z Direction: 126.226 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 590.780 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m
Position Of Neutral Axis Along Z Direction: 0.180 m
Pedestal Moment Capacity Along X Direction: 110.061 kNm
Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²
Pedestal Main/Compression Reinforcement: 12 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN
Critical Applied Moment Along X Direction: 21.591 kNm
Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m
Position Of Neutral Axis Along Z Direction: 0.235 m
Pedestal Moment Capacity Along X Direction: 116.443 kNm
Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²
Pedestal Main/Compression Reinforcement: 28 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m
Critical load Case : 3
Critical Applied Axial Load: 1108.293 kN
Critical Applied Moment Along X Direction: 22.165 kNm
Critical Applied Moment Along Z Direction: 22.165 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m
Position Of Neutral Axis Along Z Direction: 0.239 m
Pedestal Moment Capacity Along X Direction: 117.224 kNm
Pedestal Moment Capacity Along Z Direction: 133.768 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 803.721 mm²
Pedestal Main/Compression Reinforcement: 16 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m
Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN

Critical Applied Moment Along X Direction: 21.591 kNm

Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m

Position Of Neutral Axis Along Z Direction: 0.235 m

Pedestal Moment Capacity Along X Direction: 116.443 kNm

Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²

Pedestal Main/Compression Reinforcement: 28 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m

Position Of Neutral Axis Along Z Direction: 0.180 m

Pedestal Moment Capacity Along X Direction: 110.061 kNm

Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 796.824 kN

Critical Applied Moment Along X Direction: 15.936 kNm

Critical Applied Moment Along Z Direction: 15.936 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.182 m

Position Of Neutral Axis Along Z Direction: 0.182 m

Pedestal Moment Capacity Along X Direction: 110.801 kNm

Pedestal Moment Capacity Along Z Direction: 125.969 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 577.848 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

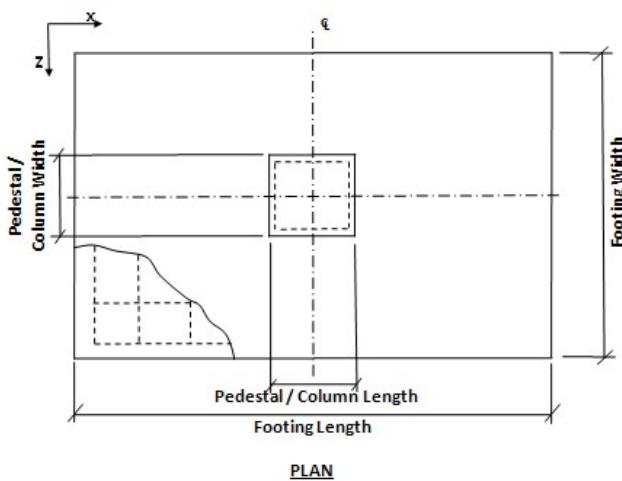
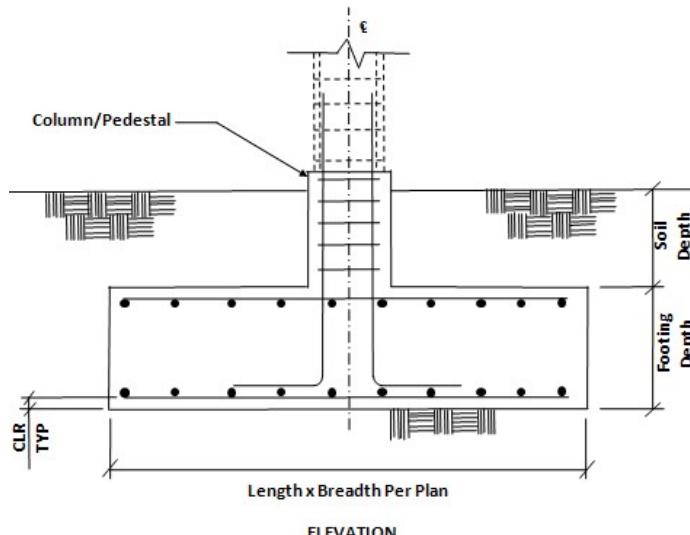
Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Isolated Footing 64



Input Values

Footing Geomtry

Design Type : Calculate Dimension
 Footing Thickness (Ft) : 12.000 in
 Footing Length - X (Fl) : 40.000 in
 Footing Width - Z (Fw) : 40.000 in
 Eccentricity along X (Oxd) : 0.000 in
 Eccentricity along Z (Ozd) : 0.000 in

Column Dimensions

Column Shape : Rectangular
 Column Length - X (Pl) : 0.450 m
 Column Width - Z (Pw) : 0.400 m

Pedestal

Include Pedestal? Yes

Pedestal Shape : Rectangular

Pedestal Height (Ph) : 0.015 m

Pedestal Length - X (Pl) : 0.450 m

Pedestal Width - Z (Pw) : 0.400 m

Design ParametersConcrete and Rebar Properties

Unit Weight of Concrete : 150.000 lb/ft³

Strength of Concrete : 4.000 ksi

Yield Strength of Steel : 60.000 ksi

Minimum Bar Size : Ø6

Maximum Bar Size : Ø32

Minimum Bar Spacing : 2.000 in

Maximum Bar Spacing : 18.000 in

Pedestal Clear Cover (P, CL) : 3.000 in

Footing Clear Cover (F, CL) : 3.000 in

Soil Properties

Soil Type : UnDrained

Unit Weight : 112.000 lb/ft³

Soil Bearing Capacity : 4.000 kip/ft²

Soil Surcharge : 0.000 kip/in²

Depth of Soil above Footing : 0.000 in

Undrained Shear Strength : 0.000 kip/in²

Min Percentage of Slab : 0.000

Sliding and Overturning

Coefficient of Friction : 0.500

Factor of Safety Against Sliding : 1.500

Factor of Safety Against Overturning : 1.500

Load Combination/s- Service Stress Level	
Load Combination Number	Load Combination Title
1	DEAD
2	LIVE
3	COMBINATION LOAD CASE 3
101	1.000 x DL+1.000 x DL+1.000 x DL

102	0.800 x DL+0.800 x DL+0.800 x DL
Load Combination/s- Strength Level	
Load Combination Number	Load Combination Title
1	DEAD
2	LIVE
3	COMBINATION LOAD CASE 3

Applied Loads - Service Stress Level					
LC	Axial (kN)	Shear X (kN)	Shear Z (kN)	Moment X (kNm)	Moment Z (kNm)
1	607.642	0.307	0.000	0.000	-0.330
2	130.192	0.135	0.000	0.000	-0.142
3	1106.751	0.662	0.000	0.000	-0.709
101	1844.586	1.103	0.000	0.000	-1.182
102	1475.669	0.882	0.000	0.000	-0.945

Applied Loads - Strength Level					
LC	Axial (kN)	Shear X (kN)	Shear Z (kN)	Moment X (kNm)	Moment Z (kNm)
1	607.642	0.307	0.000	0.000	-0.330
2	130.192	0.135	0.000	0.000	-0.142
3	1106.751	0.662	0.000	0.000	-0.709

Design Calculations

Footing Size

Initial Length (L_o) = 1.016 m

Initial Width (W_o) = 1.016 m

Uplift force due to buoyancy = 0.000 kN

Effect due to adhesion = 0.000 kN

Area from initial length and width, $A_o = L_o \times W_o = 1.032 \text{ m}^2$

Min. area required from bearing pressure, $A_{\min} = P / q_{\max} = 10.146 \text{ m}^2$

Note: A_{\min} is an initial estimation.

P = Critical Factored Axial Load (without self weight/buoyancy/soil).

q_{\max} = Respective Factored Bearing Capacity.

Final Footing Size

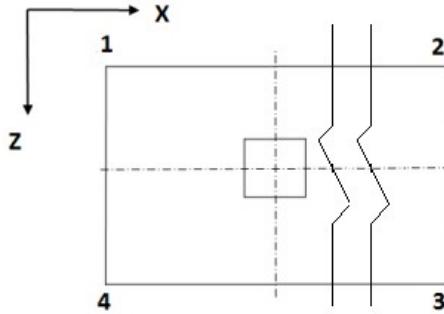
Length (L_2) = 3.200 m Governing Load Case : # 1

Width (W_2) = 3.200 m Governing Load Case : # 1

Depth (D_2) = 0.408 m Governing Load Case : # 1

$$\text{Area } (A_2) = 10.243 \text{ m}^2$$

Pressures at Four Corner



Load Case	Pressure at corner 1 (q_1) (kN/m ²)	Pressure at corner 2 (q_2) (kN/m ²)	Pressure at corner 3 (q_3) (kN/m ²)	Pressure at corner 4 (q_4) (kN/m ²)	Area of footing in uplift (A_u) (m ²)
101	189.3949	189.9982	189.9982	189.3949	0.000
101	189.3949	189.9982	189.9982	189.3949	0.000
101	189.3949	189.9982	189.9982	189.3949	0.000
101	189.3949	189.9982	189.9982	189.3949	0.000

If A_u is zero, there is no uplift and no pressure adjustment is necessary. Otherwise, to account for uplift, areas of negative pressure will be set to zero and the pressure will be redistributed to remaining corners.

Summary of adjusted Pressures at Four Corner

Load Case	Pressure at corner 1 (q_1) (kN/m ²)	Pressure at corner 2 (q_2) (kN/m ²)	Pressure at corner 3 (q_3) (kN/m ²)	Pressure at corner 4 (q_4) (kN/m ²)
101	189.3949	189.9982	189.9982	189.3949
101	189.3949	189.9982	189.9982	189.3949
101	189.3949	189.9982	189.9982	189.3949
101	189.3949	189.9982	189.9982	189.3949

Details of Out-of-Contact Area (If Any)

Governing load case = N/A

Plan area of footing = 10.243 sq.m

Area not in contact with soil = 0.000 sq.m

% of total area not in contact = 0.000%

Check For Stability Against Overturning And Sliding

-	Factor of safety against sliding		Factor of safety against overturning	
Load Case No.	Along X-Direction	Along Z-Direction	About X-Direction	About Z-Direction
1	1151.409	N/A	N/A	2455.922
2	849.694	N/A	N/A	1836.700
3	910.699	N/A	N/A	1950.371
101	880.958	N/A	N/A	1886.677
102	892.111	N/A	N/A	1910.562

Critical Load Case And The Governing Factor Of Safety For Overturning and Sliding X Direction

Critical Load Case for Sliding along X-Direction : 2

Governing Disturbing Force : 0.135 kN

Governing Restoring Force : 114.292 kN

Minimum Sliding Ratio for the Critical Load Case : 849.694

Critical Load Case for Overturning about X-Direction : 1

Governing Overturning Moment : 0.000 kNm

Governing Resisting Moment : 1129.776 kNm

Minimum Overturning Ratio for the Critical Load Case : 0.000

Critical Load Case And The Governing Factor Of Safety For Overturning and Sliding Z Direction

Critical Load Case for Sliding along Z-Direction : 1

Governing Disturbing Force : 0.000 kN

Governing Restoring Force : 353.017 kN

Minimum Sliding Ratio for the Critical Load Case : 0.000

Critical Load Case for Overturning about Z-Direction : 2

Governing Overturning Moment : -0.199 kNm

Governing Resisting Moment : 365.774 kNm

Minimum Overturning Ratio for the Critical Load Case : 1836.700

Moment CalculationCheck Trial Depth against moment (w.r.t. X Axis)**Critical Load Case = #3**

$$\text{Effective Depth} = D - (cc + 0.5 \times d_b) = 0.328 \text{ m}$$

$$\text{Governing moment (M}_u\text{)} = 338.991 \text{ kNm}$$

As Per IS 456 2000 ANNEX G G-1.1C

$$\text{Limiting Factor1 (K}_{u\max}\text{)} = \frac{700}{(1100 + 0.87 \times f_y)} = 0.479483$$

$$\text{Limiting Factor2 (R}_{u\max}\text{)} = \frac{0.36 \times f_{ck} \times k_{u\max} \times (1 - 0.42 \times k_{u\max})}{B} = 3801.834636 \text{ kN/m}^2$$

$$\text{Limit Moment Of Resistance (M}_{u\max}\text{)} = \frac{R_{u\max} \times B \times d_e^2}{2} = 1310.589440 \text{ kNm}$$

$M_u \leq M_{umax}$ hence, safe

Check Trial Depth against moment (w.r.t. Z Axis)

Critical Load Case = #3

$$\text{Effective Depth} = D - (cc + 0.5 \times d_b) = 0.328 \text{ m}$$

$$\text{Governing moment } (M_u) = 327.385 \text{ kNm}$$

As Per IS 456 2000 ANNEX G G-1.1C

$$\text{Limiting Factor1 } (K_{umax}) = \frac{700}{(1100 + 0.87 \times f_y)} = 0.479483$$

$$\text{Limiting Factor2 } (R_{umax}) = \frac{0.36 \times f_{ck} \times k_{umax} \times (1 - 0.42 \times k_{umax})}{k_{umax}} = 3801.834636 \text{ kN/m}^2$$

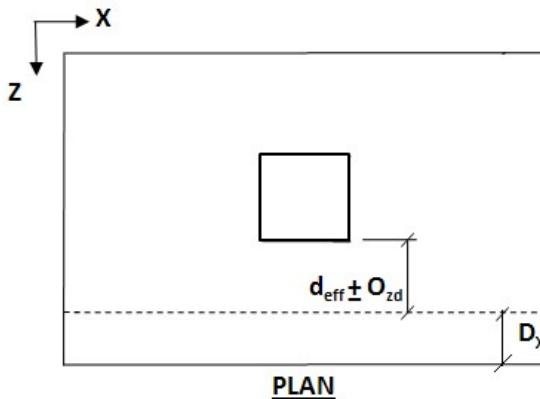
$$\text{Limit Moment Of Resistance } (M_{umax}) = \frac{R_{umax} \times B \times d_e^2}{4} = 1310.589440 \text{ kNm}$$

$M_u \leq M_{umax}$ hence, safe

Shear Calculation

Check Trial Depth for one way shear (Along X Axis)

(Shear Plane Parallel to X Axis)



Critical Load Case = #3

$$D_X = 0.328 \text{ m}$$

$$\text{Shear Force}(S) = 370.716 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 352.937646 \text{ kN/m}^2$$

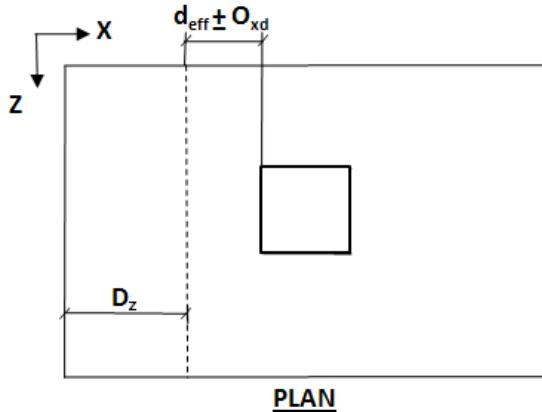
$$\text{Percentage Of Steel}(P_t) = 0.2752$$

As Per IS 456 2000 Clause 40 Table 19

$$\text{Shear Strength Of Concrete}(T_c) = 382.769 \text{ kN/m}^2$$

$T_v < T_c$ hence, safe

Check Trial Depth for one way shear (Along Z Axis)
(Shear Plane Parallel to Z Axis)



Critical Load Case = #3

$$D_z = 0.327 \text{ m}$$

$$\text{Shear Force}(S) = 362.796 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 346.453672 \text{ kN/m}^2$$

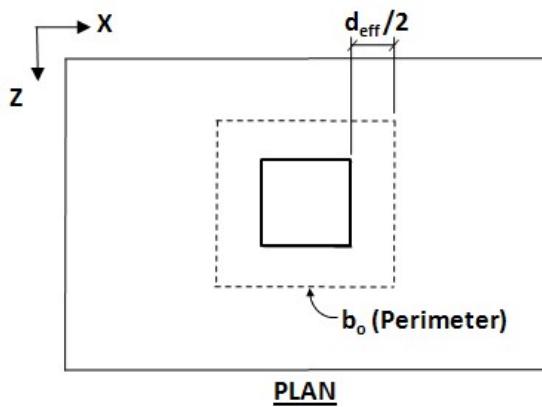
$$\text{Percentage Of Steel}(P_t) = 0.2873$$

As Per IS 456 2000 Clause 40 Table 19

$$\text{Shear Strength Of Concrete}(T_c) = 389.955 \text{ kN/m}^2$$

$T_v < T_c$ hence, safe

Check Trial Depth for two way shear



Critical Load Case = #3

$$\text{Shear Force}(S) = 1045.682 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 1062.168 \text{ kN/m}^2$$

As Per IS 456 2000 Clause 31.6.3.1

$$K_s = \min[0.5 + \beta, 1] = 1.000$$

$$\text{Shear Strength}(T_c) = 0.25 \times \sqrt{f_{ck}} = 1312.8936 \text{ kN/m}^2$$

$$K_s \times T_c = 1312.8936 \text{ kN/m}^2$$

$$T_v \leq K_s \times T_c \text{ hence, safe}$$

Reinforcement Calculation

Calculation of Maximum Bar Size

Along X Axis

Bar diameter corresponding to max bar size (d_b) = 32 mm

As Per IS 456 2000 Clause 26.2.1

$$\text{Development Length}(l_d) = \frac{d_b \times 0.87 \times f_y}{4 \times \gamma_{bd}} = 1.224 \text{ m}$$

$$\text{Allowable Length}(l_{db}) = \left[\frac{(B - b)}{2} - cc \right] = 1.299 \text{ m}$$

$$l_{db} \geq l_d \text{ hence, safe}$$

Along Z Axis

Bar diameter corresponding to max bar size(d_b) = 32 mm

As Per IS 456 2000 Clause 26.2.1

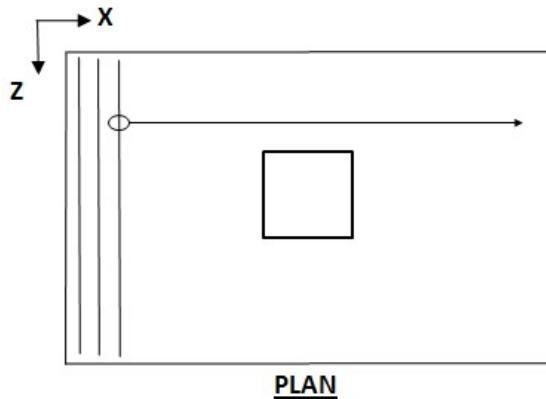
$$\text{Development Length}(l_d) = \frac{d_b \times 0.87 \times f_y}{4 \times \gamma_{bd}} = 1.224 \text{ m}$$

$$\text{Allowable Length}(l_{db}) = \left[\frac{(H - h)}{2} - cc \right] = 1.324 \text{ m}$$

$$l_{db} \geq l_d \text{ hence, safe}$$

Bottom Reinforcement Design

Along Z Axis



For moment w.r.t. X Axis (M_x)

As Per IS 456 2000 Clause 26.5.2.1

Critical Load Case = #3

Minimum Area of Steel ($A_{st,min}$) = 1568.452 mm²

Calculated Area of Steel (A_{st}) = 2998.289 mm²

Provided Area of Steel ($A_{st,Provided}$) = 2998.289 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.048 m

Selected spacing (S) = 0.052 m

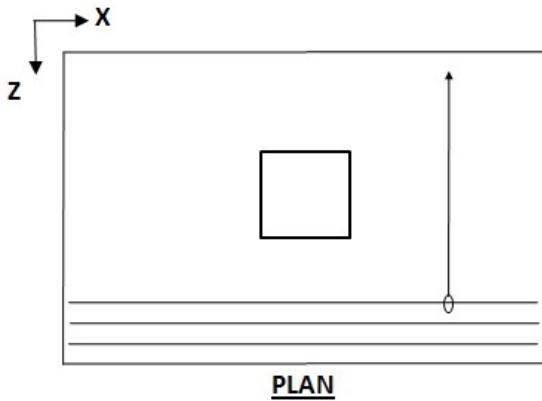
$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0.050 m o.c.

Along X Axis



For moment w.r.t. Z Axis (M_z)

As Per IS 456 2000 Clause 26.5.2.1

Critical Load Case = #3

Minimum Area of Steel ($A_{st,min}$) = 1568.452 mm²

Calculated Area of Steel (A_{st}) = 2891.010 mm²

Provided Area of Steel ($A_{st,Provided}$) = 2891.010 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.053 m

$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

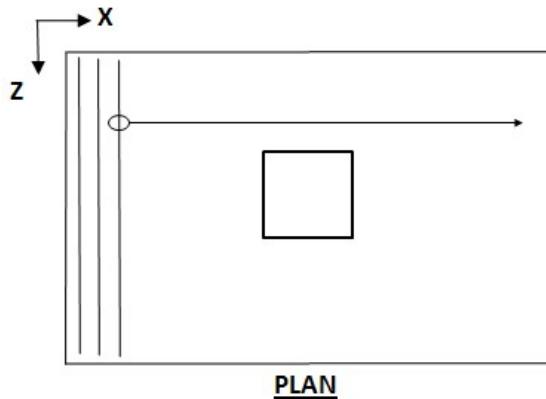
The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0.050 m o.c.

[Top Reinforcement Design](#)

[Along Z Axis](#)



Minimum Area of Steel ($A_{st,min}$) = 1568.452 mm²

Calculated Area of Steel (A_{st}) = 1564.611 mm²

Provided Area of Steel ($A_{st,Provided}$) = 1568.452 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Governing Moment = 33.464 kNm

Selected bar Size (d_b) = Ø6

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.055 m

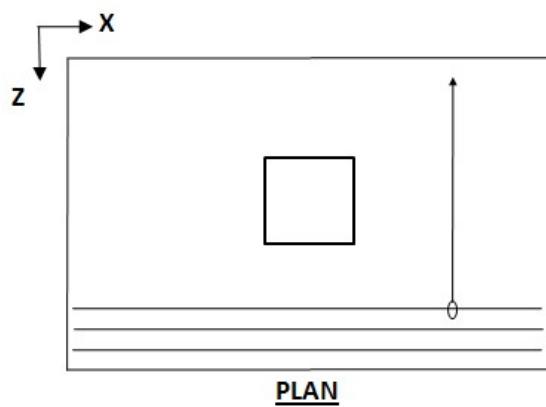
$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø6 @ 0 m o.c.

Along X Axis



Minimum Area of Steel ($A_{st,min}$) = 1568.452 mm²

Calculated Area of Steel (A_{st}) = 2891.010 mm²

Provided Area of Steel ($A_{st,Provided}$) = 2891.010 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Governing Moment = 32.279 kNm

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.053 m

$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0 m o.c.

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 796.824 kN

Critical Applied Moment Along X Direction: 15.936 kNm

Critical Applied Moment Along Z Direction: 15.936 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.182 m

Position Of Neutral Axis Along Z Direction: 0.182 m

Pedestal Moment Capacity Along X Direction: 110.801 kNm

Pedestal Moment Capacity Along Z Direction: 125.969 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 577.848 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m
Position Of Neutral Axis Along Z Direction: 0.137 m
Pedestal Moment Capacity Along X Direction: 93.412 kNm
Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²
Pedestal Main/Compression Reinforcement: 16 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 783.137 kN
Critical Applied Moment Along X Direction: 15.662 kNm
Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m
Position Of Neutral Axis Along Z Direction: 0.180 m
Pedestal Moment Capacity Along X Direction: 110.061 kNm
Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²
Pedestal Main/Compression Reinforcement: 12 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN
Critical Applied Moment Along X Direction: 21.591 kNm
Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m
Position Of Neutral Axis Along Z Direction: 0.235 m
Pedestal Moment Capacity Along X Direction: 116.443 kNm
Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²
Pedestal Main/Compression Reinforcement: 28 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1108.293 kN

Critical Applied Moment Along X Direction: 22.165 kNm

Critical Applied Moment Along Z Direction: 22.165 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.224 kNm

Pedestal Moment Capacity Along Z Direction: 133.768 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 803.721 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1079.582 kN

Critical Applied Moment Along X Direction: 21.591 kNm

Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m

Position Of Neutral Axis Along Z Direction: 0.235 m

Pedestal Moment Capacity Along X Direction: 116.443 kNm

Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²

Pedestal Main/Compression Reinforcement: 28 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m

Position Of Neutral Axis Along Z Direction: 0.180 m

Pedestal Moment Capacity Along X Direction: 110.061 kNm

Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 802.558 kN

Critical Applied Moment Along X Direction: 16.051 kNm

Critical Applied Moment Along Z Direction: 16.051 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.183 m

Position Of Neutral Axis Along Z Direction: 0.183 m

Pedestal Moment Capacity Along X Direction: 111.028 kNm

Pedestal Moment Capacity Along Z Direction: 126.226 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 590.780 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1106.751 kN

Critical Applied Moment Along X Direction: 22.135 kNm

Critical Applied Moment Along Z Direction: 22.135 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.240 kNm

Pedestal Moment Capacity Along Z Direction: 133.790 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 802.604 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1137.123 kN

Critical Applied Moment Along X Direction: 22.742 kNm

Critical Applied Moment Along Z Direction: 22.742 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.244 m

Position Of Neutral Axis Along Z Direction: 0.244 m

Pedestal Moment Capacity Along X Direction: 117.002 kNm

Pedestal Moment Capacity Along Z Direction: 133.264 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 824.628 mm²

Pedestal Main/Compression Reinforcement: 32 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1106.751 kN

Critical Applied Moment Along X Direction: 22.135 kNm

Critical Applied Moment Along Z Direction: 22.135 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.240 kNm

Pedestal Moment Capacity Along Z Direction: 133.790 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 802.604 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 802.558 kN

Critical Applied Moment Along X Direction: 16.051 kNm

Critical Applied Moment Along Z Direction: 16.051 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.183 m

Position Of Neutral Axis Along Z Direction: 0.183 m

Pedestal Moment Capacity Along X Direction: 111.028 kNm

Pedestal Moment Capacity Along Z Direction: 126.226 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 590.780 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m
Position Of Neutral Axis Along Z Direction: 0.180 m
Pedestal Moment Capacity Along X Direction: 110.061 kNm
Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²
Pedestal Main/Compression Reinforcement: 12 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN
Critical Applied Moment Along X Direction: 21.591 kNm
Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m
Position Of Neutral Axis Along Z Direction: 0.235 m
Pedestal Moment Capacity Along X Direction: 116.443 kNm
Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²
Pedestal Main/Compression Reinforcement: 28 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m
Critical load Case : 3
Critical Applied Axial Load: 1108.293 kN
Critical Applied Moment Along X Direction: 22.165 kNm
Critical Applied Moment Along Z Direction: 22.165 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m
Position Of Neutral Axis Along Z Direction: 0.239 m
Pedestal Moment Capacity Along X Direction: 117.224 kNm
Pedestal Moment Capacity Along Z Direction: 133.768 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 803.721 mm²
Pedestal Main/Compression Reinforcement: 16 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m
Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN

Critical Applied Moment Along X Direction: 21.591 kNm

Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m

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Pedestal Moment Capacity Along X Direction: 116.443 kNm

Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²

Pedestal Main/Compression Reinforcement: 28 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m

Position Of Neutral Axis Along Z Direction: 0.180 m

Pedestal Moment Capacity Along X Direction: 110.061 kNm

Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 796.824 kN

Critical Applied Moment Along X Direction: 15.936 kNm

Critical Applied Moment Along Z Direction: 15.936 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.182 m

Position Of Neutral Axis Along Z Direction: 0.182 m

Pedestal Moment Capacity Along X Direction: 110.801 kNm

Pedestal Moment Capacity Along Z Direction: 125.969 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 577.848 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

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Pedestal Moment Capacity Along X Direction: 108.152 kNm

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IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

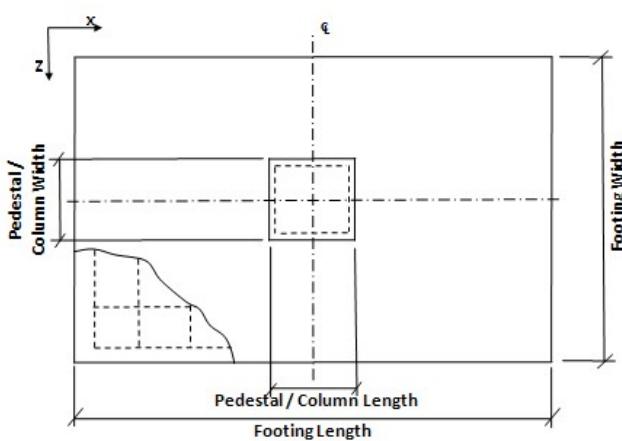
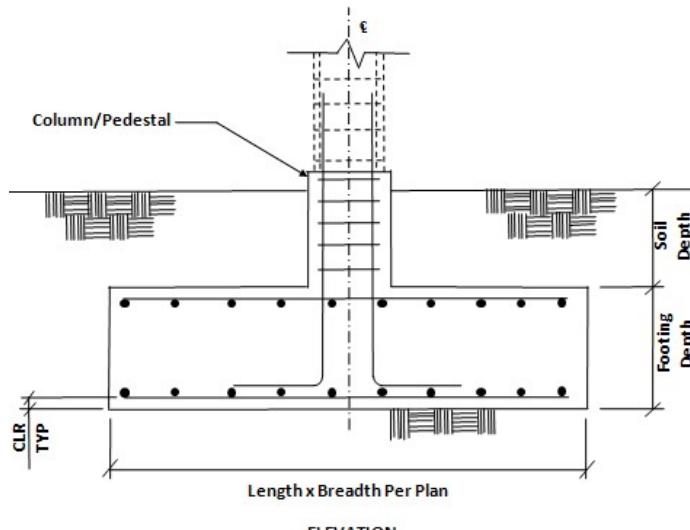
Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Isolated Footing 65



Input Values

Footing Geomtry

Design Type : Calculate Dimension
 Footing Thickness (Ft) : 12.000 in
 Footing Length - X (Fl) : 40.000 in
 Footing Width - Z (Fw) : 40.000 in
 Eccentricity along X (Oxd) : 0.000 in
 Eccentricity along Z (Ozd) : 0.000 in

Column Dimensions

Column Shape : Rectangular
 Column Length - X (Pl) : 0.450 m
 Column Width - Z (Pw) : 0.400 m

Pedestal

Include Pedestal? Yes

Pedestal Shape : Rectangular

Pedestal Height (Ph) : 0.015 m

Pedestal Length - X (Pl) : 0.450 m

Pedestal Width - Z (Pw) : 0.400 m

Design ParametersConcrete and Rebar Properties

Unit Weight of Concrete : 150.000 lb/ft³

Strength of Concrete : 4.000 ksi

Yield Strength of Steel : 60.000 ksi

Minimum Bar Size : Ø6

Maximum Bar Size : Ø32

Minimum Bar Spacing : 2.000 in

Maximum Bar Spacing : 18.000 in

Pedestal Clear Cover (P, CL) : 3.000 in

Footing Clear Cover (F, CL) : 3.000 in

Soil Properties

Soil Type : UnDrained

Unit Weight : 112.000 lb/ft³

Soil Bearing Capacity : 4.000 kip/ft²

Soil Surcharge : 0.000 kip/in²

Depth of Soil above Footing : 0.000 in

Undrained Shear Strength : 0.000 kip/in²

Min Percentage of Slab : 0.000

Sliding and Overturning

Coefficient of Friction : 0.500

Factor of Safety Against Sliding : 1.500

Factor of Safety Against Overturning : 1.500

Load Combination/s- Service Stress Level	
Load Combination Number	Load Combination Title
1	DEAD
2	LIVE
3	COMBINATION LOAD CASE 3
101	1.000 x DL+1.000 x DL+1.000 x DL

102	0.800 x DL+0.800 x DL+0.800 x DL
Load Combination/s- Strength Level	
Load Combination Number	Load Combination Title
1	DEAD
2	LIVE
3	COMBINATION LOAD CASE 3

Applied Loads - Service Stress Level					
LC	Axial (kN)	Shear X (kN)	Shear Z (kN)	Moment X (kNm)	Moment Z (kNm)
1	461.702	2.592	0.000	0.000	-2.571
2	73.337	0.865	0.000	0.000	-0.860
3	802.558	5.185	0.000	0.000	-5.147
101	1337.596	8.642	0.000	0.000	-8.578
102	1070.077	6.914	0.000	0.000	-6.862

Applied Loads - Strength Level					
LC	Axial (kN)	Shear X (kN)	Shear Z (kN)	Moment X (kNm)	Moment Z (kNm)
1	461.702	2.592	0.000	0.000	-2.571
2	73.337	0.865	0.000	0.000	-0.860
3	802.558	5.185	0.000	0.000	-5.147

Design Calculations

Footing Size

Initial Length (L_o) = 1.016 m

Initial Width (W_o) = 1.016 m

Uplift force due to buoyancy = 0.000 kN

Effect due to adhesion = 0.000 kN

Area from initial length and width, $A_o = L_o \times W_o = 1.032 \text{ m}^2$

Min. area required from bearing pressure, $A_{\min} = P / q_{\max} = 7.024 \text{ m}^2$

Note: A_{\min} is an initial estimation.

P = Critical Factored Axial Load (without self weight/buoyancy/soil).

q_{\max} = Respective Factored Bearing Capacity.

Final Footing Size

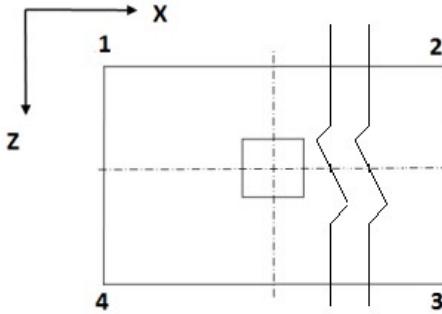
Length (L_2) = 2.743 m Governing Load Case : # 101

Width (W_2) = 2.743 m Governing Load Case : # 101

Depth (D_2) = 0.306 m Governing Load Case : # 101

$$\text{Area } (A_2) = 7.525 \text{ m}^2$$

Pressures at Four Corner



Load Case	Pressure at corner 1 (q_1) (kN/m ²)	Pressure at corner 2 (q_2) (kN/m ²)	Pressure at corner 3 (q_3) (kN/m ²)	Pressure at corner 4 (q_4) (kN/m ²)	Area of footing in uplift (A_u) (m ²)
101	181.6440	188.2383	188.2383	181.6440	0.000
101	181.6440	188.2383	188.2383	181.6440	0.000
101	181.6440	188.2383	188.2383	181.6440	0.000
101	181.6440	188.2383	188.2383	181.6440	0.000

If A_u is zero, there is no uplift and no pressure adjustment is necessary. Otherwise, to account for uplift, areas of negative pressure will be set to zero and the pressure will be redistributed to remaining corners.

Summary of adjusted Pressures at Four Corner

Load Case	Pressure at corner 1 (q_1) (kN/m ²)	Pressure at corner 2 (q_2) (kN/m ²)	Pressure at corner 3 (q_3) (kN/m ²)	Pressure at corner 4 (q_4) (kN/m ²)
101	181.6440	188.2383	188.2383	181.6440
101	181.6440	188.2383	188.2383	181.6440
101	181.6440	188.2383	188.2383	181.6440
101	181.6440	188.2383	188.2383	181.6440

Details of Out-of-Contact Area (If Any)

Governing load case = N/A

Plan area of footing = 7.525 sq.m

Area not in contact with soil = 0.000 sq.m

% of total area not in contact = 0.000%

Check For Stability Against Overturning And Sliding

-	Factor of safety against sliding		Factor of safety against overturning	
Load Case No.	Along X-Direction	Along Z-Direction	About X-Direction	About Z-Direction
1	99.517	N/A	N/A	208.030
2	73.644	N/A	N/A	153.797
3	82.605	N/A	N/A	172.635
101	80.518	N/A	N/A	168.274
102	81.300	N/A	N/A	169.909

Critical Load Case And The Governing Factor Of Safety For Overturning and Sliding X Direction

Critical Load Case for Sliding along X-Direction : 2

Governing Disturbing Force : 0.865 kN

Governing Restoring Force : 63.724 kN

Minimum Sliding Ratio for the Critical Load Case : 73.644

Critical Load Case for Overturning about X-Direction : 1

Governing Overturning Moment : 0.000 kNm

Governing Resisting Moment : 707.478 kNm

Minimum Overturning Ratio for the Critical Load Case : 0.000

Critical Load Case And The Governing Factor Of Safety For Overturning and Sliding Z Direction

Critical Load Case for Sliding along Z-Direction : 1

Governing Disturbing Force : 0.000 kN

Governing Restoring Force : 257.907 kN

Minimum Sliding Ratio for the Critical Load Case : 0.000

Critical Load Case for Overturning about Z-Direction : 2

Governing Overturning Moment : -1.137 kNm

Governing Resisting Moment : 174.806 kNm

Minimum Overturning Ratio for the Critical Load Case : 153.797

Moment Calculation

Check Trial Depth against moment (w.r.t. X Axis)

Critical Load Case = #3

$$\text{Effective Depth} = D - (cc + 0.5 \times d_b) = 0.226 \text{ m}$$

$$\text{Governing moment (M}_u\text{)} = 200.789 \text{ kNm}$$

As Per IS 456 2000 ANNEX G G-1.1C

$$\text{Limiting Factor1 (K}_{u\max}\text{)} = \frac{700}{(1100 + 0.87 \times f_y)} = 0.479483$$

$$\text{Limiting Factor2 (R}_{u\max}\text{)} = \frac{0.36 \times f_{ck} \times k_{u\max} \times (1 - 0.42 \times k_{u\max})}{B} = 3801.834636 \text{ kN/m}^2$$

$$\text{Limit Moment Of Resistance (M}_{u\max}\text{)} = \frac{R_{u\max} \times B \times d_e^2}{2} = 530.787790 \text{ kNm}$$

$M_u \leq M_{umax}$ hence, safe

Check Trial Depth against moment (w.r.t. Z Axis)

Critical Load Case = #3

$$\text{Effective Depth} = D - (cc + 0.5 \times d_b) = 0.226 \text{ m}$$

$$\text{Governing moment } (M_u) = 194.887 \text{ kNm}$$

As Per IS 456 2000 ANNEX G G-1.1C

$$\text{Limiting Factor1 } (K_{umax}) = \frac{700}{(1100 + 0.87 \times f_y)} = 0.479483$$

$$\text{Limiting Factor2 } (R_{umax}) = \frac{0.36 \times f_{ck} \times k_{umax} \times (1 - 0.42 \times k_{umax})}{k_{umax}} = 3801.834636 \text{ kN/m}^2$$

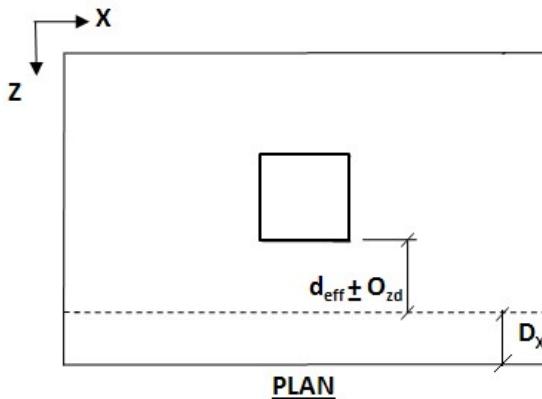
$$\text{Limit Moment Of Resistance } (M_{umax}) = \frac{R_{umax} \times B \times d_e^2}{4} = 530.787790 \text{ kNm}$$

$M_u \leq M_{umax}$ hence, safe

Shear Calculation

Check Trial Depth for one way shear (Along X Axis)

(Shear Plane Parallel to X Axis)



Critical Load Case = #3

$$D_X = 0.226 \text{ m}$$

$$\text{Shear Force}(S) = 276.764 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 447.212244 \text{ kN/m}^2$$

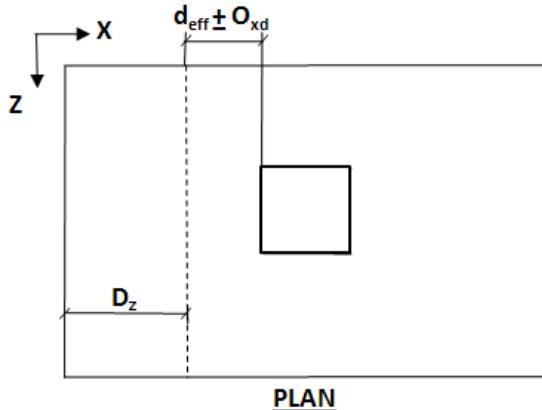
$$\text{Percentage Of Steel}(P_t) = 0.4135$$

As Per IS 456 2000 Clause 40 Table 19

$$\text{Shear Strength Of Concrete}(T_c) = 455.621 \text{ kN/m}^2$$

$T_v < T_c$ hence, safe

Check Trial Depth for one way shear (Along Z Axis)
(Shear Plane Parallel to Z Axis)



Critical Load Case = #3

$$D_z = 0.226 \text{ m}$$

$$\text{Shear Force}(S) = 272.770 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 440.758514 \text{ kN/m}^2$$

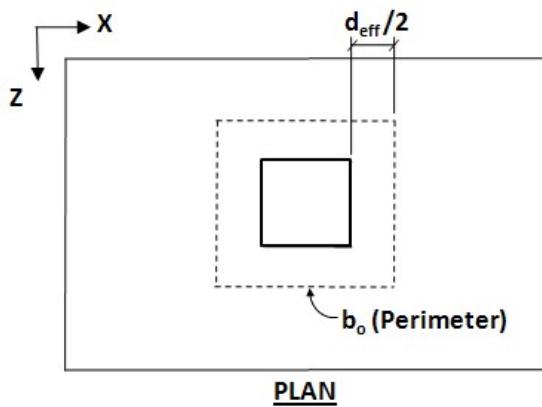
$$\text{Percentage Of Steel}(P_t) = 0.4269$$

As Per IS 456 2000 Clause 40 Table 19

$$\text{Shear Strength Of Concrete}(T_c) = 461.784 \text{ kN/m}^2$$

$T_v < T_c$ hence, safe

Check Trial Depth for two way shear



Critical Load Case = #3

$$\text{Shear Force}(S) = 757.482 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 1290.208 \text{ kN/m}^2$$

As Per IS 456 2000 Clause 31.6.3.1

$$K_s = \min[(0.5 + \beta), 1] = 1.000$$

$$\text{Shear Strength}(T_c) = 0.25 \times \sqrt{f_{ck}} = 1312.8936 \text{ kN/m}^2$$

$$K_s \times T_c = 1312.8936 \text{ kN/m}^2$$

$$T_v \leq K_s \times T_c \text{ hence, safe}$$

Reinforcement Calculation

Calculation of Maximum Bar Size

Along X Axis

Bar diameter corresponding to max bar size (d_b) = 25 mm

As Per IS 456 2000 Clause 26.2.1

$$\text{Development Length}(l_d) = \frac{d_b \times 0.87 \times f_y}{4 \times \gamma_{bd}} = 0.956 \text{ m}$$

$$\text{Allowable Length}(l_{db}) = \left[\frac{(B - b)}{2} - cc \right] = 1.070 \text{ m}$$

$$l_{db} \geq l_d \text{ hence, safe}$$

Along Z Axis

Bar diameter corresponding to max bar size(d_b) = 25 mm

As Per IS 456 2000 Clause 26.2.1

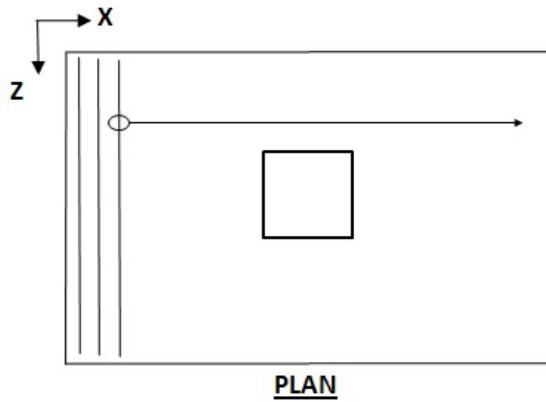
$$\text{Development Length}(l_d) = \frac{d_b \times 0.87 \times f_y}{4 \times \gamma_{bd}} = 0.956 \text{ m}$$

$$\text{Allowable Length}(l_{db}) = \left[\frac{(H - h)}{2} - cc \right] = 1.095 \text{ m}$$

$$l_{db} \geq l_d \text{ hence, safe}$$

Bottom Reinforcement Design

Along Z Axis



For moment w.r.t. X Axis (M_x)

As Per IS 456 2000 Clause 26.5.2.1

Critical Load Case = #3

Minimum Area of Steel ($A_{st,min}$) = 1009.936 mm²

Calculated Area of Steel (A_{st}) = 2642.180 mm²

Provided Area of Steel ($A_{st,Provided}$) = 2642.180 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Selected bar Size (d_b) = Ø10

Minimum spacing allowed (S_{min}) = 0.050 m

Selected spacing (S) = 0.078 m

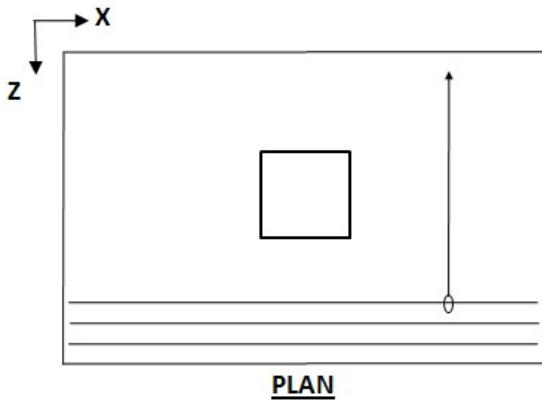
$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø10 @ 0.075 m o.c.

[Along X Axis](#)



For moment w.r.t. Z Axis (M_z)

As Per IS 456 2000 Clause 26.5.2.1

Critical Load Case = #3

Minimum Area of Steel ($A_{st,min}$) = 1006.645 mm²

Calculated Area of Steel (A_{st}) = 2559.001 mm²

Provided Area of Steel ($A_{st,Provided}$) = 2559.001 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.052 m

$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

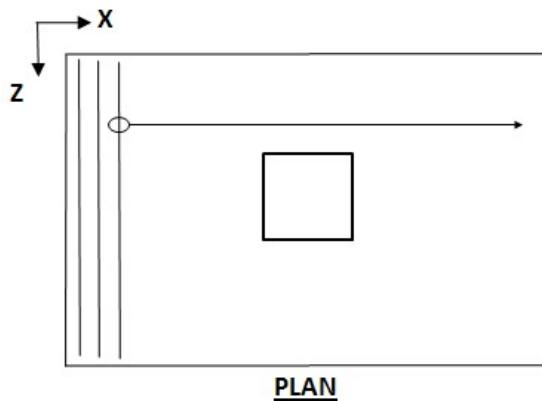
The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0.050 m o.c.

[Top Reinforcement Design](#)

[Along Z Axis](#)



Minimum Area of Steel ($A_{st,min}$) = 1009.936 mm²

Calculated Area of Steel (A_{st}) = 1003.353 mm²

Provided Area of Steel ($A_{st,Provided}$) = 1009.936 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Governing Moment = 15.024 kNm

Selected bar Size (d_b) = Ø6

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.074 m

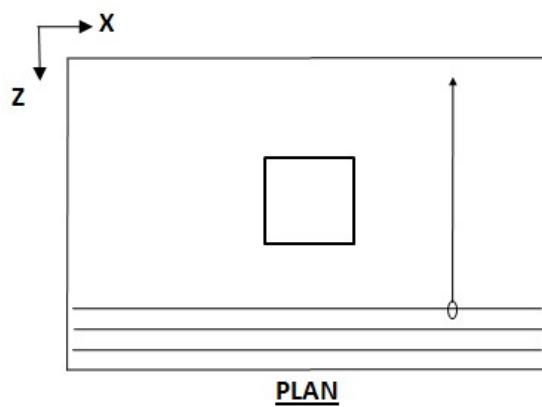
$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø6 @ 0 m o.c.

Along X Axis



Minimum Area of Steel ($A_{st,min}$) = 1006.645 mm²

Calculated Area of Steel (A_{st}) = 2559.001 mm²

Provided Area of Steel ($A_{st,Provided}$) = 2559.001 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Governing Moment = 14.390 kNm

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.052 m

$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0 m o.c.

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 796.824 kN

Critical Applied Moment Along X Direction: 15.936 kNm

Critical Applied Moment Along Z Direction: 15.936 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.182 m

Position Of Neutral Axis Along Z Direction: 0.182 m

Pedestal Moment Capacity Along X Direction: 110.801 kNm

Pedestal Moment Capacity Along Z Direction: 125.969 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 577.848 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m
Position Of Neutral Axis Along Z Direction: 0.137 m
Pedestal Moment Capacity Along X Direction: 93.412 kNm
Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²
Pedestal Main/Compression Reinforcement: 16 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 783.137 kN
Critical Applied Moment Along X Direction: 15.662 kNm
Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m
Position Of Neutral Axis Along Z Direction: 0.180 m
Pedestal Moment Capacity Along X Direction: 110.061 kNm
Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²
Pedestal Main/Compression Reinforcement: 12 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN
Critical Applied Moment Along X Direction: 21.591 kNm
Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m
Position Of Neutral Axis Along Z Direction: 0.235 m
Pedestal Moment Capacity Along X Direction: 116.443 kNm
Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²
Pedestal Main/Compression Reinforcement: 28 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1108.293 kN

Critical Applied Moment Along X Direction: 22.165 kNm

Critical Applied Moment Along Z Direction: 22.165 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.224 kNm

Pedestal Moment Capacity Along Z Direction: 133.768 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 803.721 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1079.582 kN

Critical Applied Moment Along X Direction: 21.591 kNm

Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m

Position Of Neutral Axis Along Z Direction: 0.235 m

Pedestal Moment Capacity Along X Direction: 116.443 kNm

Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²

Pedestal Main/Compression Reinforcement: 28 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m

Position Of Neutral Axis Along Z Direction: 0.180 m

Pedestal Moment Capacity Along X Direction: 110.061 kNm

Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 802.558 kN

Critical Applied Moment Along X Direction: 16.051 kNm

Critical Applied Moment Along Z Direction: 16.051 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.183 m

Position Of Neutral Axis Along Z Direction: 0.183 m

Pedestal Moment Capacity Along X Direction: 111.028 kNm

Pedestal Moment Capacity Along Z Direction: 126.226 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 590.780 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1106.751 kN

Critical Applied Moment Along X Direction: 22.135 kNm

Critical Applied Moment Along Z Direction: 22.135 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.240 kNm

Pedestal Moment Capacity Along Z Direction: 133.790 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 802.604 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1137.123 kN

Critical Applied Moment Along X Direction: 22.742 kNm

Critical Applied Moment Along Z Direction: 22.742 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.244 m

Position Of Neutral Axis Along Z Direction: 0.244 m

Pedestal Moment Capacity Along X Direction: 117.002 kNm

Pedestal Moment Capacity Along Z Direction: 133.264 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 824.628 mm²

Pedestal Main/Compression Reinforcement: 32 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1106.751 kN

Critical Applied Moment Along X Direction: 22.135 kNm

Critical Applied Moment Along Z Direction: 22.135 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.240 kNm

Pedestal Moment Capacity Along Z Direction: 133.790 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 802.604 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 802.558 kN

Critical Applied Moment Along X Direction: 16.051 kNm

Critical Applied Moment Along Z Direction: 16.051 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.183 m

Position Of Neutral Axis Along Z Direction: 0.183 m

Pedestal Moment Capacity Along X Direction: 111.028 kNm

Pedestal Moment Capacity Along Z Direction: 126.226 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 590.780 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m
Position Of Neutral Axis Along Z Direction: 0.180 m
Pedestal Moment Capacity Along X Direction: 110.061 kNm
Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²
Pedestal Main/Compression Reinforcement: 12 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN
Critical Applied Moment Along X Direction: 21.591 kNm
Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m
Position Of Neutral Axis Along Z Direction: 0.235 m
Pedestal Moment Capacity Along X Direction: 116.443 kNm
Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²
Pedestal Main/Compression Reinforcement: 28 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m
Pedestal Reinforcement Design
Critical load Case : 3
Critical Applied Axial Load: 1108.293 kN
Critical Applied Moment Along X Direction: 22.165 kNm
Critical Applied Moment Along Z Direction: 22.165 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m
Position Of Neutral Axis Along Z Direction: 0.239 m
Pedestal Moment Capacity Along X Direction: 117.224 kNm
Pedestal Moment Capacity Along Z Direction: 133.768 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 803.721 mm²
Pedestal Main/Compression Reinforcement: 16 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m
Pedestal Reinforcement Design
Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN

Critical Applied Moment Along X Direction: 21.591 kNm

Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m

Position Of Neutral Axis Along Z Direction: 0.235 m

Pedestal Moment Capacity Along X Direction: 116.443 kNm

Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²

Pedestal Main/Compression Reinforcement: 28 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m

Position Of Neutral Axis Along Z Direction: 0.180 m

Pedestal Moment Capacity Along X Direction: 110.061 kNm

Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 796.824 kN

Critical Applied Moment Along X Direction: 15.936 kNm

Critical Applied Moment Along Z Direction: 15.936 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.182 m

Position Of Neutral Axis Along Z Direction: 0.182 m

Pedestal Moment Capacity Along X Direction: 110.801 kNm

Pedestal Moment Capacity Along Z Direction: 125.969 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 577.848 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

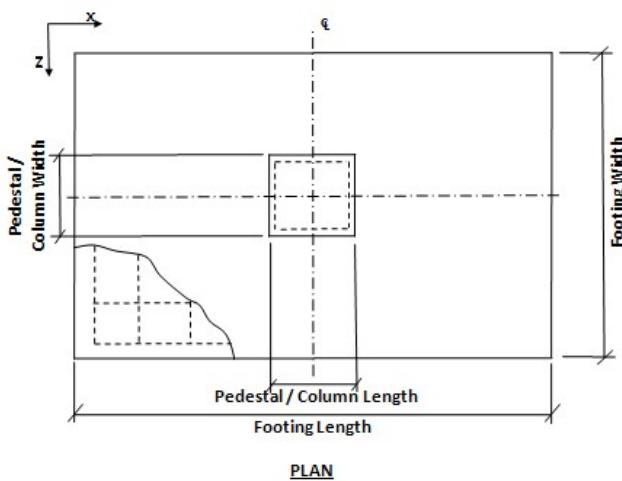
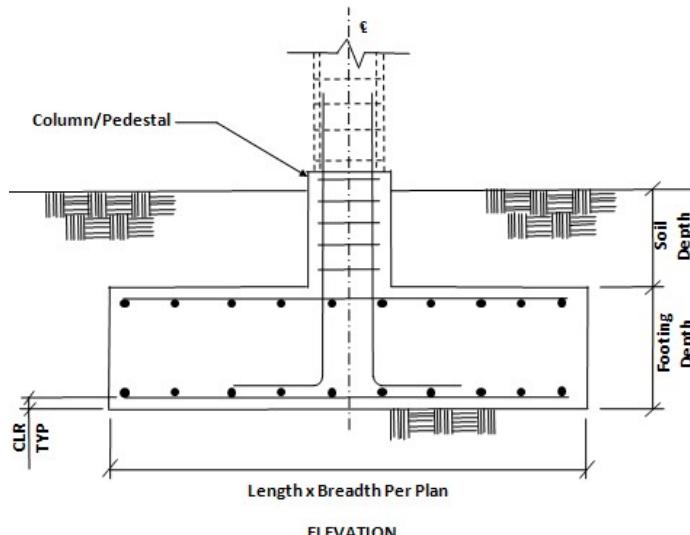
Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Isolated Footing 91



Input Values

Footing Geomtry

Design Type : Calculate Dimension
 Footing Thickness (Ft) : 12.000 in
 Footing Length - X (Fl) : 40.000 in
 Footing Width - Z (Fw) : 40.000 in
 Eccentricity along X (Oxd) : 0.000 in
 Eccentricity along Z (Ozd) : 0.000 in

Column Dimensions

Column Shape : Rectangular
 Column Length - X (Pl) : 0.450 m
 Column Width - Z (Pw) : 0.400 m

Pedestal

Include Pedestal? Yes
 Pedestal Shape : Rectangular
 Pedestal Height (Ph) : 0.015 m
 Pedestal Length - X (Pl) : 0.450 m
 Pedestal Width - Z (Pw) : 0.400 m

Design Parameters

Concrete and Rebar Properties

Unit Weight of Concrete : 150.000 lb/ft³
 Strength of Concrete : 4.000 ksi
 Yield Strength of Steel : 60.000 ksi
 Minimum Bar Size : Ø6
 Maximum Bar Size : Ø32
 Minimum Bar Spacing : 2.000 in
 Maximum Bar Spacing : 18.000 in
 Pedestal Clear Cover (P, CL) : 3.000 in
 Footing Clear Cover (F, CL) : 3.000 in

Soil Properties

Soil Type : UnDrained
 Unit Weight : 112.000 lb/ft³
 Soil Bearing Capacity : 4.000 kip/ft²
 Soil Surcharge : 0.000 kip/in²
 Depth of Soil above Footing : 0.000 in
 Undrained Shear Strength : 0.000 kip/in²
 Min Percentage of Slab : 0.000

Sliding and Overturning

Coefficient of Friction : 0.500
 Factor of Safety Against Sliding : 1.500
 Factor of Safety Against Overturning : 1.500

Load Combination/s- Service Stress Level	
Load Combination Number	Load Combination Title
1	DEAD
2	LIVE
3	COMBINATION LOAD CASE 3
101	1.000 x DL+1.000 x DL+1.000 x DL

102	0.800 x DL+0.800 x DL+0.800 x DL
Load Combination/s- Strength Level	
Load Combination Number	Load Combination Title
1	DEAD
2	LIVE
3	COMBINATION LOAD CASE 3

Applied Loads - Service Stress Level					
LC	Axial (kN)	Shear X (kN)	Shear Z (kN)	Moment X (kNm)	Moment Z (kNm)
1	452.071	-2.556	0.166	0.181	2.535
2	70.021	-0.842	0.061	0.064	0.836
3	783.137	-5.096	0.340	0.368	5.056
101	1305.229	-8.494	0.567	0.613	8.427
102	1044.183	-6.795	0.454	0.491	6.742

Applied Loads - Strength Level					
LC	Axial (kN)	Shear X (kN)	Shear Z (kN)	Moment X (kNm)	Moment Z (kNm)
1	452.071	-2.556	0.166	0.181	2.535
2	70.021	-0.842	0.061	0.064	0.836
3	783.137	-5.096	0.340	0.368	5.056

Design Calculations

Footing Size

Initial Length (L_o) = 1.016 m

Initial Width (W_o) = 1.016 m

Uplift force due to buoyancy = 0.000 kN

Effect due to adhesion = 0.000 kN

Area from initial length and width, $A_o = L_o \times W_o = 1.032 \text{ m}^2$

Min. area required from bearing pressure, $A_{\min} = P / q_{\max} = 6.855 \text{ m}^2$

Note: A_{\min} is an initial estimation.

P = Critical Factored Axial Load (without self weight/buoyancy/soil).

q_{\max} = Respective Factored Bearing Capacity.

Final Footing Size

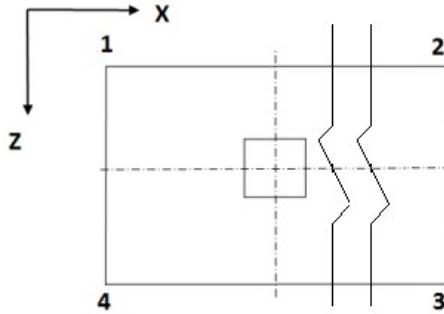
Length (L_2) = 2.692 m Governing Load Case : # 101

Width (W_2) = 2.692 m Governing Load Case : # 101

Depth (D_2) = 0.306 m Governing Load Case : # 101

$$\text{Area } (A_2) = 7.249 \text{ m}^2$$

Pressures at Four Corner



Load Case	Pressure at corner 1 (q_1) (kN/m ²)	Pressure at corner 2 (q_2) (kN/m ²)	Pressure at corner 3 (q_3) (kN/m ²)	Pressure at corner 4 (q_4) (kN/m ²)	Area of footing in uplift (A_u) (m ²)
101	190.4293	183.5763	184.0651	190.9181	0.000
101	190.4293	183.5763	184.0651	190.9181	0.000
101	190.4293	183.5763	184.0651	190.9181	0.000
101	190.4293	183.5763	184.0651	190.9181	0.000

If A_u is zero, there is no uplift and no pressure adjustment is necessary. Otherwise, to account for uplift, areas of negative pressure will be set to zero and the pressure will be redistributed to remaining corners.

Summary of adjusted Pressures at Four Corner

Load Case	Pressure at corner 1 (q_1) (kN/m ²)	Pressure at corner 2 (q_2) (kN/m ²)	Pressure at corner 3 (q_3) (kN/m ²)	Pressure at corner 4 (q_4) (kN/m ²)
101	190.4293	183.5763	184.0651	190.9181
101	190.4293	183.5763	184.0651	190.9181
101	190.4293	183.5763	184.0651	190.9181
101	190.4293	183.5763	184.0651	190.9181

Details of Out-of-Contact Area (If Any)

Governing load case = N/A

Plan area of footing = 7.249 sq.m

Area not in contact with soil = 0.000 sq.m

% of total area not in contact = 0.000%

Check For Stability Against Overturning And Sliding

-	Factor of safety against sliding		Factor of safety against overturning	
Load Case No.	Along X-Direction	Along Z-Direction	About X-Direction	About Z-Direction
1	98.633	1515.461	2893.408	202.407
2	72.576	1009.171	1971.404	148.819
3	81.950	1227.225	2357.323	168.138
101	79.904	1196.587	2298.474	163.941
102	80.671	1208.076	2320.542	165.515

Critical Load Case And The Governing Factor Of Safety For Overturning and Sliding X Direction

Critical Load Case for Sliding along X-Direction : 2

Governing Disturbing Force : -0.842 kN

Governing Restoring Force : 61.075 kN

Minimum Sliding Ratio for the Critical Load Case : 72.576

Critical Load Case for Overturning about X-Direction : 2

Governing Overturning Moment : 0.083 kNm

Governing Resisting Moment : 164.435 kNm

Minimum Overturning Ratio for the Critical Load Case : 1971.404

Critical Load Case And The Governing Factor Of Safety For Overturning and Sliding Z Direction

Critical Load Case for Sliding along Z-Direction : 2

Governing Disturbing Force : 0.061 kN

Governing Restoring Force : 61.075 kN

Minimum Sliding Ratio for the Critical Load Case : 1009.171

Critical Load Case for Overturning about Z-Direction : 2

Governing Overturning Moment : 1.105 kNm

Governing Resisting Moment : 164.435 kNm

Minimum Overturning Ratio for the Critical Load Case : 148.819

Moment CalculationCheck Trial Depth against moment (w.r.t. X Axis)**Critical Load Case = #3**

$$\text{Effective Depth} = D - (cc + 0.5 \times d_b) = 0.226 \text{ m}$$

$$\text{Governing moment (M}_u\text{)} = 191.251 \text{ kNm}$$

As Per IS 456 2000 ANNEX G G-1.1C

$$\text{Limiting Factor1 (K}_{u\max}\text{)} = \frac{700}{(1100 + 0.87 \times f_y)} = 0.479483$$

$$\text{Limiting Factor2 (R}_{u\max}\text{)} = \frac{0.36 \times f_{ck} \times k_{u\max} \times (1 - 0.42 \times k_{u\max})}{B} = 3801.834636 \text{ kN/m}^2$$

$$\text{Limit Moment Of Resistance (M}_{u\max}\text{)} = \frac{R_{u\max} \times B \times d_e^2}{2} = 520.958387 \text{ kNm}$$

$M_u \leq M_{umax}$ hence, safe

Check Trial Depth against moment (w.r.t. Z Axis)

Critical Load Case = #3

$$\text{Effective Depth} = D - (cc + 0.5 \times d_b) = 0.226 \text{ m}$$

$$\text{Governing moment } (M_u) = 185.334 \text{ kNm}$$

As Per IS 456 2000 ANNEX G G-1.1C

$$\text{Limiting Factor1 } (K_{umax}) = \frac{700}{(1100 + 0.87 \times f_y)} = 0.479483$$

$$\text{Limiting Factor2 } (R_{umax}) = \frac{0.36 \times f_{ck} \times k_{umax} \times (1 - 0.42 \times k_{umax})}{k_{umax}} = 3801.834636 \text{ kN/m}^2$$

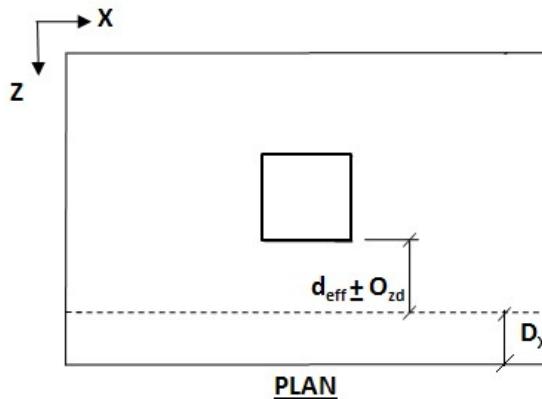
$$\text{Limit Moment Of Resistance } (M_{umax}) = \frac{R_{umax} \times B \times d_e^2}{4} = 520.958387 \text{ kNm}$$

$M_u \leq M_{umax}$ hence, safe

Shear Calculation

Check Trial Depth for one way shear (Along X Axis)

(Shear Plane Parallel to X Axis)



Critical Load Case = #3

$$D_X = 0.226 \text{ m}$$

$$\text{Shear Force}(S) = 268.014 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 441.243798 \text{ kN/m}^2$$

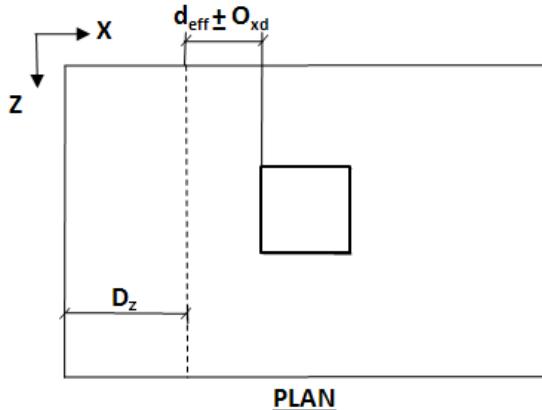
$$\text{Percentage Of Steel}(P_t) = 0.3998$$

As Per IS 456 2000 Clause 40 Table 19

$$\text{Shear Strength Of Concrete}(T_c) = 449.186 \text{ kN/m}^2$$

$T_v < T_c$ hence, safe

Check Trial Depth for one way shear (Along Z Axis)
(Shear Plane Parallel to Z Axis)



Critical Load Case = #3

$$D_z = 0.226 \text{ m}$$

$$\text{Shear Force}(S) = 263.811 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 434.324957 \text{ kN/m}^2$$

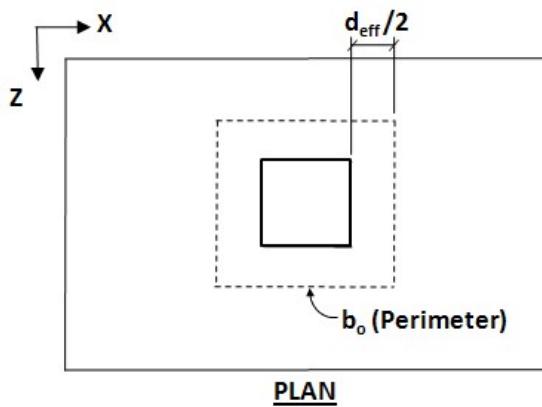
$$\text{Percentage Of Steel}(P_t) = 0.4134$$

As Per IS 456 2000 Clause 40 Table 19

$$\text{Shear Strength Of Concrete}(T_c) = 455.592 \text{ kN/m}^2$$

$T_v < T_c$ hence, safe

Check Trial Depth for two way shear



Critical Load Case = #3

$$\text{Shear Force}(S) = 737.477 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 1256.133 \text{ kN/m}^2$$

As Per IS 456 2000 Clause 31.6.3.1

$$K_s = \min[0.5 + \beta, 1] = 1.000$$

$$\text{Shear Strength}(T_c) = 0.25 \times \sqrt{f_{ck}} = 1312.8936 \text{ kN/m}^2$$

$$K_s \times T_c = 1312.8936 \text{ kN/m}^2$$

$$T_v \leq K_s \times T_c \text{ hence, safe}$$

Reinforcement Calculation

Calculation of Maximum Bar Size

Along X Axis

Bar diameter corresponding to max bar size (d_b) = 25 mm

As Per IS 456 2000 Clause 26.2.1

$$\text{Development Length}(l_d) = \frac{d_b \times 0.87 \times f_y}{4 \times \gamma_{bd}} = 0.956 \text{ m}$$

$$\text{Allowable Length}(l_{db}) = \left[\frac{(B - b)}{2} - cc \right] = 1.045 \text{ m}$$

$$l_{db} \geq l_d \text{ hence, safe}$$

Along Z Axis

Bar diameter corresponding to max bar size(d_b) = 25 mm

As Per IS 456 2000 Clause 26.2.1

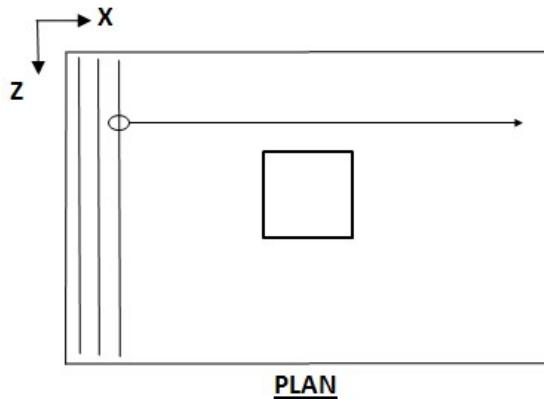
$$\text{Development Length}(l_d) = \frac{d_b \times 0.87 \times f_y}{4 \times \gamma_{bd}} = 0.956 \text{ m}$$

$$\text{Allowable Length}(l_{db}) = \left[\frac{(H - h)}{2} - cc \right] = 1.070 \text{ m}$$

$$l_{db} \geq l_d \text{ hence, safe}$$

Bottom Reinforcement Design

Along Z Axis



For moment w.r.t. X Axis (M_x)

As Per IS 456 2000 Clause 26.5.2.1

Critical Load Case = #3

Minimum Area of Steel ($A_{st,min}$) = 988.003 mm²

Calculated Area of Steel (A_{st}) = 2511.236 mm²

Provided Area of Steel ($A_{st,Provided}$) = 2511.236 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.048 m

Selected spacing (S) = 0.052 m

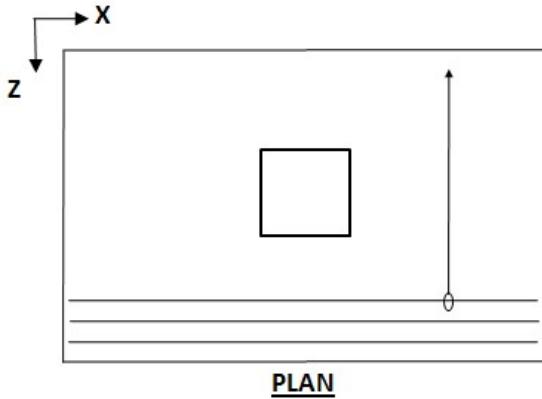
$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0.050 m o.c.

[Along X Axis](#)



For moment w.r.t. Z Axis (M_z)

As Per IS 456 2000 Clause 26.5.2.1

Critical Load Case = #3

Minimum Area of Steel ($A_{st,min}$) = 988.003 mm²

Calculated Area of Steel (A_{st}) = 2428.233 mm²

Provided Area of Steel ($A_{st,Provided}$) = 2428.233 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.053 m

$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

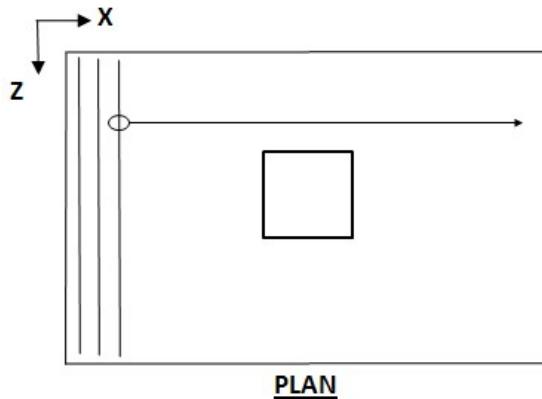
The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0.050 m o.c.

[Top Reinforcement Design](#)

[Along Z Axis](#)



Minimum Area of Steel ($A_{st,min}$) = 988.003 mm²

Calculated Area of Steel (A_{st}) = 984.772 mm²

Provided Area of Steel ($A_{st,Provided}$) = 988.003 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Governing Moment = 14.114 kNm

Selected bar Size (d_b) = Ø6

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.075 m

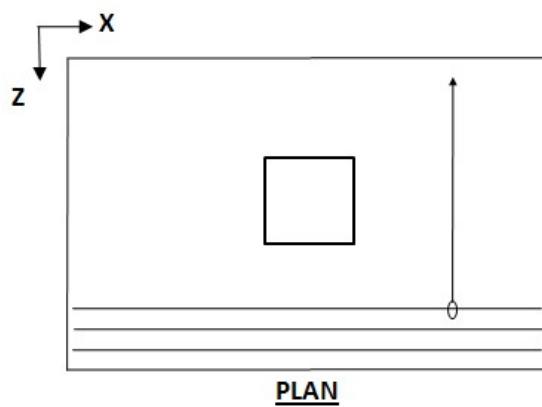
$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø6 @ 0 m o.c.

Along X Axis



Minimum Area of Steel ($A_{st,min}$) = 988.003 mm²

Calculated Area of Steel (A_{st}) = 2428.233 mm²

Provided Area of Steel ($A_{st,Provided}$) = 2428.233 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Governing Moment = 13.505 kNm

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.053 m

$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0 m o.c.

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 796.824 kN

Critical Applied Moment Along X Direction: 15.936 kNm

Critical Applied Moment Along Z Direction: 15.936 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.182 m

Position Of Neutral Axis Along Z Direction: 0.182 m

Pedestal Moment Capacity Along X Direction: 110.801 kNm

Pedestal Moment Capacity Along Z Direction: 125.969 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 577.848 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m
Position Of Neutral Axis Along Z Direction: 0.137 m
Pedestal Moment Capacity Along X Direction: 93.412 kNm
Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²
Pedestal Main/Compression Reinforcement: 16 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 783.137 kN
Critical Applied Moment Along X Direction: 15.662 kNm
Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m
Position Of Neutral Axis Along Z Direction: 0.180 m
Pedestal Moment Capacity Along X Direction: 110.061 kNm
Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²
Pedestal Main/Compression Reinforcement: 12 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN
Critical Applied Moment Along X Direction: 21.591 kNm
Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m
Position Of Neutral Axis Along Z Direction: 0.235 m
Pedestal Moment Capacity Along X Direction: 116.443 kNm
Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²
Pedestal Main/Compression Reinforcement: 28 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1108.293 kN

Critical Applied Moment Along X Direction: 22.165 kNm

Critical Applied Moment Along Z Direction: 22.165 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.224 kNm

Pedestal Moment Capacity Along Z Direction: 133.768 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 803.721 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1079.582 kN

Critical Applied Moment Along X Direction: 21.591 kNm

Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m

Position Of Neutral Axis Along Z Direction: 0.235 m

Pedestal Moment Capacity Along X Direction: 116.443 kNm

Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²

Pedestal Main/Compression Reinforcement: 28 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m

Position Of Neutral Axis Along Z Direction: 0.180 m

Pedestal Moment Capacity Along X Direction: 110.061 kNm

Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 802.558 kN

Critical Applied Moment Along X Direction: 16.051 kNm

Critical Applied Moment Along Z Direction: 16.051 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.183 m

Position Of Neutral Axis Along Z Direction: 0.183 m

Pedestal Moment Capacity Along X Direction: 111.028 kNm

Pedestal Moment Capacity Along Z Direction: 126.226 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 590.780 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1106.751 kN

Critical Applied Moment Along X Direction: 22.135 kNm

Critical Applied Moment Along Z Direction: 22.135 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.240 kNm

Pedestal Moment Capacity Along Z Direction: 133.790 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 802.604 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1137.123 kN

Critical Applied Moment Along X Direction: 22.742 kNm

Critical Applied Moment Along Z Direction: 22.742 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.244 m

Position Of Neutral Axis Along Z Direction: 0.244 m

Pedestal Moment Capacity Along X Direction: 117.002 kNm

Pedestal Moment Capacity Along Z Direction: 133.264 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 824.628 mm²

Pedestal Main/Compression Reinforcement: 32 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1106.751 kN

Critical Applied Moment Along X Direction: 22.135 kNm

Critical Applied Moment Along Z Direction: 22.135 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.240 kNm

Pedestal Moment Capacity Along Z Direction: 133.790 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 802.604 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 802.558 kN

Critical Applied Moment Along X Direction: 16.051 kNm

Critical Applied Moment Along Z Direction: 16.051 kNm

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Position Of Neutral Axis Along X Direction: 0.183 m

Position Of Neutral Axis Along Z Direction: 0.183 m

Pedestal Moment Capacity Along X Direction: 111.028 kNm

Pedestal Moment Capacity Along Z Direction: 126.226 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 590.780 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m
Position Of Neutral Axis Along Z Direction: 0.180 m
Pedestal Moment Capacity Along X Direction: 110.061 kNm
Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²
Pedestal Main/Compression Reinforcement: 12 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN
Critical Applied Moment Along X Direction: 21.591 kNm
Critical Applied Moment Along Z Direction: 21.591 kNm

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Pedestal Main/Compression Reinforcement: 28 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m

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Critical load Case : 3
Critical Applied Axial Load: 1108.293 kN
Critical Applied Moment Along X Direction: 22.165 kNm
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Pedestal Moment Capacity Along Z Direction: 125.303 kNm

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Pedestal Main/Compression Reinforcement: 12 - Ø8

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Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

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Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

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Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

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Critical Applied Moment Along X Direction: 15.936 kNm

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Minimum longitudinal pedestal reinforcement is calculated based on

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Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

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Critical Applied Moment Along X Direction: 11.460 kNm

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Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

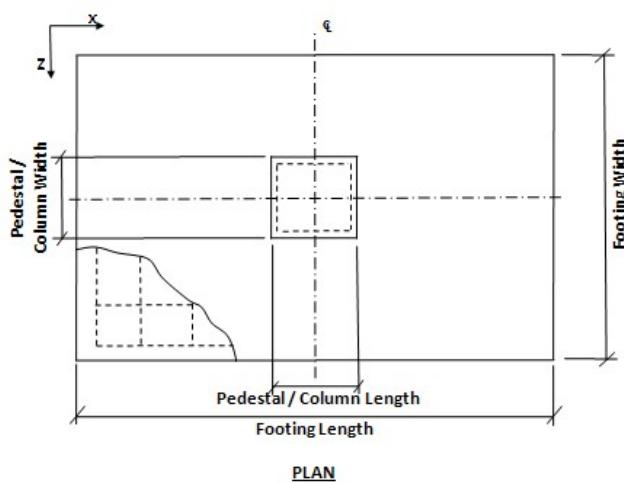
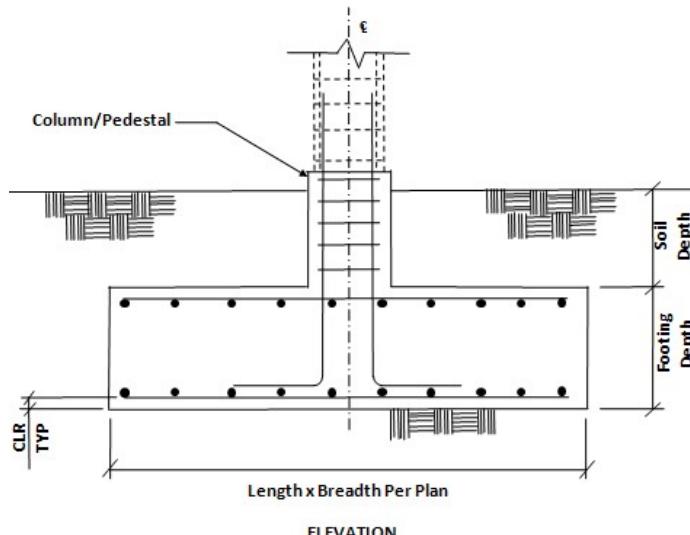
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Isolated Footing 92



Input Values

Footing Geomtry

Design Type : Calculate Dimension
 Footing Thickness (Ft) : 12.000 in
 Footing Length - X (Fl) : 40.000 in
 Footing Width - Z (Fw) : 40.000 in
 Eccentricity along X (Oxd) : 0.000 in
 Eccentricity along Z (Ozd) : 0.000 in

Column Dimensions

Column Shape : Rectangular
 Column Length - X (Pl) : 0.450 m
 Column Width - Z (Pw) : 0.400 m

Pedestal

Include Pedestal? Yes
 Pedestal Shape : Rectangular
 Pedestal Height (Ph) : 0.015 m
 Pedestal Length - X (Pl) : 0.450 m
 Pedestal Width - Z (Pw) : 0.400 m

Design Parameters

Concrete and Rebar Properties

Unit Weight of Concrete : 150.000 lb/ft³
 Strength of Concrete : 4.000 ksi
 Yield Strength of Steel : 60.000 ksi
 Minimum Bar Size : Ø6
 Maximum Bar Size : Ø32
 Minimum Bar Spacing : 2.000 in
 Maximum Bar Spacing : 18.000 in
 Pedestal Clear Cover (P, CL) : 3.000 in
 Footing Clear Cover (F, CL) : 3.000 in

Soil Properties

Soil Type : UnDrained
 Unit Weight : 112.000 lb/ft³
 Soil Bearing Capacity : 4.000 kip/ft²
 Soil Surcharge : 0.000 kip/in²
 Depth of Soil above Footing : 0.000 in
 Undrained Shear Strength : 0.000 kip/in²
 Min Percentage of Slab : 0.000

Sliding and Overturning

Coefficient of Friction : 0.500
 Factor of Safety Against Sliding : 1.500
 Factor of Safety Against Overturning : 1.500

Load Combination/s- Service Stress Level	
Load Combination Number	Load Combination Title
1	DEAD
2	LIVE
3	COMBINATION LOAD CASE 3
101	1.000 x DL+1.000 x DL+1.000 x DL

102	0.800 x DL+0.800 x DL+0.800 x DL
Load Combination/s- Strength Level	
Load Combination Number	Load Combination Title
1	DEAD
2	LIVE
3	COMBINATION LOAD CASE 3

Applied Loads - Service Stress Level					
LC	Axial (kN)	Shear X (kN)	Shear Z (kN)	Moment X (kNm)	Moment Z (kNm)
1	594.911	-0.295	0.229	0.248	0.319
2	124.810	-0.127	0.102	0.108	0.134
3	1079.582	-0.634	0.497	0.534	0.680
101	1799.303	-1.056	0.829	0.890	1.133
102	1439.443	-0.845	0.663	0.712	0.906

Applied Loads - Strength Level					
LC	Axial (kN)	Shear X (kN)	Shear Z (kN)	Moment X (kNm)	Moment Z (kNm)
1	594.911	-0.295	0.229	0.248	0.319
2	124.810	-0.127	0.102	0.108	0.134
3	1079.582	-0.634	0.497	0.534	0.680

Design Calculations

Footing Size

Initial Length (L_o) = 1.016 m

Initial Width (W_o) = 1.016 m

Uplift force due to buoyancy = 0.000 kN

Effect due to adhesion = 0.000 kN

Area from initial length and width, $A_o = L_o \times W_o = 1.032 \text{ m}^2$

Min. area required from bearing pressure, $A_{\min} = P / q_{\max} = 9.893 \text{ m}^2$

Note: A_{\min} is an initial estimation.

P = Critical Factored Axial Load (without self weight/buoyancy/soil).

q_{\max} = Respective Factored Bearing Capacity.

Final Footing Size

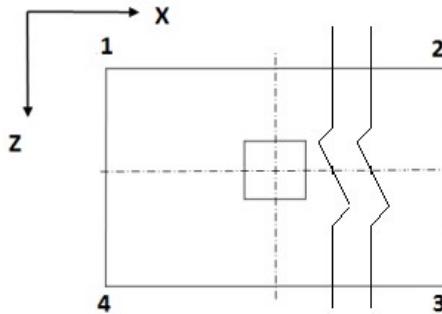
Length (L_2) = 3.200 m Governing Load Case : # 101

Width (W_2) = 3.200 m Governing Load Case : # 101

Depth (D_2) = 0.408 m Governing Load Case : # 101

$$\text{Area } (A_2) = 10.243 \text{ m}^2$$

Pressures at Four Corner



Load Case	Pressure at corner 1 (q_1) (kN/m ²)	Pressure at corner 2 (q_2) (kN/m ²)	Pressure at corner 3 (q_3) (kN/m ²)	Pressure at corner 4 (q_4) (kN/m ²)	Area of footing in uplift (A_u) (m ²)
101	188.6312	188.0663	188.5099	189.0748	0.000
101	188.6312	188.0663	188.5099	189.0748	0.000
101	188.6312	188.0663	188.5099	189.0748	0.000
101	188.6312	188.0663	188.5099	189.0748	0.000

If A_u is zero, there is no uplift and no pressure adjustment is necessary. Otherwise, to account for uplift, areas of negative pressure will be set to zero and the pressure will be redistributed to remaining corners.

Summary of adjusted Pressures at Four Corner

Load Case	Pressure at corner 1 (q_1) (kN/m ²)	Pressure at corner 2 (q_2) (kN/m ²)	Pressure at corner 3 (q_3) (kN/m ²)	Pressure at corner 4 (q_4) (kN/m ²)
101	188.6312	188.0663	188.5099	189.0748
101	188.6312	188.0663	188.5099	189.0748
101	188.6312	188.0663	188.5099	189.0748
101	188.6312	188.0663	188.5099	189.0748

Details of Out-of-Contact Area (If Any)

Governing load case = N/A

Plan area of footing = 10.243 sq.m

Area not in contact with soil = 0.000 sq.m

% of total area not in contact = 0.000%

Check For Stability Against Overturning And Sliding

-	Factor of safety against sliding		Factor of safety against overturning	
Load Case No.	Along X-Direction	Along Z-Direction	About X-Direction	About Z-Direction
1	1173.485	1513.223	3220.465	2501.423
2	878.404	1090.495	2357.348	1898.376
3	929.470	1184.771	2533.572	1989.455
101	898.415	1145.186	2448.922	1922.986
102	910.061	1160.030	2480.665	1947.912

Critical Load Case And The Governing Factor Of Safety For Overturning and Sliding X Direction

Critical Load Case for Sliding along X-Direction : 2

Governing Disturbing Force : -0.127 kN

Governing Restoring Force : 111.601 kN

Minimum Sliding Ratio for the Critical Load Case : 878.404

Critical Load Case for Overturning about X-Direction : 2

Governing Overturning Moment : 0.152 kNm

Governing Resisting Moment : 357.162 kNm

Minimum Overturning Ratio for the Critical Load Case : 2357.348

Critical Load Case And The Governing Factor Of Safety For Overturning and Sliding Z Direction

Critical Load Case for Sliding along Z-Direction : 2

Governing Disturbing Force : 0.102 kN

Governing Restoring Force : 111.601 kN

Minimum Sliding Ratio for the Critical Load Case : 1090.495

Critical Load Case for Overturning about Z-Direction : 2

Governing Overturning Moment : 0.188 kNm

Governing Resisting Moment : 357.162 kNm

Minimum Overturning Ratio for the Critical Load Case : 1898.376

Moment CalculationCheck Trial Depth against moment (w.r.t. X Axis)**Critical Load Case = #3**

Effective Depth = $D - (cc + 0.5 \times d_b) = 0.328 \text{ m}$

Governing moment (M_u) = 330.972 kNm

As Per IS 456 2000 ANNEX G G-1.1C

Limiting Factor1 (K_{umax}) = $\frac{700}{(1100 + 0.87 \times f_y)} = 0.479483$

Limiting Factor2 (R_{umax}) = $0.36 \times f_{ck} \times k_{umax} \times (1 - 0.42 \times k_{umax}) = 3801.834636 \text{ kN/m}^2$

Limit Moment Of Resistance (M_{umax}) = $R_{umax} \times B \times d_e^2 = 1310.589440 \text{ kNm}$

$M_u \leq M_{umax}$ hence, safe

Check Trial Depth against moment (w.r.t. Z Axis)

Critical Load Case = #3

$$\text{Effective Depth} = D - (cc + 0.5 \times d_b) = 0.328 \text{ m}$$

$$\text{Governing moment } (M_u) = 319.341 \text{ kNm}$$

As Per IS 456 2000 ANNEX G G-1.1C

$$\text{Limiting Factor1 } (K_{umax}) = \frac{700}{(1100 + 0.87 \times f_y)} = 0.479483$$

$$\text{Limiting Factor2 } (R_{umax}) = \frac{0.36 \times f_{ck} \times k_{umax} \times (1 - 0.42 \times k_{umax})}{k_{umax}} = 3801.834636 \text{ kN/m}^2$$

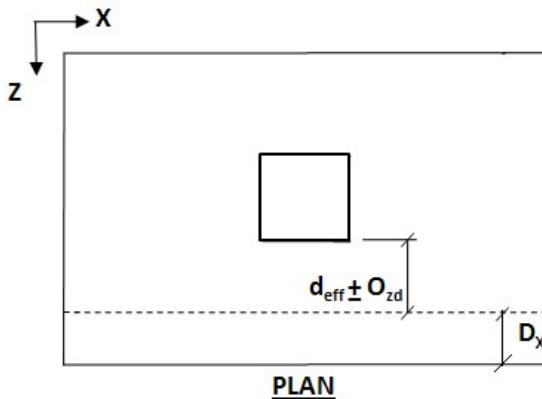
$$\text{Limit Moment Of Resistance } (M_{umax}) = \frac{R_{umax} \times B \times d_e^2}{4} = 1310.589440 \text{ kNm}$$

$M_u \leq M_{umax}$ hence, safe

Shear Calculation

Check Trial Depth for one way shear (Along X Axis)

(Shear Plane Parallel to X Axis)



Critical Load Case = #3

$$D_X = 0.328 \text{ m}$$

$$\text{Shear Force}(S) = 361.926 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 344.569241 \text{ kN/m}^2$$

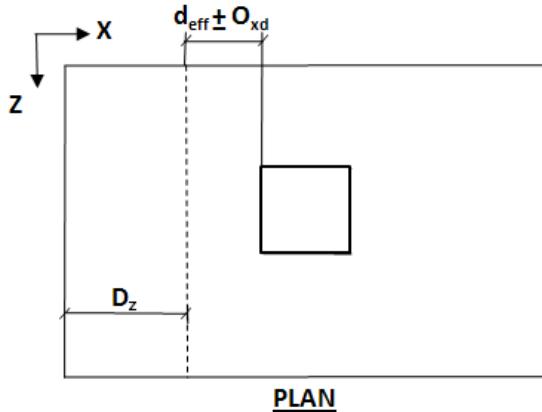
$$\text{Percentage Of Steel}(P_t) = 0.2682$$

As Per IS 456 2000 Clause 40 Table 19

$$\text{Shear Strength Of Concrete}(T_c) = 378.463 \text{ kN/m}^2$$

$T_v < T_c$ hence, safe

Check Trial Depth for one way shear (Along Z Axis)
(Shear Plane Parallel to Z Axis)



Critical Load Case = #3

$$D_z = 0.328 \text{ m}$$

$$\text{Shear Force}(S) = 353.573 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 336.616937 \text{ kN/m}^2$$

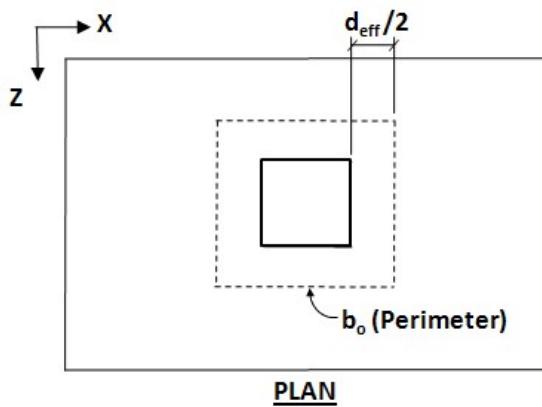
$$\text{Percentage Of Steel}(P_t) = 0.2784$$

As Per IS 456 2000 Clause 40 Table 19

$$\text{Shear Strength Of Concrete}(T_c) = 384.669 \text{ kN/m}^2$$

$T_v < T_c$ hence, safe

Check Trial Depth for two way shear



Critical Load Case = #3

$$\text{Shear Force}(S) = 1019.853 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 1031.405 \text{ kN/m}^2$$

As Per IS 456 2000 Clause 31.6.3.1

$$K_s = \min[(0.5 + \beta), 1] = 1.000$$

$$\text{Shear Strength}(T_c) = 0.25 \times \sqrt{f_{ck}} = 1312.8936 \text{ kN/m}^2$$

$$K_s \times T_c = 1312.8936 \text{ kN/m}^2$$

$$T_v \leq K_s \times T_c \text{ hence, safe}$$

Reinforcement Calculation

Calculation of Maximum Bar Size

Along X Axis

Bar diameter corresponding to max bar size (d_b) = 32 mm

As Per IS 456 2000 Clause 26.2.1

$$\text{Development Length}(l_d) = \frac{d_b \times 0.87 \times f_y}{4 \times \gamma_{bd}} = 1.224 \text{ m}$$

$$\text{Allowable Length}(l_{db}) = \left[\frac{(B - b)}{2} - cc \right] = 1.299 \text{ m}$$

$$l_{db} \geq l_d \text{ hence, safe}$$

Along Z Axis

Bar diameter corresponding to max bar size(d_b) = 32 mm

As Per IS 456 2000 Clause 26.2.1

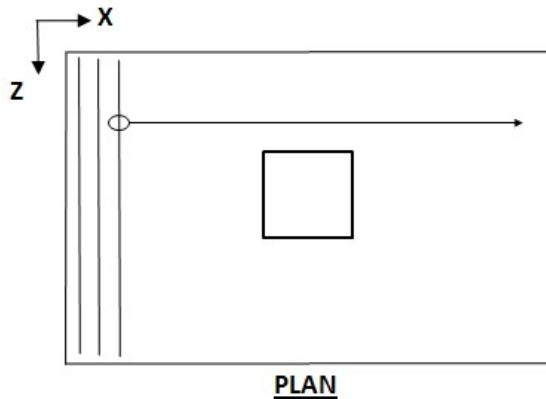
$$\text{Development Length}(l_d) = \frac{d_b \times 0.87 \times f_y}{4 \times \gamma_{bd}} = 1.224 \text{ m}$$

$$\text{Allowable Length}(l_{db}) = \left[\frac{(H - h)}{2} - cc \right] = 1.324 \text{ m}$$

$$l_{db} \geq l_d \text{ hence, safe}$$

Bottom Reinforcement Design

Along Z Axis



For moment w.r.t. X Axis (M_x)

As Per IS 456 2000 Clause 26.5.2.1

Critical Load Case = #3

Minimum Area of Steel ($A_{st,min}$) = 1568.452 mm²

Calculated Area of Steel (A_{st}) = 2924.127 mm²

Provided Area of Steel ($A_{st,Provided}$) = 2924.127 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.048 m

Selected spacing (S) = 0.052 m

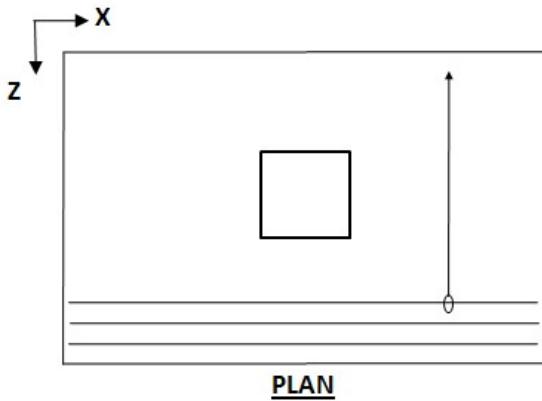
$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0.050 m o.c.

[Along X Axis](#)



For moment w.r.t. Z Axis (M_z)

As Per IS 456 2000 Clause 26.5.2.1

Critical Load Case = #3

Minimum Area of Steel ($A_{st,min}$) = 1568.452 mm²

Calculated Area of Steel (A_{st}) = 2816.865 mm²

Provided Area of Steel ($A_{st,Provided}$) = 2816.865 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.054 m

$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

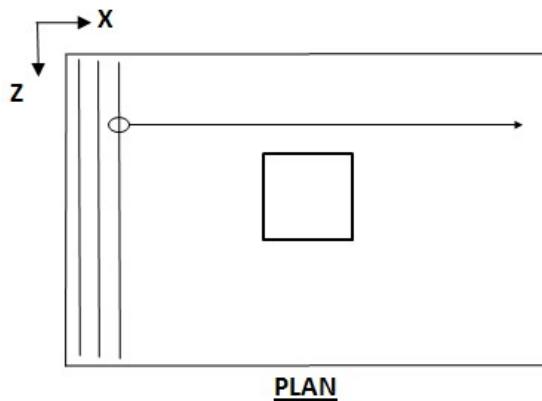
The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0.050 m o.c.

[Top Reinforcement Design](#)

[Along Z Axis](#)



Minimum Area of Steel ($A_{st,min}$) = 1568.452 mm²

Calculated Area of Steel (A_{st}) = 1564.611 mm²

Provided Area of Steel ($A_{st,Provided}$) = 1568.452 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Governing Moment = 33.464 kNm

Selected bar Size (d_b) = Ø6

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.055 m

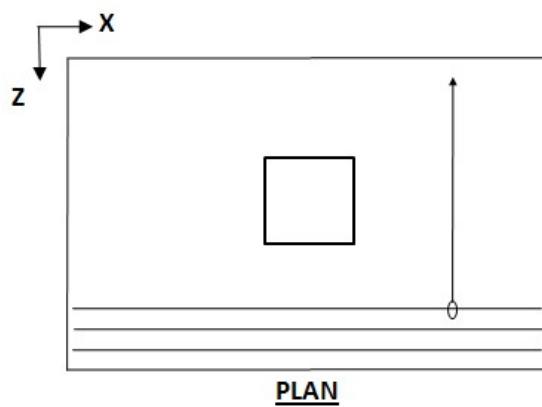
$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø6 @ 0 m o.c.

Along X Axis



Minimum Area of Steel ($A_{st,min}$) = 1568.452 mm²

Calculated Area of Steel (A_{st}) = 2816.865 mm²

Provided Area of Steel ($A_{st,Provided}$) = 2816.865 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Governing Moment = 32.279 kNm

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.054 m

$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0 m o.c.

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 796.824 kN

Critical Applied Moment Along X Direction: 15.936 kNm

Critical Applied Moment Along Z Direction: 15.936 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.182 m

Position Of Neutral Axis Along Z Direction: 0.182 m

Pedestal Moment Capacity Along X Direction: 110.801 kNm

Pedestal Moment Capacity Along Z Direction: 125.969 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 577.848 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m
Position Of Neutral Axis Along Z Direction: 0.137 m
Pedestal Moment Capacity Along X Direction: 93.412 kNm
Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²
Pedestal Main/Compression Reinforcement: 16 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 783.137 kN
Critical Applied Moment Along X Direction: 15.662 kNm
Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m
Position Of Neutral Axis Along Z Direction: 0.180 m
Pedestal Moment Capacity Along X Direction: 110.061 kNm
Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²
Pedestal Main/Compression Reinforcement: 12 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN
Critical Applied Moment Along X Direction: 21.591 kNm
Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m
Position Of Neutral Axis Along Z Direction: 0.235 m
Pedestal Moment Capacity Along X Direction: 116.443 kNm
Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²
Pedestal Main/Compression Reinforcement: 28 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1108.293 kN

Critical Applied Moment Along X Direction: 22.165 kNm

Critical Applied Moment Along Z Direction: 22.165 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.224 kNm

Pedestal Moment Capacity Along Z Direction: 133.768 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 803.721 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1079.582 kN

Critical Applied Moment Along X Direction: 21.591 kNm

Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m

Position Of Neutral Axis Along Z Direction: 0.235 m

Pedestal Moment Capacity Along X Direction: 116.443 kNm

Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²

Pedestal Main/Compression Reinforcement: 28 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m

Position Of Neutral Axis Along Z Direction: 0.180 m

Pedestal Moment Capacity Along X Direction: 110.061 kNm

Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 802.558 kN

Critical Applied Moment Along X Direction: 16.051 kNm

Critical Applied Moment Along Z Direction: 16.051 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.183 m

Position Of Neutral Axis Along Z Direction: 0.183 m

Pedestal Moment Capacity Along X Direction: 111.028 kNm

Pedestal Moment Capacity Along Z Direction: 126.226 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 590.780 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1106.751 kN

Critical Applied Moment Along X Direction: 22.135 kNm

Critical Applied Moment Along Z Direction: 22.135 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.240 kNm

Pedestal Moment Capacity Along Z Direction: 133.790 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 802.604 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1137.123 kN

Critical Applied Moment Along X Direction: 22.742 kNm

Critical Applied Moment Along Z Direction: 22.742 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.244 m

Position Of Neutral Axis Along Z Direction: 0.244 m

Pedestal Moment Capacity Along X Direction: 117.002 kNm

Pedestal Moment Capacity Along Z Direction: 133.264 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 824.628 mm²

Pedestal Main/Compression Reinforcement: 32 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1106.751 kN

Critical Applied Moment Along X Direction: 22.135 kNm

Critical Applied Moment Along Z Direction: 22.135 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.240 kNm

Pedestal Moment Capacity Along Z Direction: 133.790 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 802.604 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 802.558 kN

Critical Applied Moment Along X Direction: 16.051 kNm

Critical Applied Moment Along Z Direction: 16.051 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.183 m

Position Of Neutral Axis Along Z Direction: 0.183 m

Pedestal Moment Capacity Along X Direction: 111.028 kNm

Pedestal Moment Capacity Along Z Direction: 126.226 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 590.780 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m
Position Of Neutral Axis Along Z Direction: 0.180 m
Pedestal Moment Capacity Along X Direction: 110.061 kNm
Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²
Pedestal Main/Compression Reinforcement: 12 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN
Critical Applied Moment Along X Direction: 21.591 kNm
Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m
Position Of Neutral Axis Along Z Direction: 0.235 m
Pedestal Moment Capacity Along X Direction: 116.443 kNm
Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²
Pedestal Main/Compression Reinforcement: 28 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m
Critical load Case : 3
Critical Applied Axial Load: 1108.293 kN
Critical Applied Moment Along X Direction: 22.165 kNm
Critical Applied Moment Along Z Direction: 22.165 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m
Position Of Neutral Axis Along Z Direction: 0.239 m
Pedestal Moment Capacity Along X Direction: 117.224 kNm
Pedestal Moment Capacity Along Z Direction: 133.768 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 803.721 mm²
Pedestal Main/Compression Reinforcement: 16 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m
Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN

Critical Applied Moment Along X Direction: 21.591 kNm

Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m

Position Of Neutral Axis Along Z Direction: 0.235 m

Pedestal Moment Capacity Along X Direction: 116.443 kNm

Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²

Pedestal Main/Compression Reinforcement: 28 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m

Position Of Neutral Axis Along Z Direction: 0.180 m

Pedestal Moment Capacity Along X Direction: 110.061 kNm

Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 796.824 kN

Critical Applied Moment Along X Direction: 15.936 kNm

Critical Applied Moment Along Z Direction: 15.936 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.182 m

Position Of Neutral Axis Along Z Direction: 0.182 m

Pedestal Moment Capacity Along X Direction: 110.801 kNm

Pedestal Moment Capacity Along Z Direction: 125.969 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 577.848 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

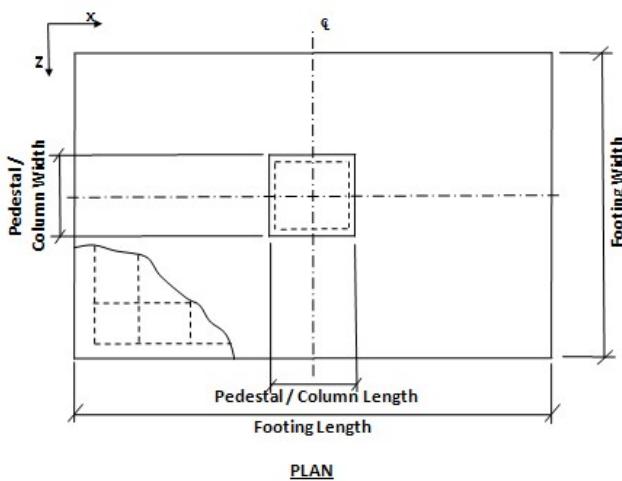
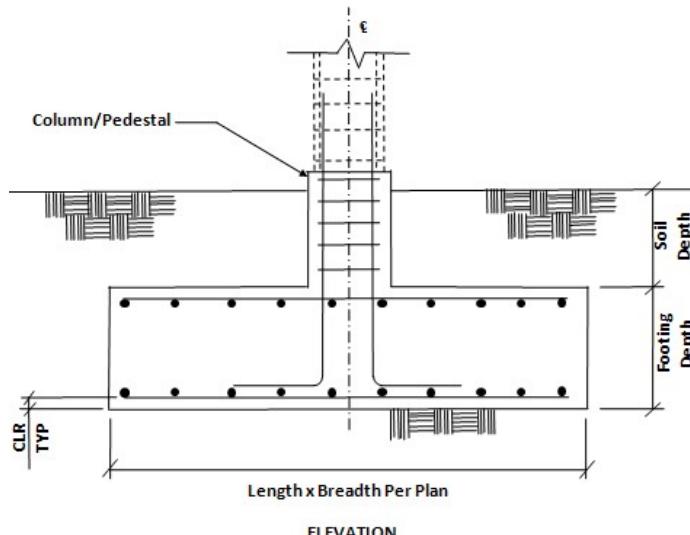
Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Isolated Footing 93



Input Values

Footing Geomtry

Design Type : Calculate Dimension
 Footing Thickness (Ft) : 12.000 in
 Footing Length - X (Fl) : 40.000 in
 Footing Width - Z (Fw) : 40.000 in
 Eccentricity along X (Oxd) : 0.000 in
 Eccentricity along Z (Ozd) : 0.000 in

Column Dimensions

Column Shape : Rectangular
 Column Length - X (Pl) : 0.450 m
 Column Width - Z (Pw) : 0.400 m

Pedestal

Include Pedestal? Yes
 Pedestal Shape : Rectangular
 Pedestal Height (Ph) : 0.015 m
 Pedestal Length - X (Pl) : 0.450 m
 Pedestal Width - Z (Pw) : 0.400 m

Design Parameters

Concrete and Rebar Properties

Unit Weight of Concrete : 150.000 lb/ft³
 Strength of Concrete : 4.000 ksi
 Yield Strength of Steel : 60.000 ksi
 Minimum Bar Size : Ø6
 Maximum Bar Size : Ø32
 Minimum Bar Spacing : 2.000 in
 Maximum Bar Spacing : 18.000 in
 Pedestal Clear Cover (P, CL) : 3.000 in
 Footing Clear Cover (F, CL) : 3.000 in

Soil Properties

Soil Type : UnDrained
 Unit Weight : 112.000 lb/ft³
 Soil Bearing Capacity : 4.000 kip/ft²
 Soil Surcharge : 0.000 kip/in²
 Depth of Soil above Footing : 0.000 in
 Undrained Shear Strength : 0.000 kip/in²
 Min Percentage of Slab : 0.000

Sliding and Overturning

Coefficient of Friction : 0.500
 Factor of Safety Against Sliding : 1.500
 Factor of Safety Against Overturning : 1.500

Load Combination/s- Service Stress Level	
Load Combination Number	Load Combination Title
1	DEAD
2	LIVE
3	COMBINATION LOAD CASE 3
101	1.000 x DL+1.000 x DL+1.000 x DL

102	0.800 x DL+0.800 x DL+0.800 x DL
Load Combination/s- Strength Level	
Load Combination Number	Load Combination Title
1	DEAD
2	LIVE
3	COMBINATION LOAD CASE 3

Applied Loads - Service Stress Level					
LC	Axial (kN)	Shear X (kN)	Shear Z (kN)	Moment X (kNm)	Moment Z (kNm)
1	608.433	0.000	0.239	0.258	0.000
2	130.429	0.000	0.109	0.115	0.000
3	1108.293	0.000	0.522	0.560	0.000
101	1847.154	0.000	0.869	0.933	0.000
102	1477.723	0.000	0.695	0.746	0.000

Applied Loads - Strength Level					
LC	Axial (kN)	Shear X (kN)	Shear Z (kN)	Moment X (kNm)	Moment Z (kNm)
1	608.433	0.000	0.239	0.258	0.000
2	130.429	0.000	0.109	0.115	0.000
3	1108.293	0.000	0.522	0.560	0.000

Design Calculations

Footing Size

Initial Length (L_o) = 1.016 m

Initial Width (W_o) = 1.016 m

Uplift force due to buoyancy = 0.000 kN

Effect due to adhesion = 0.000 kN

Area from initial length and width, $A_o = L_o \times W_o = 1.032 \text{ m}^2$

Min. area required from bearing pressure, $A_{\min} = P / q_{\max} = 10.159 \text{ m}^2$

Note: A_{\min} is an initial estimation.

P = Critical Factored Axial Load (without self weight/buoyancy/soil).

q_{\max} = Respective Factored Bearing Capacity.

Final Footing Size

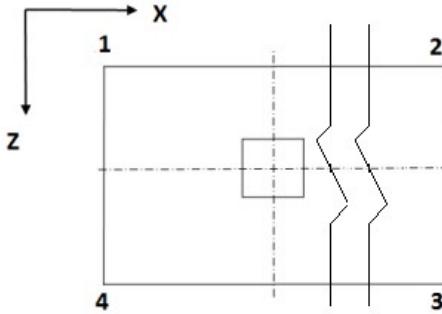
Length (L_2) = 3.200 m Governing Load Case : # 1

Width (W_2) = 3.200 m Governing Load Case : # 1

Depth (D_2) = 0.408 m Governing Load Case : # 1

$$\text{Area } (A_2) = 10.243 \text{ m}^2$$

Pressures at Four Corner



Load Case	Pressure at corner 1 (q_1) (kN/m ²)	Pressure at corner 2 (q_2) (kN/m ²)	Pressure at corner 3 (q_3) (kN/m ²)	Pressure at corner 4 (q_4) (kN/m ²)	Area of footing in uplift (A_u) (m ²)
101	189.7094	189.7094	190.1853	190.1853	0.000
101	189.7094	189.7094	190.1853	190.1853	0.000
101	189.7094	189.7094	190.1853	190.1853	0.000
101	189.7094	189.7094	190.1853	190.1853	0.000

If A_u is zero, there is no uplift and no pressure adjustment is necessary. Otherwise, to account for uplift, areas of negative pressure will be set to zero and the pressure will be redistributed to remaining corners.

Summary of adjusted Pressures at Four Corner

Load Case	Pressure at corner 1 (q_1) (kN/m ²)	Pressure at corner 2 (q_2) (kN/m ²)	Pressure at corner 3 (q_3) (kN/m ²)	Pressure at corner 4 (q_4) (kN/m ²)
101	189.7094	189.7094	190.1853	190.1853
101	189.7094	189.7094	190.1853	190.1853
101	189.7094	189.7094	190.1853	190.1853
101	189.7094	189.7094	190.1853	190.1853

Details of Out-of-Contact Area (If Any)

Governing load case = N/A

Plan area of footing = 10.243 sq.m

Area not in contact with soil = 0.000 sq.m

% of total area not in contact = 0.000%

Check For Stability Against Overturning And Sliding

-	Factor of safety against sliding		Factor of safety against overturning	
Load Case No.	Along X-Direction	Along Z-Direction	About X-Direction	About Z-Direction
1	N/A	1479.699	3151.795	N/A
2	N/A	1051.125	2272.965	N/A
3	N/A	1156.868	2475.768	N/A
101	N/A	1119.136	2395.019	N/A
102	N/A	1133.286	2425.300	N/A

Critical Load Case And The Governing Factor Of Safety For Overturning and Sliding X Direction

Critical Load Case for Sliding along X-Direction : 1

Governing Disturbing Force : 0.000 kN

Governing Restoring Force : 353.413 kN

Minimum Sliding Ratio for the Critical Load Case : 0.000

Critical Load Case for Overturning about X-Direction : 2

Governing Overturning Moment : 0.161 kNm

Governing Resisting Moment : 366.154 kNm

Minimum Overturning Ratio for the Critical Load Case : 2272.965

Critical Load Case And The Governing Factor Of Safety For Overturning and Sliding Z Direction

Critical Load Case for Sliding along Z-Direction : 2

Governing Disturbing Force : 0.109 kN

Governing Restoring Force : 114.411 kN

Minimum Sliding Ratio for the Critical Load Case : 1051.125

Critical Load Case for Overturning about Z-Direction : 1

Governing Overturning Moment : 0.000 kNm

Governing Resisting Moment : 1131.041 kNm

Minimum Overturning Ratio for the Critical Load Case : 0.000

Moment CalculationCheck Trial Depth against moment (w.r.t. X Axis)**Critical Load Case = #3**

$$\text{Effective Depth} = D - (cc + 0.5 \times d_b) = 0.328 \text{ m}$$

$$\text{Governing moment (M}_u\text{)} = 339.781 \text{ kNm}$$

As Per IS 456 2000 ANNEX G G-1.1C

$$\text{Limiting Factor1 (K}_{u\max}\text{)} = \frac{700}{(1100 + 0.87 \times f_y)} = 0.479483$$

$$\text{Limiting Factor2 (R}_{u\max}\text{)} = \frac{0.36 \times f_{ck} \times k_{u\max} \times (1 - 0.42 \times k_{u\max})}{B} = 3801.834636 \text{ kN/m}^2$$

$$\text{Limit Moment Of Resistance (M}_{u\max}\text{)} = \frac{R_{u\max} \times B \times d_e^2}{2} = 1310.589440 \text{ kNm}$$

$M_u \leq M_{umax}$ hence, safe

Check Trial Depth against moment (w.r.t. Z Axis)

Critical Load Case = #3

$$\text{Effective Depth} = D - (cc + 0.5 \times d_b) = 0.328 \text{ m}$$

$$\text{Governing moment } (M_u) = 327.449 \text{ kNm}$$

As Per IS 456 2000 ANNEX G G-1.1C

$$\text{Limiting Factor1 } (K_{umax}) = \frac{700}{(1100 + 0.87 \times f_y)} = 0.479483$$

$$\text{Limiting Factor2 } (R_{umax}) = \frac{0.36 \times f_{ck} \times k_{umax} \times (1 - 0.42 \times k_{umax})}{k_{umax}} = 3801.834636 \text{ kN/m}^2$$

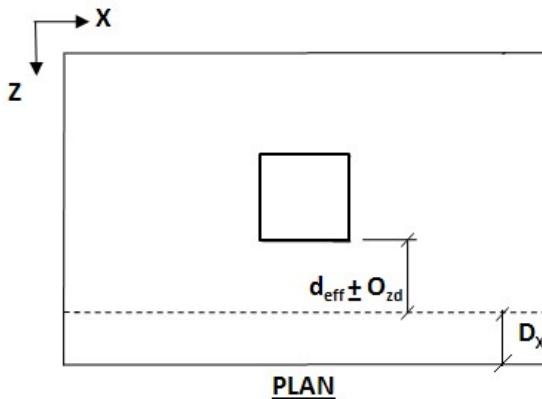
$$\text{Limit Moment Of Resistance } (M_{umax}) = \frac{R_{umax} \times B \times d_e^2}{4} = 1310.589440 \text{ kNm}$$

$M_u \leq M_{umax}$ hence, safe

Shear Calculation

Check Trial Depth for one way shear (Along X Axis)

(Shear Plane Parallel to X Axis)



Critical Load Case = #3

$$D_X = 0.328 \text{ m}$$

$$\text{Shear Force}(S) = 371.557 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 353.739164 \text{ kN/m}^2$$

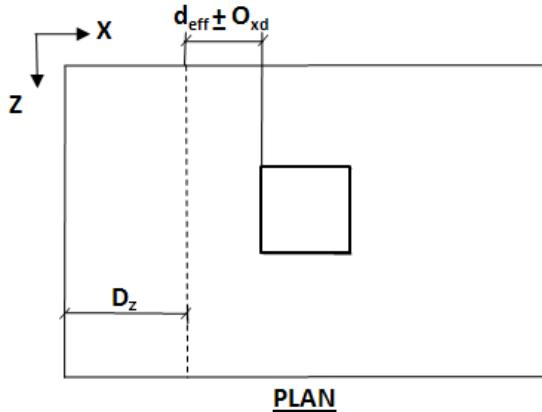
$$\text{Percentage Of Steel}(P_t) = 0.2753$$

As Per IS 456 2000 Clause 40 Table 19

$$\text{Shear Strength Of Concrete}(T_c) = 382.803 \text{ kN/m}^2$$

$T_v < T_c$ hence, safe

Check Trial Depth for one way shear (Along Z Axis)
(Shear Plane Parallel to Z Axis)



Critical Load Case = #3

$$D_z = 0.327 \text{ m}$$

$$\text{Shear Force}(S) = 362.921 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 346.572468 \text{ kN/m}^2$$

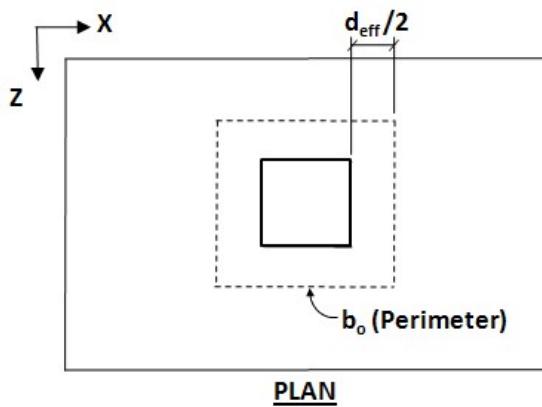
$$\text{Percentage Of Steel}(P_t) = 0.2880$$

As Per IS 456 2000 Clause 40 Table 19

$$\text{Shear Strength Of Concrete}(T_c) = 390.355 \text{ kN/m}^2$$

$T_v < T_c$ hence, safe

Check Trial Depth for two way shear



Critical Load Case = #3

$$\text{Shear Force}(S) = 1047.138 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 1063.647 \text{ kN/m}^2$$

As Per IS 456 2000 Clause 31.6.3.1

$$K_s = \min[(0.5 + \beta), 1] = 1.000$$

$$\text{Shear Strength}(T_c) = 0.25 \times \sqrt{f_{ck}} = 1312.8936 \text{ kN/m}^2$$

$$K_s \times T_c = 1312.8936 \text{ kN/m}^2$$

$$T_v \leq K_s \times T_c \text{ hence, safe}$$

Reinforcement Calculation

Calculation of Maximum Bar Size

Along X Axis

Bar diameter corresponding to max bar size (d_b) = 32 mm

As Per IS 456 2000 Clause 26.2.1

$$\text{Development Length}(l_d) = \frac{d_b \times 0.87 \times f_y}{4 \times \gamma_{bd}} = 1.224 \text{ m}$$

$$\text{Allowable Length}(l_{db}) = \left[\frac{(B - b)}{2} - cc \right] = 1.299 \text{ m}$$

$$l_{db} \geq l_d \text{ hence, safe}$$

Along Z Axis

Bar diameter corresponding to max bar size(d_b) = 32 mm

As Per IS 456 2000 Clause 26.2.1

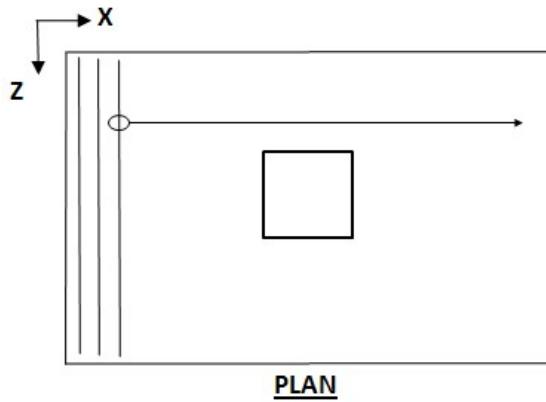
$$\text{Development Length}(l_d) = \frac{d_b \times 0.87 \times f_y}{4 \times \gamma_{bd}} = 1.224 \text{ m}$$

$$\text{Allowable Length}(l_{db}) = \left[\frac{(H - h)}{2} - cc \right] = 1.324 \text{ m}$$

$$l_{db} \geq l_d \text{ hence, safe}$$

Bottom Reinforcement Design

Along Z Axis



For moment w.r.t. X Axis (M_x)

As Per IS 456 2000 Clause 26.5.2.1

Critical Load Case = #3

Minimum Area of Steel ($A_{st,min}$) = 1568.452 mm²

Calculated Area of Steel (A_{st}) = 3005.599 mm²

Provided Area of Steel ($A_{st,Provided}$) = 3005.599 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.048 m

Selected spacing (S) = 0.052 m

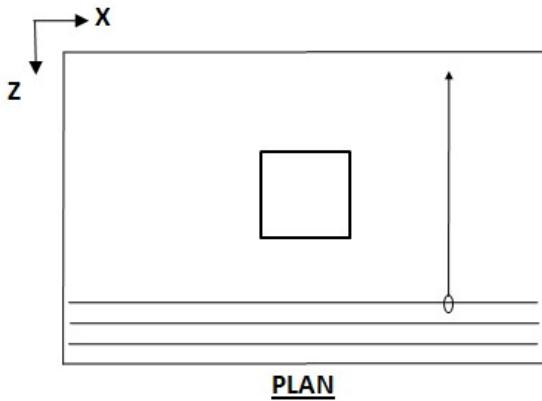
$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0.050 m o.c.

[Along X Axis](#)



For moment w.r.t. Z Axis (M_z)

As Per IS 456 2000 Clause 26.5.2.1

Critical Load Case = #3

Minimum Area of Steel ($A_{st,min}$) = 1568.452 mm²

Calculated Area of Steel (A_{st}) = 2891.603 mm²

Provided Area of Steel ($A_{st,Provided}$) = 2891.603 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.053 m

$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

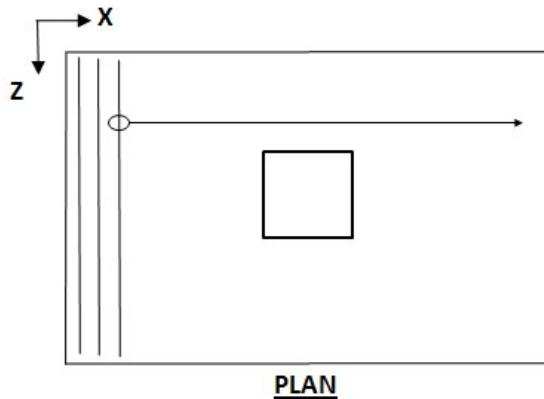
The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0.050 m o.c.

[Top Reinforcement Design](#)

[Along Z Axis](#)



Minimum Area of Steel ($A_{st,min}$) = 1568.452 mm²

Calculated Area of Steel (A_{st}) = 1564.611 mm²

Provided Area of Steel ($A_{st,Provided}$) = 1568.452 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Governing Moment = 33.464 kNm

Selected bar Size (d_b) = Ø6

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.055 m

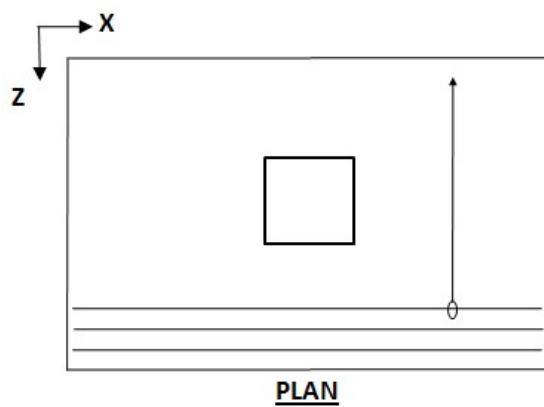
$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø6 @ 0 m o.c.

Along X Axis



Minimum Area of Steel ($A_{st,min}$) = 1568.452 mm²

Calculated Area of Steel (A_{st}) = 2891.603 mm²

Provided Area of Steel ($A_{st,Provided}$) = 2891.603 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Governing Moment = 32.279 kNm

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.053 m

$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0 m o.c.

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 796.824 kN

Critical Applied Moment Along X Direction: 15.936 kNm

Critical Applied Moment Along Z Direction: 15.936 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.182 m

Position Of Neutral Axis Along Z Direction: 0.182 m

Pedestal Moment Capacity Along X Direction: 110.801 kNm

Pedestal Moment Capacity Along Z Direction: 125.969 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 577.848 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m
Position Of Neutral Axis Along Z Direction: 0.137 m
Pedestal Moment Capacity Along X Direction: 93.412 kNm
Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²
Pedestal Main/Compression Reinforcement: 16 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 783.137 kN
Critical Applied Moment Along X Direction: 15.662 kNm
Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m
Position Of Neutral Axis Along Z Direction: 0.180 m
Pedestal Moment Capacity Along X Direction: 110.061 kNm
Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²
Pedestal Main/Compression Reinforcement: 12 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN
Critical Applied Moment Along X Direction: 21.591 kNm
Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m
Position Of Neutral Axis Along Z Direction: 0.235 m
Pedestal Moment Capacity Along X Direction: 116.443 kNm
Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²
Pedestal Main/Compression Reinforcement: 28 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1108.293 kN

Critical Applied Moment Along X Direction: 22.165 kNm

Critical Applied Moment Along Z Direction: 22.165 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.224 kNm

Pedestal Moment Capacity Along Z Direction: 133.768 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 803.721 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1079.582 kN

Critical Applied Moment Along X Direction: 21.591 kNm

Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m

Position Of Neutral Axis Along Z Direction: 0.235 m

Pedestal Moment Capacity Along X Direction: 116.443 kNm

Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²

Pedestal Main/Compression Reinforcement: 28 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m

Position Of Neutral Axis Along Z Direction: 0.180 m

Pedestal Moment Capacity Along X Direction: 110.061 kNm

Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 802.558 kN

Critical Applied Moment Along X Direction: 16.051 kNm

Critical Applied Moment Along Z Direction: 16.051 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.183 m

Position Of Neutral Axis Along Z Direction: 0.183 m

Pedestal Moment Capacity Along X Direction: 111.028 kNm

Pedestal Moment Capacity Along Z Direction: 126.226 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 590.780 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1106.751 kN

Critical Applied Moment Along X Direction: 22.135 kNm

Critical Applied Moment Along Z Direction: 22.135 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.240 kNm

Pedestal Moment Capacity Along Z Direction: 133.790 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 802.604 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1137.123 kN

Critical Applied Moment Along X Direction: 22.742 kNm

Critical Applied Moment Along Z Direction: 22.742 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.244 m

Position Of Neutral Axis Along Z Direction: 0.244 m

Pedestal Moment Capacity Along X Direction: 117.002 kNm

Pedestal Moment Capacity Along Z Direction: 133.264 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 824.628 mm²

Pedestal Main/Compression Reinforcement: 32 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1106.751 kN

Critical Applied Moment Along X Direction: 22.135 kNm

Critical Applied Moment Along Z Direction: 22.135 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.240 kNm

Pedestal Moment Capacity Along Z Direction: 133.790 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 802.604 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 802.558 kN

Critical Applied Moment Along X Direction: 16.051 kNm

Critical Applied Moment Along Z Direction: 16.051 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.183 m

Position Of Neutral Axis Along Z Direction: 0.183 m

Pedestal Moment Capacity Along X Direction: 111.028 kNm

Pedestal Moment Capacity Along Z Direction: 126.226 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 590.780 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m
Position Of Neutral Axis Along Z Direction: 0.180 m
Pedestal Moment Capacity Along X Direction: 110.061 kNm
Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²
Pedestal Main/Compression Reinforcement: 12 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN
Critical Applied Moment Along X Direction: 21.591 kNm
Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m
Position Of Neutral Axis Along Z Direction: 0.235 m
Pedestal Moment Capacity Along X Direction: 116.443 kNm
Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²
Pedestal Main/Compression Reinforcement: 28 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m
Critical load Case : 3
Critical Applied Axial Load: 1108.293 kN
Critical Applied Moment Along X Direction: 22.165 kNm
Critical Applied Moment Along Z Direction: 22.165 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m
Position Of Neutral Axis Along Z Direction: 0.239 m
Pedestal Moment Capacity Along X Direction: 117.224 kNm
Pedestal Moment Capacity Along Z Direction: 133.768 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 803.721 mm²
Pedestal Main/Compression Reinforcement: 16 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m
Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN

Critical Applied Moment Along X Direction: 21.591 kNm

Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m

Position Of Neutral Axis Along Z Direction: 0.235 m

Pedestal Moment Capacity Along X Direction: 116.443 kNm

Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²

Pedestal Main/Compression Reinforcement: 28 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m

Position Of Neutral Axis Along Z Direction: 0.180 m

Pedestal Moment Capacity Along X Direction: 110.061 kNm

Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 796.824 kN

Critical Applied Moment Along X Direction: 15.936 kNm

Critical Applied Moment Along Z Direction: 15.936 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.182 m

Position Of Neutral Axis Along Z Direction: 0.182 m

Pedestal Moment Capacity Along X Direction: 110.801 kNm

Pedestal Moment Capacity Along Z Direction: 125.969 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 577.848 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

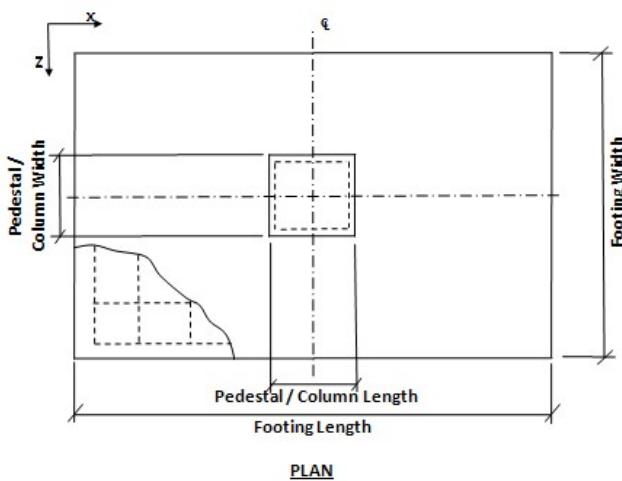
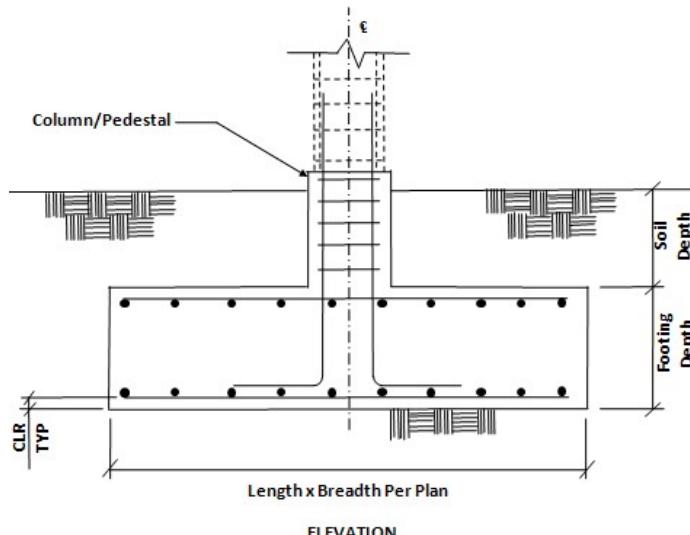
Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Isolated Footing 94



Input Values

Footing Geomtry

Design Type : Calculate Dimension
 Footing Thickness (Ft) : 12.000 in
 Footing Length - X (Fl) : 40.000 in
 Footing Width - Z (Fw) : 40.000 in
 Eccentricity along X (Oxd) : 0.000 in
 Eccentricity along Z (Ozd) : 0.000 in

Column Dimensions

Column Shape : Rectangular
 Column Length - X (Pl) : 0.450 m
 Column Width - Z (Pw) : 0.400 m

Pedestal

Include Pedestal? Yes
 Pedestal Shape : Rectangular
 Pedestal Height (Ph) : 0.015 m
 Pedestal Length - X (Pl) : 0.450 m
 Pedestal Width - Z (Pw) : 0.400 m

Design Parameters

Concrete and Rebar Properties

Unit Weight of Concrete : 150.000 lb/ft³
 Strength of Concrete : 4.000 ksi
 Yield Strength of Steel : 60.000 ksi
 Minimum Bar Size : Ø6
 Maximum Bar Size : Ø32
 Minimum Bar Spacing : 2.000 in
 Maximum Bar Spacing : 18.000 in
 Pedestal Clear Cover (P, CL) : 3.000 in
 Footing Clear Cover (F, CL) : 3.000 in

Soil Properties

Soil Type : UnDrained
 Unit Weight : 112.000 lb/ft³
 Soil Bearing Capacity : 4.000 kip/ft²
 Soil Surcharge : 0.000 kip/in²
 Depth of Soil above Footing : 0.000 in
 Undrained Shear Strength : 0.000 kip/in²
 Min Percentage of Slab : 0.000

Sliding and Overturning

Coefficient of Friction : 0.500
 Factor of Safety Against Sliding : 1.500
 Factor of Safety Against Overturning : 1.500

Load Combination/s- Service Stress Level	
Load Combination Number	Load Combination Title
1	DEAD
2	LIVE
3	COMBINATION LOAD CASE 3
101	1.000 x DL+1.000 x DL+1.000 x DL

102	0.800 x DL+0.800 x DL+0.800 x DL
Load Combination/s- Strength Level	
Load Combination Number	Load Combination Title
1	DEAD
2	LIVE
3	COMBINATION LOAD CASE 3

Applied Loads - Service Stress Level					
LC	Axial (kN)	Shear X (kN)	Shear Z (kN)	Moment X (kNm)	Moment Z (kNm)
1	594.911	0.295	0.229	0.248	-0.319
2	124.810	0.127	0.102	0.108	-0.134
3	1079.582	0.634	0.497	0.534	-0.680
101	1799.303	1.056	0.829	0.890	-1.133
102	1439.443	0.845	0.663	0.712	-0.906

Applied Loads - Strength Level					
LC	Axial (kN)	Shear X (kN)	Shear Z (kN)	Moment X (kNm)	Moment Z (kNm)
1	594.911	0.295	0.229	0.248	-0.319
2	124.810	0.127	0.102	0.108	-0.134
3	1079.582	0.634	0.497	0.534	-0.680

Design Calculations

Footing Size

Initial Length (L_o) = 1.016 m

Initial Width (W_o) = 1.016 m

Uplift force due to buoyancy = 0.000 kN

Effect due to adhesion = 0.000 kN

Area from initial length and width, $A_o = L_o \times W_o = 1.032 \text{ m}^2$

Min. area required from bearing pressure, $A_{\min} = P / q_{\max} = 9.893 \text{ m}^2$

Note: A_{\min} is an initial estimation.

P = Critical Factored Axial Load (without self weight/buoyancy/soil).

q_{\max} = Respective Factored Bearing Capacity.

Final Footing Size

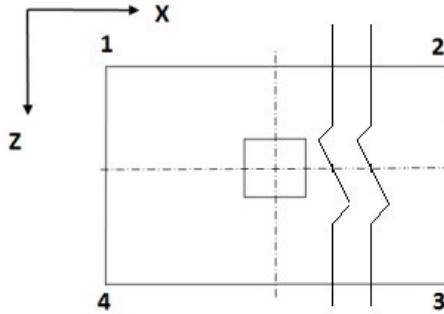
Length (L_2) = 3.200 m Governing Load Case : # 101

Width (W_2) = 3.200 m Governing Load Case : # 101

Depth (D_2) = 0.408 m Governing Load Case : # 101

$$\text{Area } (A_2) = 10.243 \text{ m}^2$$

Pressures at Four Corner



Load Case	Pressure at corner 1 (q_1) (kN/m ²)	Pressure at corner 2 (q_2) (kN/m ²)	Pressure at corner 3 (q_3) (kN/m ²)	Pressure at corner 4 (q_4) (kN/m ²)	Area of footing in uplift (A_u) (m ²)
101	188.0663	188.6312	189.0748	188.5099	0.000
101	188.0663	188.6312	189.0748	188.5099	0.000
101	188.0663	188.6312	189.0748	188.5099	0.000
101	188.0663	188.6312	189.0748	188.5099	0.000

If A_u is zero, there is no uplift and no pressure adjustment is necessary. Otherwise, to account for uplift, areas of negative pressure will be set to zero and the pressure will be redistributed to remaining corners.

Summary of adjusted Pressures at Four Corner

Load Case	Pressure at corner 1 (q_1) (kN/m ²)	Pressure at corner 2 (q_2) (kN/m ²)	Pressure at corner 3 (q_3) (kN/m ²)	Pressure at corner 4 (q_4) (kN/m ²)
101	188.0663	188.6312	189.0748	188.5099
101	188.0663	188.6312	189.0748	188.5099
101	188.0663	188.6312	189.0748	188.5099
101	188.0663	188.6312	189.0748	188.5099

Details of Out-of-Contact Area (If Any)

Governing load case = N/A

Plan area of footing = 10.243 sq.m

Area not in contact with soil = 0.000 sq.m

% of total area not in contact = 0.000%

Check For Stability Against Overturning And Sliding

-	Factor of safety against sliding		Factor of safety against overturning	
Load Case No.	Along X-Direction	Along Z-Direction	About X-Direction	About Z-Direction
1	1173.481	1513.223	3220.465	2501.415
2	878.404	1090.495	2357.348	1898.376
3	929.468	1184.771	2533.572	1989.452
101	898.414	1145.186	2448.922	1922.983
102	910.059	1160.030	2480.665	1947.909

Critical Load Case And The Governing Factor Of Safety For Overturning and Sliding X Direction

Critical Load Case for Sliding along X-Direction : 2

Governing Disturbing Force : 0.127 kN

Governing Restoring Force : 111.601 kN

Minimum Sliding Ratio for the Critical Load Case : 878.404

Critical Load Case for Overturning about X-Direction : 2

Governing Overturning Moment : 0.152 kNm

Governing Resisting Moment : 357.162 kNm

Minimum Overturning Ratio for the Critical Load Case : 2357.348

Critical Load Case And The Governing Factor Of Safety For Overturning and Sliding Z Direction

Critical Load Case for Sliding along Z-Direction : 2

Governing Disturbing Force : 0.102 kN

Governing Restoring Force : 111.601 kN

Minimum Sliding Ratio for the Critical Load Case : 1090.495

Critical Load Case for Overturning about Z-Direction : 2

Governing Overturning Moment : -0.188 kNm

Governing Resisting Moment : 357.162 kNm

Minimum Overturning Ratio for the Critical Load Case : 1898.376

Moment CalculationCheck Trial Depth against moment (w.r.t. X Axis)**Critical Load Case = #3**

Effective Depth = $D - (cc + 0.5 \times d_b) = 0.328 \text{ m}$

Governing moment (M_u) = 330.972 kNm

As Per IS 456 2000 ANNEX G G-1.1C

Limiting Factor1 (K_{umax}) = $\frac{700}{(1100 + 0.87 \times f_y)} = 0.479483$

Limiting Factor2 (R_{umax}) = $0.36 \times f_{ck} \times k_{umax} \times (1 - 0.42 \times k_{umax}) = 3801.834636 \text{ kN/m}^2$

Limit Moment Of Resistance (M_{umax}) = $R_{umax} \times B \times d_e^2 = 1310.589440 \text{ kNm}$

$M_u \leq M_{umax}$ hence, safe

Check Trial Depth against moment (w.r.t. Z Axis)

Critical Load Case = #3

$$\text{Effective Depth} = D - (cc + 0.5 \times d_b) = 0.328 \text{ m}$$

$$\text{Governing moment } (M_u) = 319.342 \text{ kNm}$$

As Per IS 456 2000 ANNEX G G-1.1C

$$\text{Limiting Factor1 } (K_{umax}) = \frac{700}{(1100 + 0.87 \times f_y)} = 0.479483$$

$$\text{Limiting Factor2 } (R_{umax}) = \frac{0.36 \times f_{ck} \times k_{umax} \times (1 - 0.42 \times k_{umax})}{k_{umax}} = 3801.834636 \text{ kN/m}^2$$

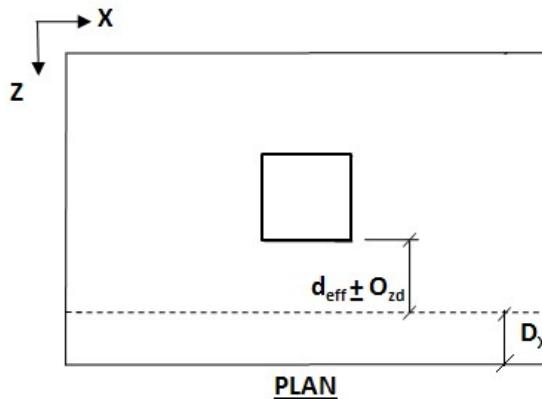
$$\text{Limit Moment Of Resistance } (M_{umax}) = \frac{R_{umax} \times B \times d_e^2}{k_{umax}} = 1310.589440 \text{ kNm}$$

$M_u \leq M_{umax}$ hence, safe

Shear Calculation

Check Trial Depth for one way shear (Along X Axis)

(Shear Plane Parallel to X Axis)



Critical Load Case = #3

$$D_X = 0.328 \text{ m}$$

$$\text{Shear Force}(S) = 361.926 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 344.569241 \text{ kN/m}^2$$

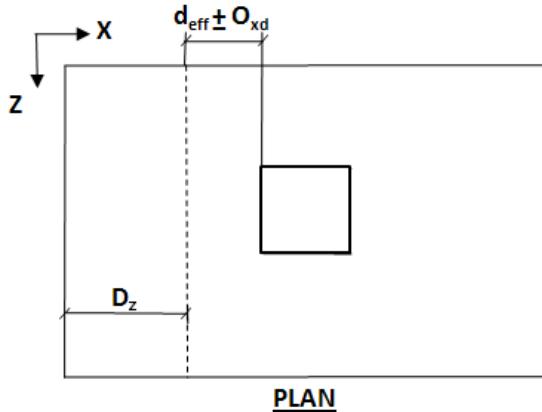
$$\text{Percentage Of Steel}(P_t) = 0.2682$$

As Per IS 456 2000 Clause 40 Table 19

$$\text{Shear Strength Of Concrete}(T_c) = 378.463 \text{ kN/m}^2$$

$T_v < T_c$ hence, safe

Check Trial Depth for one way shear (Along Z Axis)
(Shear Plane Parallel to Z Axis)



Critical Load Case = #3

$$D_z = 0.328 \text{ m}$$

$$\text{Shear Force}(S) = 353.573 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 336.616937 \text{ kN/m}^2$$

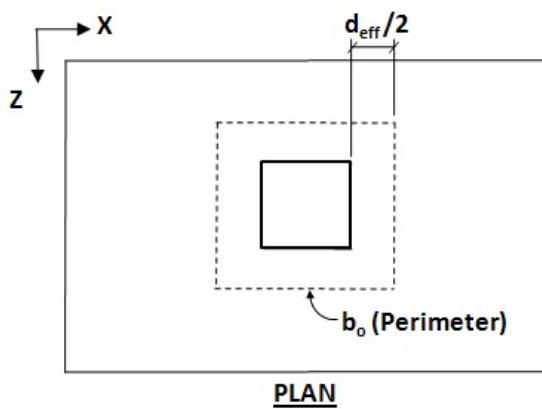
$$\text{Percentage Of Steel}(P_t) = 0.2784$$

As Per IS 456 2000 Clause 40 Table 19

$$\text{Shear Strength Of Concrete}(T_c) = 384.669 \text{ kN/m}^2$$

$T_v < T_c$ hence, safe

Check Trial Depth for two way shear



Critical Load Case = #3

$$\text{Shear Force}(S) = 1019.853 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 1031.405 \text{ kN/m}^2$$

As Per IS 456 2000 Clause 31.6.3.1

$$K_s = \min[(0.5 + \beta), 1] = 1.000$$

$$\text{Shear Strength}(T_c) = 0.25 \times \sqrt{f_{ck}} = 1312.8936 \text{ kN/m}^2$$

$$K_s \times T_c = 1312.8936 \text{ kN/m}^2$$

$$T_v \leq K_s \times T_c \text{ hence, safe}$$

Reinforcement Calculation

Calculation of Maximum Bar Size

Along X Axis

Bar diameter corresponding to max bar size (d_b) = 32 mm

As Per IS 456 2000 Clause 26.2.1

$$\text{Development Length}(l_d) = \frac{d_b \times 0.87 \times f_y}{4 \times \gamma_{bd}} = 1.224 \text{ m}$$

$$\text{Allowable Length}(l_{db}) = \left[\frac{(B - b)}{2} - cc \right] = 1.299 \text{ m}$$

$$l_{db} \geq l_d \text{ hence, safe}$$

Along Z Axis

Bar diameter corresponding to max bar size(d_b) = 32 mm

As Per IS 456 2000 Clause 26.2.1

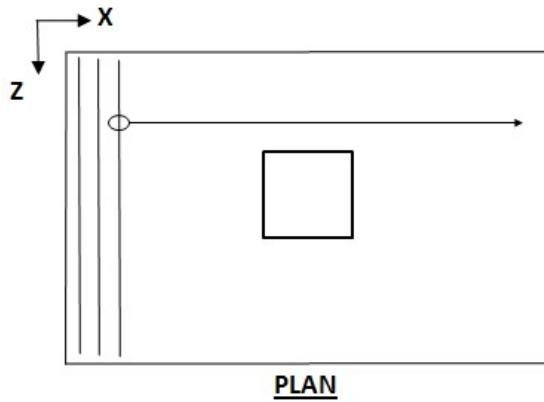
$$\text{Development Length}(l_d) = \frac{d_b \times 0.87 \times f_y}{4 \times \gamma_{bd}} = 1.224 \text{ m}$$

$$\text{Allowable Length}(l_{db}) = \left[\frac{(H - h)}{2} - cc \right] = 1.324 \text{ m}$$

$$l_{db} \geq l_d \text{ hence, safe}$$

Bottom Reinforcement Design

Along Z Axis



For moment w.r.t. X Axis (M_x)

As Per IS 456 2000 Clause 26.5.2.1

Critical Load Case = #3

Minimum Area of Steel ($A_{st,min}$) = 1568.452 mm²

Calculated Area of Steel (A_{st}) = 2924.127 mm²

Provided Area of Steel ($A_{st,Provided}$) = 2924.127 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.048 m

Selected spacing (S) = 0.052 m

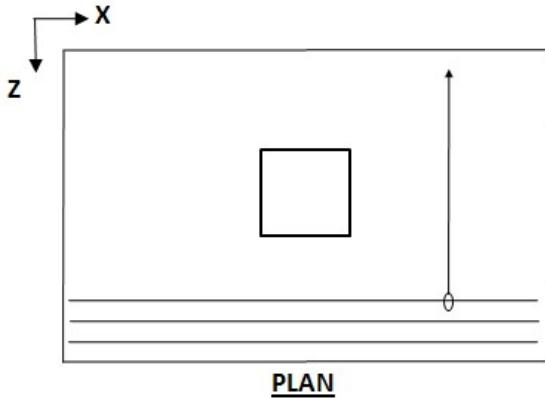
$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0.050 m o.c.

[Along X Axis](#)



For moment w.r.t. Z Axis (M_z)

As Per IS 456 2000 Clause 26.5.2.1

Critical Load Case = #3

Minimum Area of Steel ($A_{st,min}$) = 1568.452 mm²

Calculated Area of Steel (A_{st}) = 2816.869 mm²

Provided Area of Steel ($A_{st,Provided}$) = 2816.869 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.054 m

$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

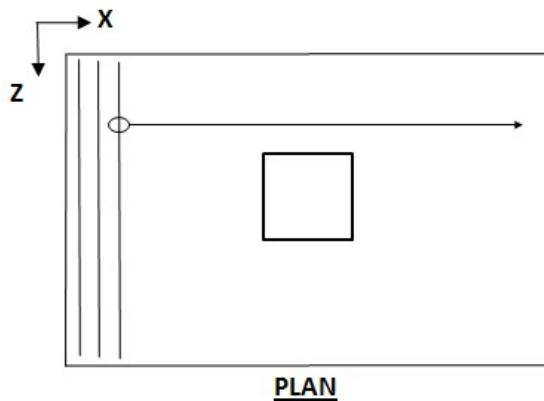
The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0.050 m o.c.

[Top Reinforcement Design](#)

[Along Z Axis](#)



Minimum Area of Steel ($A_{st,min}$) = 1568.452 mm²

Calculated Area of Steel (A_{st}) = 1564.611 mm²

Provided Area of Steel ($A_{st,Provided}$) = 1568.452 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Governing Moment = 33.464 kNm

Selected bar Size (d_b) = Ø6

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.055 m

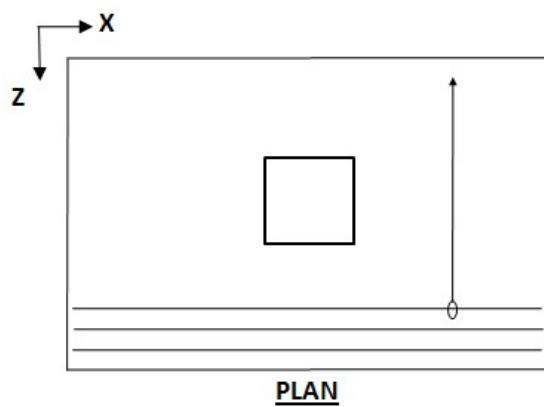
$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø6 @ 0 m o.c.

Along X Axis



Minimum Area of Steel ($A_{st,min}$) = 1568.452 mm²

Calculated Area of Steel (A_{st}) = 2816.869 mm²

Provided Area of Steel ($A_{st,Provided}$) = 2816.869 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Governing Moment = 32.279 kNm

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.054 m

$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0 m o.c.

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 796.824 kN

Critical Applied Moment Along X Direction: 15.936 kNm

Critical Applied Moment Along Z Direction: 15.936 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.182 m

Position Of Neutral Axis Along Z Direction: 0.182 m

Pedestal Moment Capacity Along X Direction: 110.801 kNm

Pedestal Moment Capacity Along Z Direction: 125.969 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 577.848 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m
Position Of Neutral Axis Along Z Direction: 0.137 m
Pedestal Moment Capacity Along X Direction: 93.412 kNm
Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²
Pedestal Main/Compression Reinforcement: 16 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 783.137 kN
Critical Applied Moment Along X Direction: 15.662 kNm
Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m
Position Of Neutral Axis Along Z Direction: 0.180 m
Pedestal Moment Capacity Along X Direction: 110.061 kNm
Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²
Pedestal Main/Compression Reinforcement: 12 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN
Critical Applied Moment Along X Direction: 21.591 kNm
Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m
Position Of Neutral Axis Along Z Direction: 0.235 m
Pedestal Moment Capacity Along X Direction: 116.443 kNm
Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²
Pedestal Main/Compression Reinforcement: 28 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1108.293 kN

Critical Applied Moment Along X Direction: 22.165 kNm

Critical Applied Moment Along Z Direction: 22.165 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.224 kNm

Pedestal Moment Capacity Along Z Direction: 133.768 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 803.721 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1079.582 kN

Critical Applied Moment Along X Direction: 21.591 kNm

Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m

Position Of Neutral Axis Along Z Direction: 0.235 m

Pedestal Moment Capacity Along X Direction: 116.443 kNm

Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²

Pedestal Main/Compression Reinforcement: 28 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m

Position Of Neutral Axis Along Z Direction: 0.180 m

Pedestal Moment Capacity Along X Direction: 110.061 kNm

Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 802.558 kN

Critical Applied Moment Along X Direction: 16.051 kNm

Critical Applied Moment Along Z Direction: 16.051 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.183 m

Position Of Neutral Axis Along Z Direction: 0.183 m

Pedestal Moment Capacity Along X Direction: 111.028 kNm

Pedestal Moment Capacity Along Z Direction: 126.226 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 590.780 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1106.751 kN

Critical Applied Moment Along X Direction: 22.135 kNm

Critical Applied Moment Along Z Direction: 22.135 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.240 kNm

Pedestal Moment Capacity Along Z Direction: 133.790 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 802.604 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1137.123 kN

Critical Applied Moment Along X Direction: 22.742 kNm

Critical Applied Moment Along Z Direction: 22.742 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.244 m

Position Of Neutral Axis Along Z Direction: 0.244 m

Pedestal Moment Capacity Along X Direction: 117.002 kNm

Pedestal Moment Capacity Along Z Direction: 133.264 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 824.628 mm²

Pedestal Main/Compression Reinforcement: 32 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1106.751 kN

Critical Applied Moment Along X Direction: 22.135 kNm

Critical Applied Moment Along Z Direction: 22.135 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.240 kNm

Pedestal Moment Capacity Along Z Direction: 133.790 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 802.604 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 802.558 kN

Critical Applied Moment Along X Direction: 16.051 kNm

Critical Applied Moment Along Z Direction: 16.051 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.183 m

Position Of Neutral Axis Along Z Direction: 0.183 m

Pedestal Moment Capacity Along X Direction: 111.028 kNm

Pedestal Moment Capacity Along Z Direction: 126.226 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 590.780 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m
Position Of Neutral Axis Along Z Direction: 0.180 m
Pedestal Moment Capacity Along X Direction: 110.061 kNm
Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²
Pedestal Main/Compression Reinforcement: 12 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN
Critical Applied Moment Along X Direction: 21.591 kNm
Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m
Position Of Neutral Axis Along Z Direction: 0.235 m
Pedestal Moment Capacity Along X Direction: 116.443 kNm
Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²
Pedestal Main/Compression Reinforcement: 28 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m
Critical load Case : 3
Critical Applied Axial Load: 1108.293 kN
Critical Applied Moment Along X Direction: 22.165 kNm
Critical Applied Moment Along Z Direction: 22.165 kNm

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Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 803.721 mm²
Pedestal Main/Compression Reinforcement: 16 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m
Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN

Critical Applied Moment Along X Direction: 21.591 kNm

Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

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Required Main Reinforcement: 782.901 mm²

Pedestal Main/Compression Reinforcement: 28 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m

Position Of Neutral Axis Along Z Direction: 0.180 m

Pedestal Moment Capacity Along X Direction: 110.061 kNm

Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 796.824 kN

Critical Applied Moment Along X Direction: 15.936 kNm

Critical Applied Moment Along Z Direction: 15.936 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.182 m

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Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 577.848 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

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Required Main Reinforcement: 563.143 mm²

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Critical load Case : 3

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Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

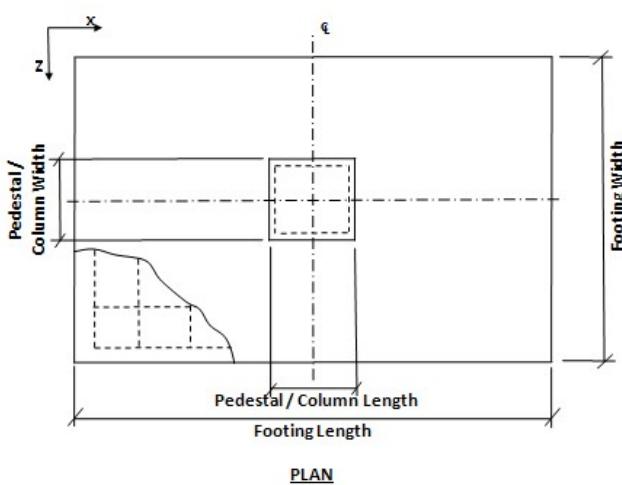
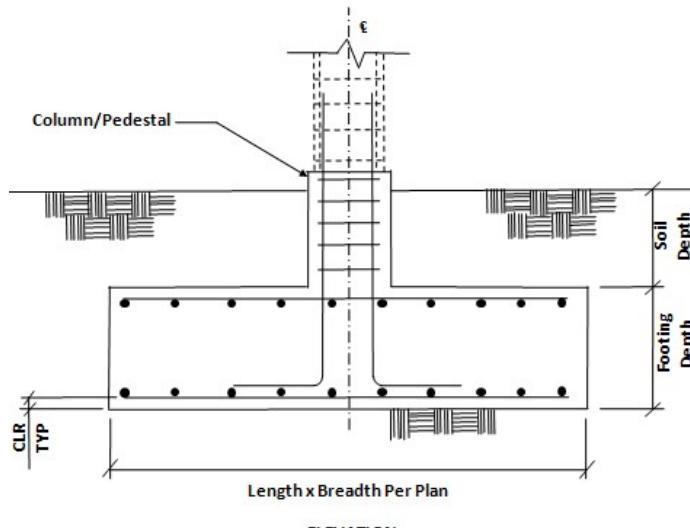
Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Isolated Footing 95



Input Values

Footing Geomtry

Design Type : Calculate Dimension
 Footing Thickness (Ft) : 12.000 in
 Footing Length - X (Fl) : 40.000 in
 Footing Width - Z (Fw) : 40.000 in
 Eccentricity along X (Oxd) : 0.000 in
 Eccentricity along Z (Ozd) : 0.000 in

Column Dimensions

Column Shape : Rectangular
 Column Length - X (Pl) : 0.450 m
 Column Width - Z (Pw) : 0.400 m

Pedestal

Include Pedestal? Yes
 Pedestal Shape : Rectangular
 Pedestal Height (Ph) : 0.015 m
 Pedestal Length - X (Pl) : 0.450 m
 Pedestal Width - Z (Pw) : 0.400 m

Design Parameters

Concrete and Rebar Properties

Unit Weight of Concrete : 150.000 lb/ft³
 Strength of Concrete : 4.000 ksi
 Yield Strength of Steel : 60.000 ksi
 Minimum Bar Size : Ø6
 Maximum Bar Size : Ø32
 Minimum Bar Spacing : 2.000 in
 Maximum Bar Spacing : 18.000 in
 Pedestal Clear Cover (P, CL) : 3.000 in
 Footing Clear Cover (F, CL) : 3.000 in

Soil Properties

Soil Type : UnDrained
 Unit Weight : 112.000 lb/ft³
 Soil Bearing Capacity : 4.000 kip/ft²
 Soil Surcharge : 0.000 kip/in²
 Depth of Soil above Footing : 0.000 in
 Undrained Shear Strength : 0.000 kip/in²
 Min Percentage of Slab : 0.000

Sliding and Overturning

Coefficient of Friction : 0.500
 Factor of Safety Against Sliding : 1.500
 Factor of Safety Against Overturning : 1.500

Load Combination/s- Service Stress Level	
Load Combination Number	Load Combination Title
1	DEAD
2	LIVE
3	COMBINATION LOAD CASE 3
101	1.000 x DL+1.000 x DL+1.000 x DL

102	0.800 x DL+0.800 x DL+0.800 x DL
Load Combination/s- Strength Level	
Load Combination Number	Load Combination Title
1	DEAD
2	LIVE
3	COMBINATION LOAD CASE 3

Applied Loads - Service Stress Level					
LC	Axial (kN)	Shear X (kN)	Shear Z (kN)	Moment X (kNm)	Moment Z (kNm)
1	452.071	2.556	0.166	0.181	-2.535
2	70.021	0.842	0.061	0.064	-0.836
3	783.137	5.096	0.340	0.368	-5.056
101	1305.229	8.494	0.567	0.613	-8.427
102	1044.183	6.795	0.454	0.491	-6.742

Applied Loads - Strength Level					
LC	Axial (kN)	Shear X (kN)	Shear Z (kN)	Moment X (kNm)	Moment Z (kNm)
1	452.071	2.556	0.166	0.181	-2.535
2	70.021	0.842	0.061	0.064	-0.836
3	783.137	5.096	0.340	0.368	-5.056

Design Calculations

Footing Size

Initial Length (L_o) = 1.016 m

Initial Width (W_o) = 1.016 m

Uplift force due to buoyancy = 0.000 kN

Effect due to adhesion = 0.000 kN

Area from initial length and width, $A_o = L_o \times W_o = 1.032 \text{ m}^2$

Min. area required from bearing pressure, $A_{\min} = P / q_{\max} = 6.855 \text{ m}^2$

Note: A_{\min} is an initial estimation.

P = Critical Factored Axial Load (without self weight/buoyancy/soil).

q_{\max} = Respective Factored Bearing Capacity.

Final Footing Size

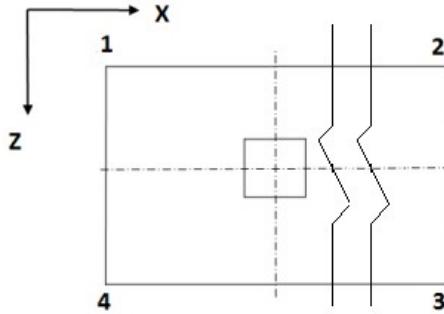
Length (L_2) = 2.692 m Governing Load Case : # 101

Width (W_2) = 2.692 m Governing Load Case : # 101

Depth (D_2) = 0.306 m Governing Load Case : # 101

$$\text{Area } (A_2) = 7.249 \text{ m}^2$$

Pressures at Four Corner



Load Case	Pressure at corner 1 (q_1) (kN/m ²)	Pressure at corner 2 (q_2) (kN/m ²)	Pressure at corner 3 (q_3) (kN/m ²)	Pressure at corner 4 (q_4) (kN/m ²)	Area of footing in uplift (A_u) (m ²)
101	183.5763	190.4293	190.9181	184.0651	0.000
101	183.5763	190.4293	190.9181	184.0651	0.000
101	183.5763	190.4293	190.9181	184.0651	0.000
101	183.5763	190.4293	190.9181	184.0651	0.000

If A_u is zero, there is no uplift and no pressure adjustment is necessary. Otherwise, to account for uplift, areas of negative pressure will be set to zero and the pressure will be redistributed to remaining corners.

Summary of adjusted Pressures at Four Corner

Load Case	Pressure at corner 1 (q_1) (kN/m ²)	Pressure at corner 2 (q_2) (kN/m ²)	Pressure at corner 3 (q_3) (kN/m ²)	Pressure at corner 4 (q_4) (kN/m ²)
101	183.5763	190.4293	190.9181	184.0651
101	183.5763	190.4293	190.9181	184.0651
101	183.5763	190.4293	190.9181	184.0651
101	183.5763	190.4293	190.9181	184.0651

Details of Out-of-Contact Area (If Any)

Governing load case = N/A

Plan area of footing = 7.249 sq.m

Area not in contact with soil = 0.000 sq.m

% of total area not in contact = 0.000%

Check For Stability Against Overturning And Sliding

-	Factor of safety against sliding		Factor of safety against overturning	
Load Case No.	Along X-Direction	Along Z-Direction	About X-Direction	About Z-Direction
1	98.633	1515.461	2893.408	202.407
2	72.576	1009.171	1971.403	148.819
3	81.950	1227.225	2357.323	168.139
101	79.904	1196.587	2298.474	163.941
102	80.671	1208.076	2320.542	165.515

Critical Load Case And The Governing Factor Of Safety For Overturning and Sliding X Direction

Critical Load Case for Sliding along X-Direction : 2

Governing Disturbing Force : 0.842 kN

Governing Restoring Force : 61.075 kN

Minimum Sliding Ratio for the Critical Load Case : 72.576

Critical Load Case for Overturning about X-Direction : 2

Governing Overturning Moment : 0.083 kNm

Governing Resisting Moment : 164.435 kNm

Minimum Overturning Ratio for the Critical Load Case : 1971.403

Critical Load Case And The Governing Factor Of Safety For Overturning and Sliding Z Direction

Critical Load Case for Sliding along Z-Direction : 2

Governing Disturbing Force : 0.061 kN

Governing Restoring Force : 61.075 kN

Minimum Sliding Ratio for the Critical Load Case : 1009.171

Critical Load Case for Overturning about Z-Direction : 2

Governing Overturning Moment : -1.105 kNm

Governing Resisting Moment : 164.435 kNm

Minimum Overturning Ratio for the Critical Load Case : 148.819

Moment CalculationCheck Trial Depth against moment (w.r.t. X Axis)**Critical Load Case = #3**

$$\text{Effective Depth} = D - (cc + 0.5 \times d_b) = 0.226 \text{ m}$$

$$\text{Governing moment (M}_u\text{)} = 191.251 \text{ kNm}$$

As Per IS 456 2000 ANNEX G G-1.1C

$$\text{Limiting Factor1 (K}_{u\max}\text{)} = \frac{700}{(1100 + 0.87 \times f_y)} = 0.479483$$

$$\text{Limiting Factor2 (R}_{u\max}\text{)} = \frac{0.36 \times f_{ck} \times k_{u\max} \times (1 - 0.42 \times k_{u\max})}{B} = 3801.834636 \text{ kN/m}^2$$

$$\text{Limit Moment Of Resistance (M}_{u\max}\text{)} = \frac{R_{u\max} \times B \times d_e^2}{2} = 520.958387 \text{ kNm}$$

$M_u \leq M_{umax}$ hence, safe

Check Trial Depth against moment (w.r.t. Z Axis)

Critical Load Case = #3

$$\text{Effective Depth} = D - (cc + 0.5 \times d_b) = 0.226 \text{ m}$$

$$\text{Governing moment } (M_u) = 185.337 \text{ kNm}$$

As Per IS 456 2000 ANNEX G G-1.1C

$$\text{Limiting Factor1 } (K_{umax}) = \frac{700}{(1100 + 0.87 \times f_y)} = 0.479483$$

$$\text{Limiting Factor2 } (R_{umax}) = \frac{0.36 \times f_{ck} \times k_{umax} \times (1 - 0.42 \times k_{umax})}{k_{umax}} = 3801.834636 \text{ kN/m}^2$$

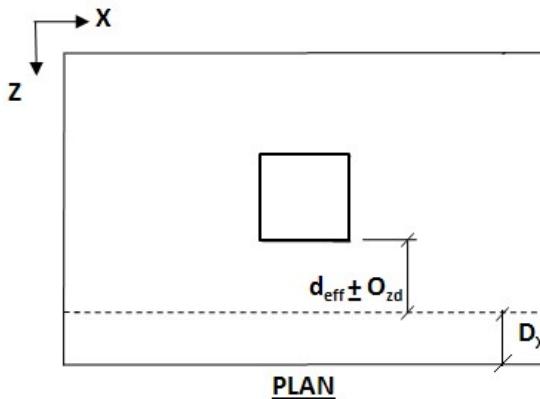
$$\text{Limit Moment Of Resistance } (M_{umax}) = \frac{R_{umax} \times B \times d_e^2}{4} = 520.958387 \text{ kNm}$$

$M_u \leq M_{umax}$ hence, safe

Shear Calculation

Check Trial Depth for one way shear (Along X Axis)

(Shear Plane Parallel to X Axis)



Critical Load Case = #3

$$D_X = 0.226 \text{ m}$$

$$\text{Shear Force}(S) = 268.014 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 441.243798 \text{ kN/m}^2$$

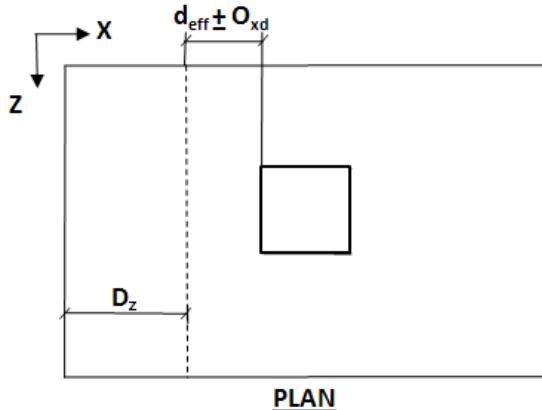
$$\text{Percentage Of Steel}(P_t) = 0.3998$$

As Per IS 456 2000 Clause 40 Table 19

$$\text{Shear Strength Of Concrete}(T_c) = 449.189 \text{ kN/m}^2$$

$T_v < T_c$ hence, safe

Check Trial Depth for one way shear (Along Z Axis)
(Shear Plane Parallel to Z Axis)



Critical Load Case = #3

$$D_z = 0.226 \text{ m}$$

$$\text{Shear Force}(S) = 263.811 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 434.324956 \text{ kN/m}^2$$

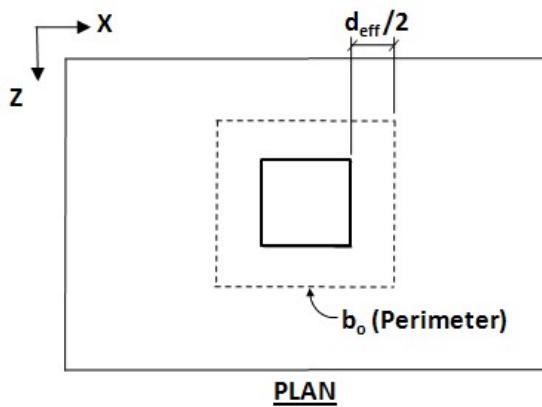
$$\text{Percentage Of Steel}(P_t) = 0.4134$$

As Per IS 456 2000 Clause 40 Table 19

$$\text{Shear Strength Of Concrete}(T_c) = 455.592 \text{ kN/m}^2$$

$T_v < T_c$ hence, safe

Check Trial Depth for two way shear



Critical Load Case = #3

$$\text{Shear Force}(S) = 737.477 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 1256.133 \text{ kN/m}^2$$

As Per IS 456 2000 Clause 31.6.3.1

$$K_s = \min[0.5 + \beta, 1] = 1.000$$

$$\text{Shear Strength}(T_c) = 0.25 \times \sqrt{f_{ck}} = 1312.8936 \text{ kN/m}^2$$

$$K_s \times T_c = 1312.8936 \text{ kN/m}^2$$

$$T_v \leq K_s \times T_c \text{ hence, safe}$$

Reinforcement Calculation

Calculation of Maximum Bar Size

Along X Axis

Bar diameter corresponding to max bar size (d_b) = 25 mm

As Per IS 456 2000 Clause 26.2.1

$$\text{Development Length}(l_d) = \frac{d_b \times 0.87 \times f_y}{4 \times \gamma_{bd}} = 0.956 \text{ m}$$

$$\text{Allowable Length}(l_{db}) = \left[\frac{(B - b)}{2} - cc \right] = 1.045 \text{ m}$$

$$l_{db} \geq l_d \text{ hence, safe}$$

Along Z Axis

Bar diameter corresponding to max bar size(d_b) = 25 mm

As Per IS 456 2000 Clause 26.2.1

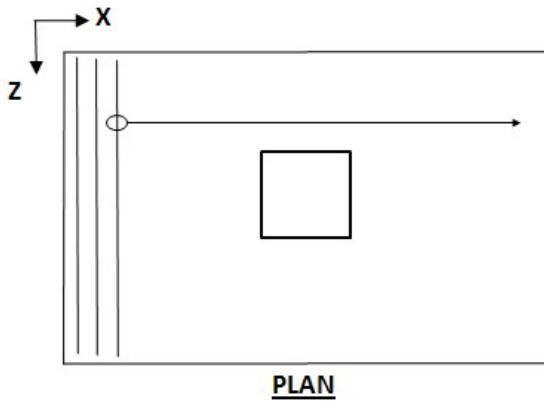
$$\text{Development Length}(l_d) = \frac{d_b \times 0.87 \times f_y}{4 \times \gamma_{bd}} = 0.956 \text{ m}$$

$$\text{Allowable Length}(l_{db}) = \left[\frac{(H - h)}{2} - cc \right] = 1.070 \text{ m}$$

$$l_{db} \geq l_d \text{ hence, safe}$$

Bottom Reinforcement Design

Along Z Axis



For moment w.r.t. X Axis (M_x)

As Per IS 456 2000 Clause 26.5.2.1

Critical Load Case = #3

Minimum Area of Steel ($A_{st,min}$) = 988.003 mm²

Calculated Area of Steel (A_{st}) = 2511.236 mm²

Provided Area of Steel ($A_{st,Provided}$) = 2511.236 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.048 m

Selected spacing (S) = 0.052 m

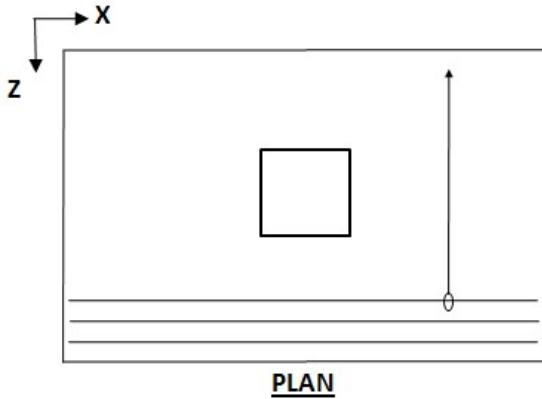
$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0.050 m o.c.

Along X Axis



For moment w.r.t. Z Axis (M_z)

As Per IS 456 2000 Clause 26.5.2.1

Critical Load Case = #3

Minimum Area of Steel ($A_{st,min}$) = 988.003 mm²

Calculated Area of Steel (A_{st}) = 2428.273 mm²

Provided Area of Steel ($A_{st,Provided}$) = 2428.273 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.053 m

$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

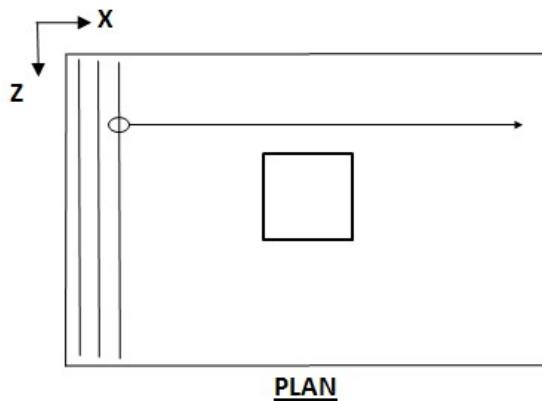
The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0.050 m o.c.

[Top Reinforcement Design](#)

[Along Z Axis](#)



Minimum Area of Steel ($A_{st,min}$) = 988.003 mm²

Calculated Area of Steel (A_{st}) = 984.772 mm²

Provided Area of Steel ($A_{st,Provided}$) = 988.003 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Governing Moment = 14.114 kNm

Selected bar Size (d_b) = Ø6

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.075 m

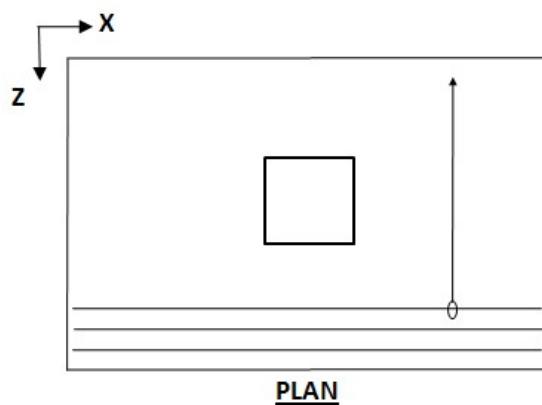
$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø6 @ 0 m o.c.

Along X Axis



Minimum Area of Steel ($A_{st,min}$) = 988.003 mm²

Calculated Area of Steel (A_{st}) = 2428.273 mm²

Provided Area of Steel ($A_{st,Provided}$) = 2428.273 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Governing Moment = 13.505 kNm

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.053 m

$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0 m o.c.

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 796.824 kN

Critical Applied Moment Along X Direction: 15.936 kNm

Critical Applied Moment Along Z Direction: 15.936 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.182 m

Position Of Neutral Axis Along Z Direction: 0.182 m

Pedestal Moment Capacity Along X Direction: 110.801 kNm

Pedestal Moment Capacity Along Z Direction: 125.969 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 577.848 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m
Position Of Neutral Axis Along Z Direction: 0.137 m
Pedestal Moment Capacity Along X Direction: 93.412 kNm
Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²
Pedestal Main/Compression Reinforcement: 16 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 783.137 kN
Critical Applied Moment Along X Direction: 15.662 kNm
Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m
Position Of Neutral Axis Along Z Direction: 0.180 m
Pedestal Moment Capacity Along X Direction: 110.061 kNm
Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²
Pedestal Main/Compression Reinforcement: 12 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN
Critical Applied Moment Along X Direction: 21.591 kNm
Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m
Position Of Neutral Axis Along Z Direction: 0.235 m
Pedestal Moment Capacity Along X Direction: 116.443 kNm
Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²
Pedestal Main/Compression Reinforcement: 28 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1108.293 kN

Critical Applied Moment Along X Direction: 22.165 kNm

Critical Applied Moment Along Z Direction: 22.165 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.224 kNm

Pedestal Moment Capacity Along Z Direction: 133.768 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 803.721 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1079.582 kN

Critical Applied Moment Along X Direction: 21.591 kNm

Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m

Position Of Neutral Axis Along Z Direction: 0.235 m

Pedestal Moment Capacity Along X Direction: 116.443 kNm

Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²

Pedestal Main/Compression Reinforcement: 28 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m

Position Of Neutral Axis Along Z Direction: 0.180 m

Pedestal Moment Capacity Along X Direction: 110.061 kNm

Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 802.558 kN

Critical Applied Moment Along X Direction: 16.051 kNm

Critical Applied Moment Along Z Direction: 16.051 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.183 m

Position Of Neutral Axis Along Z Direction: 0.183 m

Pedestal Moment Capacity Along X Direction: 111.028 kNm

Pedestal Moment Capacity Along Z Direction: 126.226 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 590.780 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1106.751 kN

Critical Applied Moment Along X Direction: 22.135 kNm

Critical Applied Moment Along Z Direction: 22.135 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.240 kNm

Pedestal Moment Capacity Along Z Direction: 133.790 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 802.604 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1137.123 kN

Critical Applied Moment Along X Direction: 22.742 kNm

Critical Applied Moment Along Z Direction: 22.742 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.244 m

Position Of Neutral Axis Along Z Direction: 0.244 m

Pedestal Moment Capacity Along X Direction: 117.002 kNm

Pedestal Moment Capacity Along Z Direction: 133.264 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 824.628 mm²

Pedestal Main/Compression Reinforcement: 32 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1106.751 kN

Critical Applied Moment Along X Direction: 22.135 kNm

Critical Applied Moment Along Z Direction: 22.135 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.240 kNm

Pedestal Moment Capacity Along Z Direction: 133.790 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 802.604 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 802.558 kN

Critical Applied Moment Along X Direction: 16.051 kNm

Critical Applied Moment Along Z Direction: 16.051 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.183 m

Position Of Neutral Axis Along Z Direction: 0.183 m

Pedestal Moment Capacity Along X Direction: 111.028 kNm

Pedestal Moment Capacity Along Z Direction: 126.226 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 590.780 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m
Position Of Neutral Axis Along Z Direction: 0.180 m
Pedestal Moment Capacity Along X Direction: 110.061 kNm
Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²
Pedestal Main/Compression Reinforcement: 12 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN
Critical Applied Moment Along X Direction: 21.591 kNm
Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m
Position Of Neutral Axis Along Z Direction: 0.235 m
Pedestal Moment Capacity Along X Direction: 116.443 kNm
Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²
Pedestal Main/Compression Reinforcement: 28 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m
Pedestal Reinforcement Design
Critical load Case : 3
Critical Applied Axial Load: 1108.293 kN
Critical Applied Moment Along X Direction: 22.165 kNm
Critical Applied Moment Along Z Direction: 22.165 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m
Position Of Neutral Axis Along Z Direction: 0.239 m
Pedestal Moment Capacity Along X Direction: 117.224 kNm
Pedestal Moment Capacity Along Z Direction: 133.768 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 803.721 mm²
Pedestal Main/Compression Reinforcement: 16 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m
Pedestal Reinforcement Design
Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN

Critical Applied Moment Along X Direction: 21.591 kNm

Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m

Position Of Neutral Axis Along Z Direction: 0.235 m

Pedestal Moment Capacity Along X Direction: 116.443 kNm

Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²

Pedestal Main/Compression Reinforcement: 28 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m

Position Of Neutral Axis Along Z Direction: 0.180 m

Pedestal Moment Capacity Along X Direction: 110.061 kNm

Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 796.824 kN

Critical Applied Moment Along X Direction: 15.936 kNm

Critical Applied Moment Along Z Direction: 15.936 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.182 m

Position Of Neutral Axis Along Z Direction: 0.182 m

Pedestal Moment Capacity Along X Direction: 110.801 kNm

Pedestal Moment Capacity Along Z Direction: 125.969 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 577.848 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

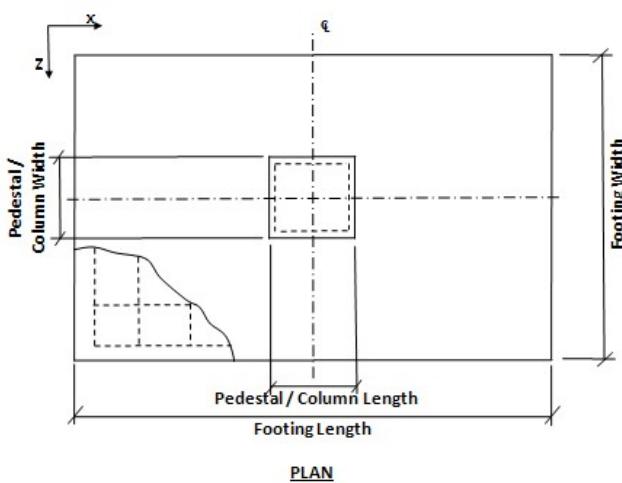
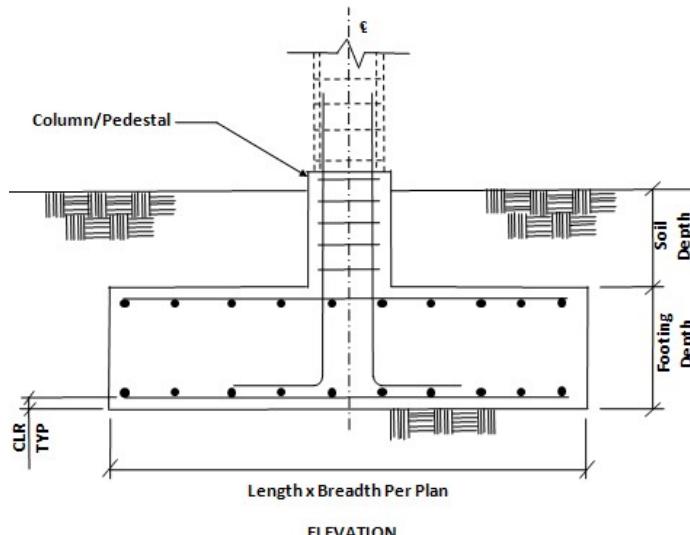
Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Isolated Footing 121



Input Values

Footing Geomtry

Design Type : Calculate Dimension
 Footing Thickness (Ft) : 12.000 in
 Footing Length - X (Fl) : 40.000 in
 Footing Width - Z (Fw) : 40.000 in
 Eccentricity along X (Oxd) : 0.000 in
 Eccentricity along Z (Ozd) : 0.000 in

Column Dimensions

Column Shape : Rectangular
 Column Length - X (Pl) : 0.450 m
 Column Width - Z (Pw) : 0.400 m

Pedestal

Include Pedestal? Yes

Pedestal Shape : Rectangular

Pedestal Height (Ph) : 0.015 m

Pedestal Length - X (Pl) : 0.450 m

Pedestal Width - Z (Pw) : 0.400 m

Design ParametersConcrete and Rebar Properties

Unit Weight of Concrete : 150.000 lb/ft³

Strength of Concrete : 4.000 ksi

Yield Strength of Steel : 60.000 ksi

Minimum Bar Size : Ø6

Maximum Bar Size : Ø32

Minimum Bar Spacing : 2.000 in

Maximum Bar Spacing : 18.000 in

Pedestal Clear Cover (P, CL) : 3.000 in

Footing Clear Cover (F, CL) : 3.000 in

Soil Properties

Soil Type : UnDrained

Unit Weight : 112.000 lb/ft³

Soil Bearing Capacity : 4.000 kip/ft²

Soil Surcharge : 0.000 kip/in²

Depth of Soil above Footing : 0.000 in

Undrained Shear Strength : 0.000 kip/in²

Min Percentage of Slab : 0.000

Sliding and Overturning

Coefficient of Friction : 0.500

Factor of Safety Against Sliding : 1.500

Factor of Safety Against Overturning : 1.500

Load Combination/s- Service Stress Level	
Load Combination Number	Load Combination Title
1	DEAD
2	LIVE
3	COMBINATION LOAD CASE 3
101	1.000 x DL+1.000 x DL+1.000 x DL

102	0.800 x DL+0.800 x DL+0.800 x DL
Load Combination/s- Strength Level	
Load Combination Number	Load Combination Title
1	DEAD
2	LIVE
3	COMBINATION LOAD CASE 3

Applied Loads - Service Stress Level					
LC	Axial (kN)	Shear X (kN)	Shear Z (kN)	Moment X (kNm)	Moment Z (kNm)
1	343.039	-1.982	1.854	1.843	1.966
2	38.969	-0.459	0.432	0.430	0.456
3	573.013	-3.661	3.428	3.410	3.634
101	955.021	-6.102	5.714	5.683	6.057
102	764.017	-4.882	4.571	4.546	4.845

Applied Loads - Strength Level					
LC	Axial (kN)	Shear X (kN)	Shear Z (kN)	Moment X (kNm)	Moment Z (kNm)
1	343.039	-1.982	1.854	1.843	1.966
2	38.969	-0.459	0.432	0.430	0.456
3	573.013	-3.661	3.428	3.410	3.634

Design Calculations

Footing Size

Initial Length (L_o) = 1.016 m

Initial Width (W_o) = 1.016 m

Uplift force due to buoyancy = 0.000 kN

Effect due to adhesion = 0.000 kN

Area from initial length and width, $A_o = L_o \times W_o = 1.032 \text{ m}^2$

Min. area required from bearing pressure, $A_{\min} = P / q_{\max} = 5.026 \text{ m}^2$

Note: A_{\min} is an initial estimation.

P = Critical Factored Axial Load (without self weight/buoyancy/soil).

q_{\max} = Respective Factored Bearing Capacity.

Final Footing Size

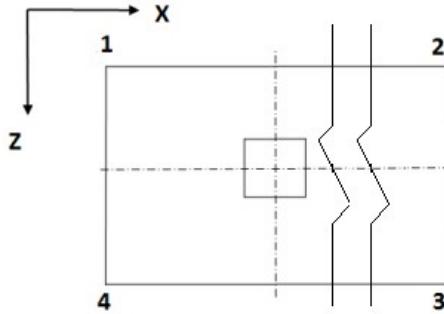
Length (L_2) = 2.337 m Governing Load Case : # 101

Width (W_2) = 2.337 m Governing Load Case : # 101

Depth (D_2) = 0.306 m Governing Load Case : # 101

$$\text{Area } (A_2) = 5.461 \text{ m}^2$$

Pressures at Four Corner



Load Case	Pressure at corner 1 (q_1) (kN/m ²)	Pressure at corner 2 (q_2) (kN/m ²)	Pressure at corner 3 (q_3) (kN/m ²)	Pressure at corner 4 (q_4) (kN/m ²)	Area of footing in uplift (A_u) (m ²)
101	182.3203	174.7877	181.8519	189.3845	0.000
101	182.3203	174.7877	181.8519	189.3845	0.000
101	182.3203	174.7877	181.8519	189.3845	0.000
101	182.3203	174.7877	181.8519	189.3845	0.000

If A_u is zero, there is no uplift and no pressure adjustment is necessary. Otherwise, to account for uplift, areas of negative pressure will be set to zero and the pressure will be redistributed to remaining corners.

Summary of adjusted Pressures at Four Corner

Load Case	Pressure at corner 1 (q_1) (kN/m ²)	Pressure at corner 2 (q_2) (kN/m ²)	Pressure at corner 3 (q_3) (kN/m ²)	Pressure at corner 4 (q_4) (kN/m ²)
101	182.3203	174.7877	181.8519	189.3845
101	182.3203	174.7877	181.8519	189.3845
101	182.3203	174.7877	181.8519	189.3845
101	182.3203	174.7877	181.8519	189.3845

Details of Out-of-Contact Area (If Any)

Governing load case = N/A

Plan area of footing = 5.461 sq.m

Area not in contact with soil = 0.000 sq.m

% of total area not in contact = 0.000%

Check For Stability Against Overturning And Sliding

-	Factor of safety against sliding		Factor of safety against overturning	
Load Case No.	Along X-Direction	Along Z-Direction	About X-Direction	About Z-Direction
1	96.450	103.102	183.315	171.761
2	85.263	90.675	161.000	151.581
3	83.617	89.298	158.729	148.860
101	81.471	87.006	154.656	145.040
102	82.276	87.865	156.183	146.472

Critical Load Case And The Governing Factor Of Safety For Overturning and Sliding X Direction

Critical Load Case for Sliding along X-Direction : 101

Governing Disturbing Force : -6.102 kN

Governing Restoring Force : 497.153 kN

Minimum Sliding Ratio for the Critical Load Case : 81.471

Critical Load Case for Overturning about X-Direction : 101

Governing Overturning Moment : 7.512 kNm

Governing Resisting Moment : 1161.725 kNm

Minimum Overturning Ratio for the Critical Load Case : 154.656

Critical Load Case And The Governing Factor Of Safety For Overturning and Sliding Z Direction

Critical Load Case for Sliding along Z-Direction : 101

Governing Disturbing Force : 5.714 kN

Governing Restoring Force : 497.153 kN

Minimum Sliding Ratio for the Critical Load Case : 87.006

Critical Load Case for Overturning about Z-Direction : 101

Governing Overturning Moment : 8.010 kNm

Governing Resisting Moment : 1161.725 kNm

Minimum Overturning Ratio for the Critical Load Case : 145.040

Moment CalculationCheck Trial Depth against moment (w.r.t. X Axis)**Critical Load Case = #3**

Effective Depth = $D - (cc + 0.5 \times d_b) = 0.226 \text{ m}$

Governing moment (M_u) = 116.660 kNm

As Per IS 456 2000 ANNEX G G-1.1C

Limiting Factor1 (K_{umax}) = $\frac{700}{(1100 + 0.87 \times f_y)} = 0.479483$

Limiting Factor2 (R_{umax}) = $0.36 \times f_{ck} \times k_{umax} \times (1 - 0.42 \times k_{umax}) = 3801.834636 \text{ kN/m}^2$

Limit Moment Of Resistance (M_{umax}) = $R_{umax} \times B \times d_e^2 = 452.152562 \text{ kNm}$

$M_u \leq M_{umax}$ hence, safe

Check Trial Depth against moment (w.r.t. Z Axis)

Critical Load Case = #3

$$\text{Effective Depth} = D - (cc + 0.5 \times d_b) = 0.226 \text{ m}$$

$$\text{Governing moment } (M_u) = 110.835 \text{ kNm}$$

As Per IS 456 2000 ANNEX G G-1.1C

$$\text{Limiting Factor1 } (K_{umax}) = \frac{700}{(1100 + 0.87 \times f_y)} = 0.479483$$

$$\text{Limiting Factor2 } (R_{umax}) = \frac{0.36 \times f_{ck} \times k_{umax} \times (1 - 0.42 \times k_{umax})}{k_{umax}} = 3801.834636 \text{ kN/m}^2$$

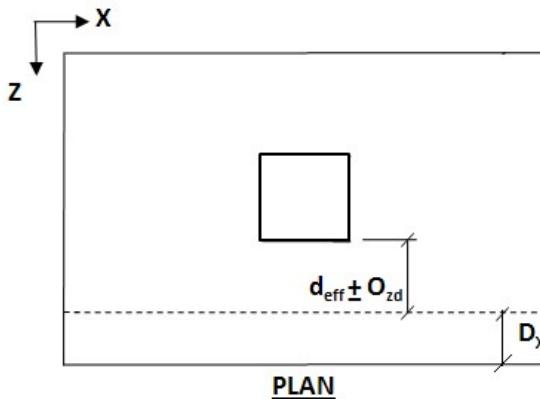
$$\text{Limit Moment Of Resistance } (M_{umax}) = \frac{R_{umax} \times B \times d_e^2}{4} = 452.152562 \text{ kNm}$$

$M_u \leq M_{umax}$ hence, safe

Shear Calculation

Check Trial Depth for one way shear (Along X Axis)

(Shear Plane Parallel to X Axis)



Critical Load Case = #3

$$D_x = 0.226 \text{ m}$$

$$\text{Shear Force}(S) = 184.653 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 350.264583 \text{ kN/m}^2$$

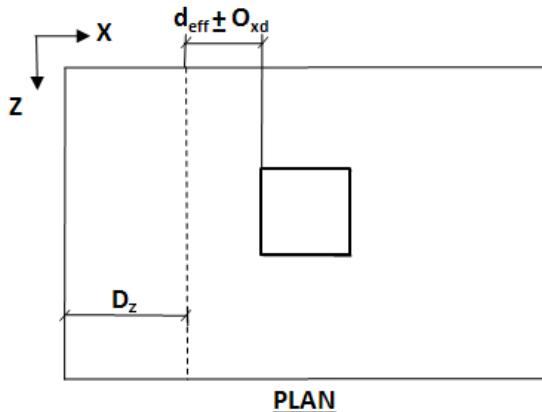
$$\text{Percentage Of Steel}(P_t) = 0.2699$$

As Per IS 456 2000 Clause 40 Table 19

$$\text{Shear Strength Of Concrete}(T_c) = 379.496 \text{ kN/m}^2$$

$T_v < T_c$ hence, safe

Check Trial Depth for one way shear (Along Z Axis)
(Shear Plane Parallel to Z Axis)



Critical Load Case = #3

$$D_z = 0.226 \text{ m}$$

$$\text{Shear Force}(S) = 178.640 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 338.857823 \text{ kN/m}^2$$

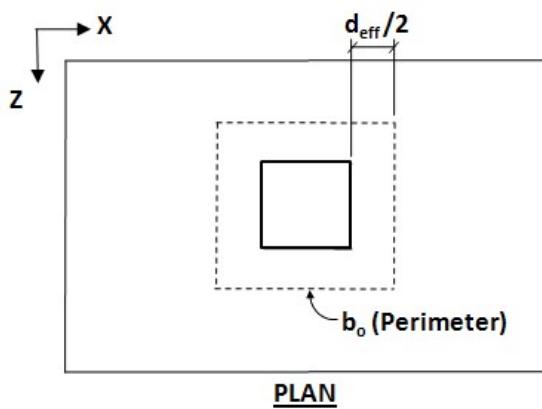
$$\text{Percentage Of Steel}(P_t) = 0.2847$$

As Per IS 456 2000 Clause 40 Table 19

$$\text{Shear Strength Of Concrete}(T_c) = 388.434 \text{ kN/m}^2$$

$T_v < T_c$ hence, safe

Check Trial Depth for two way shear



Critical Load Case = #3

$$\text{Shear Force}(S) = 528.661 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 900.461 \text{ kN/m}^2$$

As Per IS 456 2000 Clause 31.6.3.1

$$K_s = \min[0.5 + \beta, 1] = 1.000$$

$$\text{Shear Strength}(T_c) = 0.25 \times \sqrt{f_{ck}} = 1312.8936 \text{ kN/m}^2$$

$$K_s \times T_c = 1312.8936 \text{ kN/m}^2$$

$$T_v \leq K_s \times T_c \text{ hence, safe}$$

Reinforcement Calculation

Calculation of Maximum Bar Size

Along X Axis

Bar diameter corresponding to max bar size (d_b) = 20 mm

As Per IS 456 2000 Clause 26.2.1

$$\text{Development Length}(l_d) = \frac{d_b \times 0.87 \times f_y}{4 \times \gamma_{bd}} = 0.765 \text{ m}$$

$$\text{Allowable Length}(l_{db}) = \left[\frac{(B - b)}{2} - cc \right] = 0.867 \text{ m}$$

$$l_{db} \geq l_d \text{ hence, safe}$$

Along Z Axis

Bar diameter corresponding to max bar size(d_b) = 20 mm

As Per IS 456 2000 Clause 26.2.1

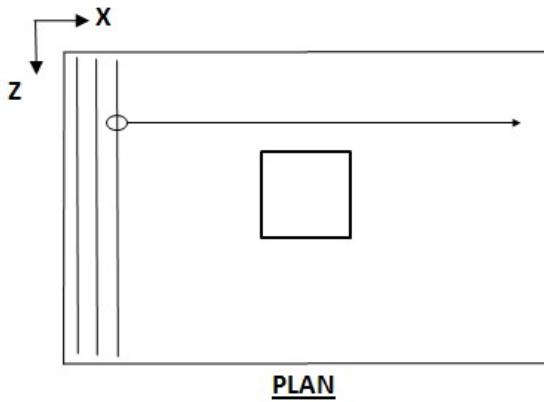
$$\text{Development Length}(l_d) = \frac{d_b \times 0.87 \times f_y}{4 \times \gamma_{bd}} = 0.765 \text{ m}$$

$$\text{Allowable Length}(l_{db}) = \left[\frac{(H - h)}{2} - cc \right] = 0.892 \text{ m}$$

$$l_{db} \geq l_d \text{ hence, safe}$$

Bottom Reinforcement Design

Along Z Axis



For moment w.r.t. X Axis (M_x)

As Per IS 456 2000 Clause 26.5.2.1

Critical Load Case = #3

Minimum Area of Steel ($A_{st,min}$) = 857.512 mm²

Calculated Area of Steel (A_{st}) = 1500.914 mm²

Provided Area of Steel ($A_{st,Provided}$) = 1500.914 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.048 m

Selected spacing (S) = 0.075 m

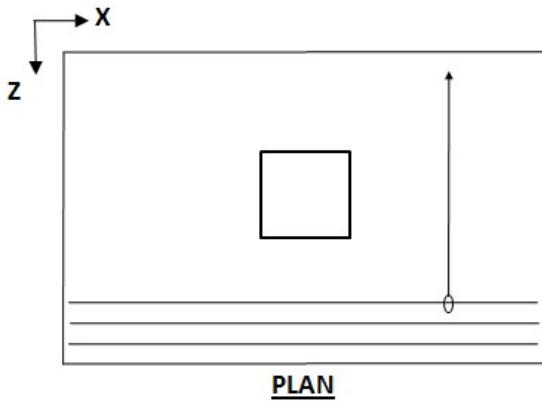
$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0.075 m o.c.

[Along X Axis](#)



For moment w.r.t. Z Axis (M_z)

As Per IS 456 2000 Clause 26.5.2.1

Critical Load Case = #3

Minimum Area of Steel ($A_{st,min}$) = 857.512 mm²

Calculated Area of Steel (A_{st}) = 1422.663 mm²

Provided Area of Steel ($A_{st,Provided}$) = 1422.663 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.078 m

$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

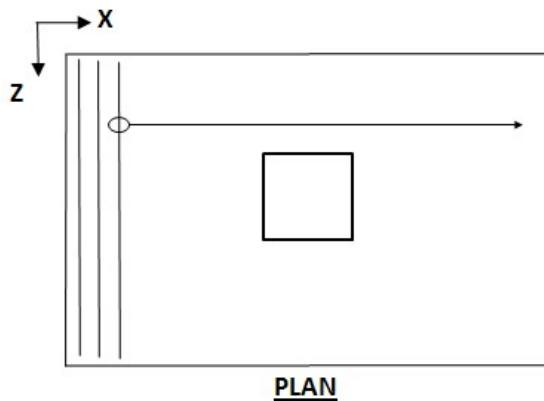
The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0.075 m o.c.

[Top Reinforcement Design](#)

[Along Z Axis](#)



Minimum Area of Steel ($A_{st,min}$) = 857.512 mm²

Calculated Area of Steel (A_{st}) = 854.708 mm²

Provided Area of Steel ($A_{st,Provided}$) = 857.512 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Governing Moment = 8.744 kNm

Selected bar Size (d_b) = Ø6

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.073 m

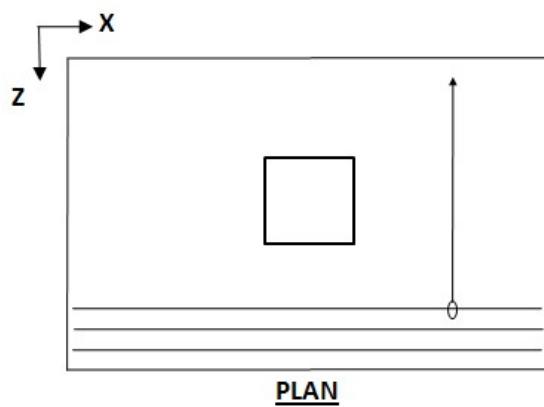
$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø6 @ 0 m o.c.

Along X Axis



Minimum Area of Steel ($A_{st,min}$) = 857.512 mm²

Calculated Area of Steel (A_{st}) = 1422.663 mm²

Provided Area of Steel ($A_{st,Provided}$) = 1422.663 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Governing Moment = 8.298 kNm

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.078 m

$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0 m o.c.

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 796.824 kN

Critical Applied Moment Along X Direction: 15.936 kNm

Critical Applied Moment Along Z Direction: 15.936 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.182 m

Position Of Neutral Axis Along Z Direction: 0.182 m

Pedestal Moment Capacity Along X Direction: 110.801 kNm

Pedestal Moment Capacity Along Z Direction: 125.969 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 577.848 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m
Position Of Neutral Axis Along Z Direction: 0.137 m
Pedestal Moment Capacity Along X Direction: 93.412 kNm
Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²
Pedestal Main/Compression Reinforcement: 16 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 783.137 kN
Critical Applied Moment Along X Direction: 15.662 kNm
Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m
Position Of Neutral Axis Along Z Direction: 0.180 m
Pedestal Moment Capacity Along X Direction: 110.061 kNm
Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²
Pedestal Main/Compression Reinforcement: 12 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN
Critical Applied Moment Along X Direction: 21.591 kNm
Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m
Position Of Neutral Axis Along Z Direction: 0.235 m
Pedestal Moment Capacity Along X Direction: 116.443 kNm
Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²
Pedestal Main/Compression Reinforcement: 28 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1108.293 kN

Critical Applied Moment Along X Direction: 22.165 kNm

Critical Applied Moment Along Z Direction: 22.165 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.224 kNm

Pedestal Moment Capacity Along Z Direction: 133.768 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 803.721 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1079.582 kN

Critical Applied Moment Along X Direction: 21.591 kNm

Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m

Position Of Neutral Axis Along Z Direction: 0.235 m

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Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²

Pedestal Main/Compression Reinforcement: 28 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m

Position Of Neutral Axis Along Z Direction: 0.180 m

Pedestal Moment Capacity Along X Direction: 110.061 kNm

Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 802.558 kN

Critical Applied Moment Along X Direction: 16.051 kNm

Critical Applied Moment Along Z Direction: 16.051 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.183 m

Position Of Neutral Axis Along Z Direction: 0.183 m

Pedestal Moment Capacity Along X Direction: 111.028 kNm

Pedestal Moment Capacity Along Z Direction: 126.226 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 590.780 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1106.751 kN

Critical Applied Moment Along X Direction: 22.135 kNm

Critical Applied Moment Along Z Direction: 22.135 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.240 kNm

Pedestal Moment Capacity Along Z Direction: 133.790 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 802.604 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1137.123 kN

Critical Applied Moment Along X Direction: 22.742 kNm

Critical Applied Moment Along Z Direction: 22.742 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.244 m

Position Of Neutral Axis Along Z Direction: 0.244 m

Pedestal Moment Capacity Along X Direction: 117.002 kNm

Pedestal Moment Capacity Along Z Direction: 133.264 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 824.628 mm²

Pedestal Main/Compression Reinforcement: 32 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1106.751 kN

Critical Applied Moment Along X Direction: 22.135 kNm

Critical Applied Moment Along Z Direction: 22.135 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.240 kNm

Pedestal Moment Capacity Along Z Direction: 133.790 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 802.604 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 802.558 kN

Critical Applied Moment Along X Direction: 16.051 kNm

Critical Applied Moment Along Z Direction: 16.051 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.183 m

Position Of Neutral Axis Along Z Direction: 0.183 m

Pedestal Moment Capacity Along X Direction: 111.028 kNm

Pedestal Moment Capacity Along Z Direction: 126.226 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 590.780 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m
Position Of Neutral Axis Along Z Direction: 0.180 m
Pedestal Moment Capacity Along X Direction: 110.061 kNm
Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²
Pedestal Main/Compression Reinforcement: 12 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN
Critical Applied Moment Along X Direction: 21.591 kNm
Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m
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Pedestal Moment Capacity Along X Direction: 116.443 kNm
Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
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Required Main Reinforcement: 782.901 mm²
Pedestal Main/Compression Reinforcement: 28 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1108.293 kN
Critical Applied Moment Along X Direction: 22.165 kNm
Critical Applied Moment Along Z Direction: 22.165 kNm

Pedestal design is performed in accordance with IS 456 Section 39

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Pedestal Reinforcement Design

Critical load Case : 3
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Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

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Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 796.824 kN

Critical Applied Moment Along X Direction: 15.936 kNm

Critical Applied Moment Along Z Direction: 15.936 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.182 m

Position Of Neutral Axis Along Z Direction: 0.182 m

Pedestal Moment Capacity Along X Direction: 110.801 kNm

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Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

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Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

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Pedestal design is performed in accordance with IS 456 Section 39

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Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

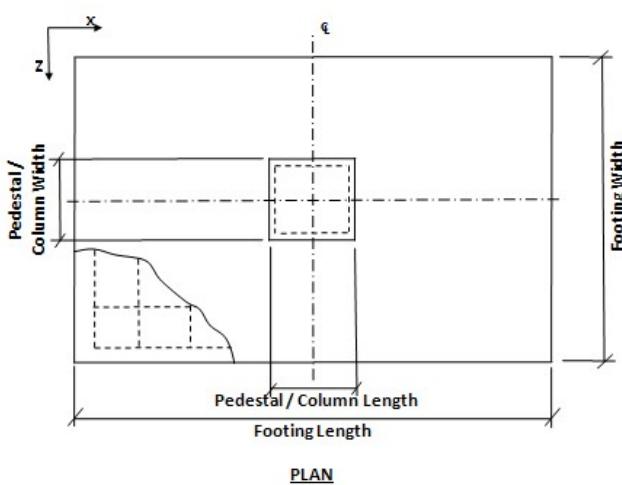
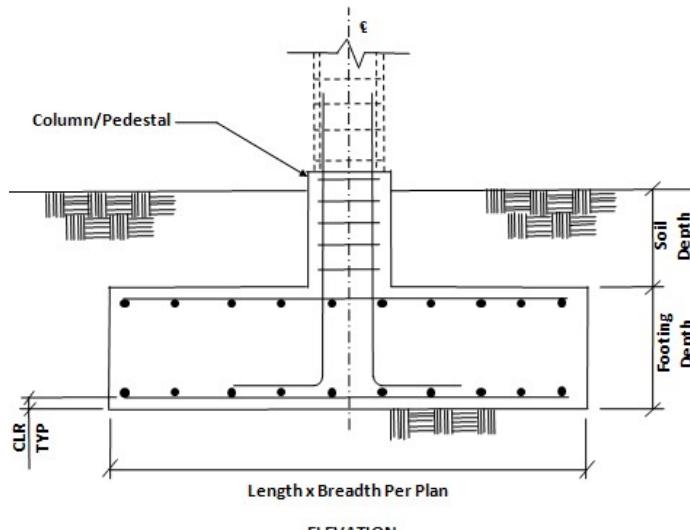
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IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Isolated Footing 122



Input Values

Footing Geomtry

Design Type : Calculate Dimension
 Footing Thickness (Ft) : 12.000 in
 Footing Length - X (Fl) : 40.000 in
 Footing Width - Z (Fw) : 40.000 in
 Eccentricity along X (Oxd) : 0.000 in
 Eccentricity along Z (Ozd) : 0.000 in

Column Dimensions

Column Shape : Rectangular
 Column Length - X (Pl) : 0.450 m
 Column Width - Z (Pw) : 0.400 m

Pedestal

Include Pedestal? Yes
 Pedestal Shape : Rectangular
 Pedestal Height (Ph) : 0.015 m
 Pedestal Length - X (Pl) : 0.450 m
 Pedestal Width - Z (Pw) : 0.400 m

Design Parameters

Concrete and Rebar Properties

Unit Weight of Concrete : 150.000 lb/ft³
 Strength of Concrete : 4.000 ksi
 Yield Strength of Steel : 60.000 ksi
 Minimum Bar Size : Ø6
 Maximum Bar Size : Ø32
 Minimum Bar Spacing : 2.000 in
 Maximum Bar Spacing : 18.000 in
 Pedestal Clear Cover (P, CL) : 3.000 in
 Footing Clear Cover (F, CL) : 3.000 in

Soil Properties

Soil Type : UnDrained
 Unit Weight : 112.000 lb/ft³
 Soil Bearing Capacity : 4.000 kip/ft²
 Soil Surcharge : 0.000 kip/in²
 Depth of Soil above Footing : 0.000 in
 Undrained Shear Strength : 0.000 kip/in²
 Min Percentage of Slab : 0.000

Sliding and Overturning

Coefficient of Friction : 0.500
 Factor of Safety Against Sliding : 1.500
 Factor of Safety Against Overturning : 1.500

Load Combination/s- Service Stress Level	
Load Combination Number	Load Combination Title
1	DEAD
2	LIVE
3	COMBINATION LOAD CASE 3
101	1.000 x DL+1.000 x DL+1.000 x DL

102	0.800 x DL+0.800 x DL+0.800 x DL
Load Combination/s- Strength Level	
Load Combination Number	Load Combination Title
1	DEAD
2	LIVE
3	COMBINATION LOAD CASE 3

Applied Loads - Service Stress Level					
LC	Axial (kN)	Shear X (kN)	Shear Z (kN)	Moment X (kNm)	Moment Z (kNm)
1	448.716	-0.215	2.379	2.365	0.234
2	68.982	-0.073	0.781	0.777	0.078
3	776.547	-0.433	4.740	4.713	0.467
101	1294.245	-0.721	7.900	7.855	0.778
102	1035.396	-0.577	6.320	6.284	0.623

Applied Loads - Strength Level					
LC	Axial (kN)	Shear X (kN)	Shear Z (kN)	Moment X (kNm)	Moment Z (kNm)
1	448.716	-0.215	2.379	2.365	0.234
2	68.982	-0.073	0.781	0.777	0.078
3	776.547	-0.433	4.740	4.713	0.467

Design Calculations

Footing Size

Initial Length (L_o) = 1.016 m

Initial Width (W_o) = 1.016 m

Uplift force due to buoyancy = 0.000 kN

Effect due to adhesion = 0.000 kN

Area from initial length and width, $A_o = L_o \times W_o = 1.032 \text{ m}^2$

Min. area required from bearing pressure, $A_{\min} = P / q_{\max} = 6.797 \text{ m}^2$

Note: A_{\min} is an initial estimation.

P = Critical Factored Axial Load (without self weight/buoyancy/soil).

q_{\max} = Respective Factored Bearing Capacity.

Final Footing Size

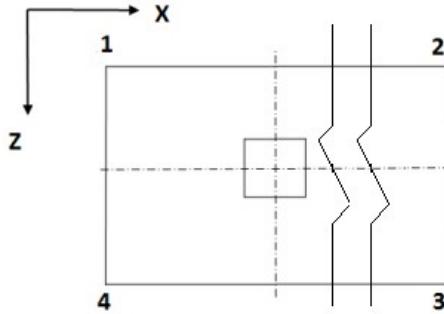
Length (L_2) = 2.692 m Governing Load Case : # 101

Width (W_2) = 2.692 m Governing Load Case : # 101

Depth (D_2) = 0.306 m Governing Load Case : # 101

$$\text{Area } (A_2) = 7.249 \text{ m}^2$$

Pressures at Four Corner



Load Case	Pressure at corner 1 (q_1) (kN/m ²)	Pressure at corner 2 (q_2) (kN/m ²)	Pressure at corner 3 (q_3) (kN/m ²)	Pressure at corner 4 (q_4) (kN/m ²)	Area of footing in uplift (A_u) (m ²)
101	182.8500	182.2296	188.6138	189.2342	0.000
101	182.8500	182.2296	188.6138	189.2342	0.000
101	182.8500	182.2296	188.6138	189.2342	0.000
101	182.8500	182.2296	188.6138	189.2342	0.000

If A_u is zero, there is no uplift and no pressure adjustment is necessary. Otherwise, to account for uplift, areas of negative pressure will be set to zero and the pressure will be redistributed to remaining corners.

Summary of adjusted Pressures at Four Corner

Load Case	Pressure at corner 1 (q_1) (kN/m ²)	Pressure at corner 2 (q_2) (kN/m ²)	Pressure at corner 3 (q_3) (kN/m ²)	Pressure at corner 4 (q_4) (kN/m ²)
101	182.8500	182.2296	188.6138	189.2342
101	182.8500	182.2296	188.6138	189.2342
101	182.8500	182.2296	188.6138	189.2342
101	182.8500	182.2296	188.6138	189.2342

Details of Out-of-Contact Area (If Any)

Governing load case = N/A

Plan area of footing = 7.249 sq.m

Area not in contact with soil = 0.000 sq.m

% of total area not in contact = 0.000%

Check For Stability Against Overturning And Sliding

-	Factor of safety against sliding		Factor of safety against overturning	
Load Case No.	Along X-Direction	Along Z-Direction	About X-Direction	About Z-Direction
1	1165.124	105.271	215.685	2229.557
2	824.996	77.504	158.697	1610.408
3	958.005	87.409	179.060	1842.455
101	933.900	85.209	174.555	1796.096
102	942.940	86.034	176.244	1813.481

Critical Load Case And The Governing Factor Of Safety For Overturning and Sliding X Direction

Critical Load Case for Sliding along X-Direction : 2

Governing Disturbing Force : -0.073 kN

Governing Restoring Force : 60.556 kN

Minimum Sliding Ratio for the Critical Load Case : 824.996

Critical Load Case for Overturning about X-Direction : 2

Governing Overturning Moment : 1.027 kNm

Governing Resisting Moment : 163.037 kNm

Minimum Overturning Ratio for the Critical Load Case : 158.697

Critical Load Case And The Governing Factor Of Safety For Overturning and Sliding Z Direction

Critical Load Case for Sliding along Z-Direction : 2

Governing Disturbing Force : 0.781 kN

Governing Restoring Force : 60.556 kN

Minimum Sliding Ratio for the Critical Load Case : 77.504

Critical Load Case for Overturning about Z-Direction : 2

Governing Overturning Moment : 0.101 kNm

Governing Resisting Moment : 163.037 kNm

Minimum Overturning Ratio for the Critical Load Case : 1610.408

Moment CalculationCheck Trial Depth against moment (w.r.t. X Axis)**Critical Load Case = #3**

Effective Depth = $D - (cc + 0.5 \times d_b) = 0.226 \text{ m}$

Governing moment (M_u) = 191.885 kNm

As Per IS 456 2000 ANNEX G G-1.1C

Limiting Factor1 (K_{umax}) = $\frac{700}{(1100 + 0.87 \times f_y)} = 0.479483$

Limiting Factor2 (R_{umax}) = $0.36 \times f_{ck} \times k_{umax} \times (1 - 0.42 \times k_{umax}) = 3801.834636 \text{ kN/m}^2$

Limit Moment Of Resistance (M_{umax}) = $R_{umax} \times B \times d_e^2 = 520.958387 \text{ kNm}$

$M_u \leq M_{umax}$ hence, safe

Check Trial Depth against moment (w.r.t. Z Axis)

Critical Load Case = #3

$$\text{Effective Depth} = D - (cc + 0.5 \times d_b) = 0.226 \text{ m}$$

$$\text{Governing moment } (M_u) = 181.510 \text{ kNm}$$

As Per IS 456 2000 ANNEX G G-1.1C

$$\text{Limiting Factor1 } (K_{umax}) = \frac{700}{(1100 + 0.87 \times f_y)} = 0.479483$$

$$\text{Limiting Factor2 } (R_{umax}) = \frac{0.36 \times f_{ck} \times k_{umax} \times (1 - 0.42 \times k_{umax})}{k_{umax}} = 3801.834636 \text{ kN/m}^2$$

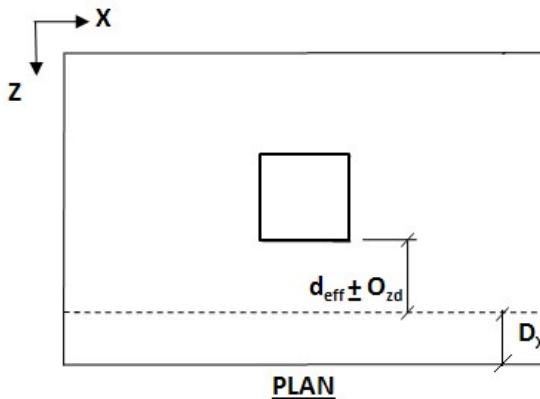
$$\text{Limit Moment Of Resistance } (M_{umax}) = \frac{R_{umax} \times B \times d_e^2}{4} = 520.958387 \text{ kNm}$$

$M_u \leq M_{umax}$ hence, safe

Shear Calculation

Check Trial Depth for one way shear (Along X Axis)

(Shear Plane Parallel to X Axis)



Critical Load Case = #3

$$D_X = 0.226 \text{ m}$$

$$\text{Shear Force}(S) = 268.645 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 442.283184 \text{ kN/m}^2$$

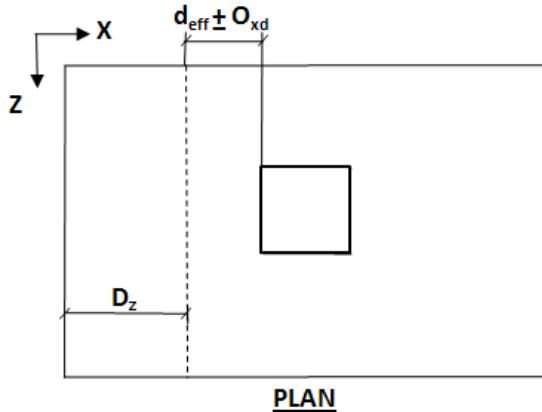
$$\text{Percentage Of Steel}(P_t) = 0.3910$$

As Per IS 456 2000 Clause 40 Table 19

$$\text{Shear Strength Of Concrete}(T_c) = 444.984 \text{ kN/m}^2$$

$T_v < T_c$ hence, safe

Check Trial Depth for one way shear (Along Z Axis)
(Shear Plane Parallel to Z Axis)



Critical Load Case = #3

$$D_z = 0.226 \text{ m}$$

$$\text{Shear Force}(S) = 258.610 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 425.762070 \text{ kN/m}^2$$

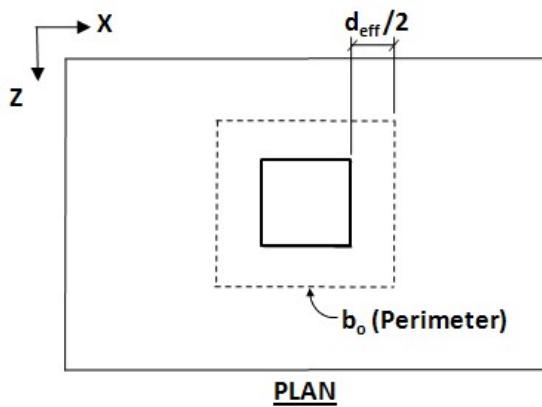
$$\text{Percentage Of Steel}(P_t) = 0.4149$$

As Per IS 456 2000 Clause 40 Table 19

$$\text{Shear Strength Of Concrete}(T_c) = 456.271 \text{ kN/m}^2$$

$T_v < T_c$ hence, safe

Check Trial Depth for two way shear



Critical Load Case = #3

$$\text{Shear Force}(S) = 731.270 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 1245.562 \text{ kN/m}^2$$

As Per IS 456 2000 Clause 31.6.3.1

$$K_s = \min[(0.5 + \beta), 1] = 1.000$$

$$\text{Shear Strength}(T_c) = 0.25 \times \sqrt{f_{ck}} = 1312.8936 \text{ kN/m}^2$$

$$K_s \times T_c = 1312.8936 \text{ kN/m}^2$$

$$T_v \leq K_s \times T_c \text{ hence, safe}$$

Reinforcement Calculation

Calculation of Maximum Bar Size

Along X Axis

Bar diameter corresponding to max bar size (d_b) = 25 mm

As Per IS 456 2000 Clause 26.2.1

$$\text{Development Length}(l_d) = \frac{d_b \times 0.87 \times f_y}{4 \times \gamma_{bd}} = 0.956 \text{ m}$$

$$\text{Allowable Length}(l_{db}) = \left[\frac{(B - b)}{2} - cc \right] = 1.045 \text{ m}$$

$$l_{db} \geq l_d \text{ hence, safe}$$

Along Z Axis

Bar diameter corresponding to max bar size(d_b) = 25 mm

As Per IS 456 2000 Clause 26.2.1

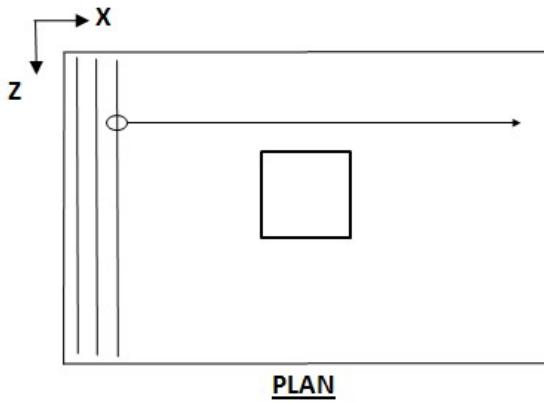
$$\text{Development Length}(l_d) = \frac{d_b \times 0.87 \times f_y}{4 \times \gamma_{bd}} = 0.956 \text{ m}$$

$$\text{Allowable Length}(l_{db}) = \left[\frac{(H - h)}{2} - cc \right] = 1.070 \text{ m}$$

$$l_{db} \geq l_d \text{ hence, safe}$$

Bottom Reinforcement Design

Along Z Axis



For moment w.r.t. X Axis (M_x)

As Per IS 456 2000 Clause 26.5.2.1

Critical Load Case = #3

Minimum Area of Steel ($A_{st,min}$) = 991.234 mm²

Calculated Area of Steel (A_{st}) = 2520.152 mm²

Provided Area of Steel ($A_{st,Provided}$) = 2520.152 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Selected bar Size (d_b) = Ø10

Minimum spacing allowed (S_{min}) = 0.050 m

Selected spacing (S) = 0.079 m

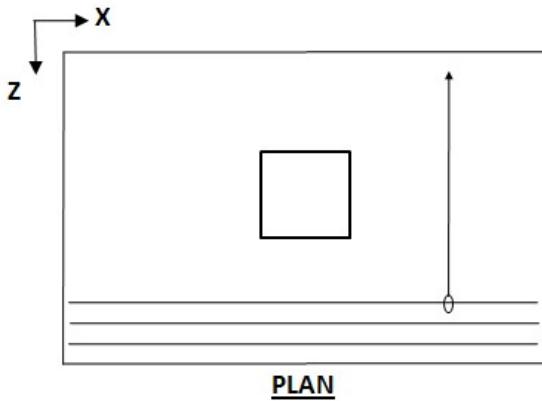
$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø10 @ 0.075 m o.c.

[Along X Axis](#)



For moment w.r.t. Z Axis (M_z)

As Per IS 456 2000 Clause 26.5.2.1

Critical Load Case = #3

Minimum Area of Steel ($A_{st,min}$) = 988.003 mm²

Calculated Area of Steel (A_{st}) = 2374.803 mm²

Provided Area of Steel ($A_{st,Provided}$) = 2374.803 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.054 m

$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

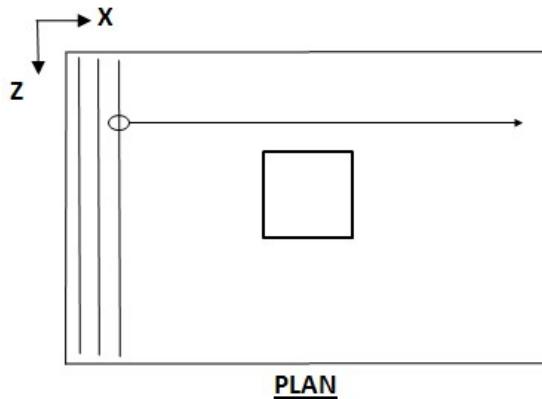
The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0.050 m o.c.

[Top Reinforcement Design](#)

[Along Z Axis](#)



Minimum Area of Steel ($A_{st,min}$) = 991.234 mm²

Calculated Area of Steel (A_{st}) = 984.772 mm²

Provided Area of Steel ($A_{st,Provided}$) = 991.234 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Governing Moment = 14.114 kNm

Selected bar Size (d_b) = Ø6

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.075 m

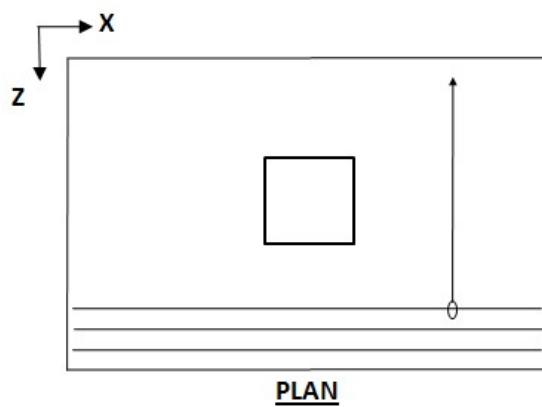
$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø6 @ 0 m o.c.

Along X Axis



Minimum Area of Steel ($A_{st,min}$) = 988.003 mm²

Calculated Area of Steel (A_{st}) = 2374.803 mm²

Provided Area of Steel ($A_{st,Provided}$) = 2374.803 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Governing Moment = 13.505 kNm

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.054 m

$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0 m o.c.

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 796.824 kN

Critical Applied Moment Along X Direction: 15.936 kNm

Critical Applied Moment Along Z Direction: 15.936 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.182 m

Position Of Neutral Axis Along Z Direction: 0.182 m

Pedestal Moment Capacity Along X Direction: 110.801 kNm

Pedestal Moment Capacity Along Z Direction: 125.969 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 577.848 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m
Position Of Neutral Axis Along Z Direction: 0.137 m
Pedestal Moment Capacity Along X Direction: 93.412 kNm
Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²
Pedestal Main/Compression Reinforcement: 16 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 783.137 kN
Critical Applied Moment Along X Direction: 15.662 kNm
Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m
Position Of Neutral Axis Along Z Direction: 0.180 m
Pedestal Moment Capacity Along X Direction: 110.061 kNm
Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²
Pedestal Main/Compression Reinforcement: 12 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m
Pedestal Reinforcement Design
Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN
Critical Applied Moment Along X Direction: 21.591 kNm
Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m
Position Of Neutral Axis Along Z Direction: 0.235 m
Pedestal Moment Capacity Along X Direction: 116.443 kNm
Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²
Pedestal Main/Compression Reinforcement: 28 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m
Pedestal Reinforcement Design
Critical load Case : 3
Critical Applied Axial Load: 1108.293 kN

Critical Applied Moment Along X Direction: 22.165 kNm

Critical Applied Moment Along Z Direction: 22.165 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.224 kNm

Pedestal Moment Capacity Along Z Direction: 133.768 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 803.721 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1079.582 kN

Critical Applied Moment Along X Direction: 21.591 kNm

Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m

Position Of Neutral Axis Along Z Direction: 0.235 m

Pedestal Moment Capacity Along X Direction: 116.443 kNm

Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²

Pedestal Main/Compression Reinforcement: 28 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m

Position Of Neutral Axis Along Z Direction: 0.180 m

Pedestal Moment Capacity Along X Direction: 110.061 kNm

Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 802.558 kN

Critical Applied Moment Along X Direction: 16.051 kNm

Critical Applied Moment Along Z Direction: 16.051 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.183 m

Position Of Neutral Axis Along Z Direction: 0.183 m

Pedestal Moment Capacity Along X Direction: 111.028 kNm

Pedestal Moment Capacity Along Z Direction: 126.226 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 590.780 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1106.751 kN

Critical Applied Moment Along X Direction: 22.135 kNm

Critical Applied Moment Along Z Direction: 22.135 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.240 kNm

Pedestal Moment Capacity Along Z Direction: 133.790 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 802.604 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1137.123 kN

Critical Applied Moment Along X Direction: 22.742 kNm

Critical Applied Moment Along Z Direction: 22.742 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.244 m

Position Of Neutral Axis Along Z Direction: 0.244 m

Pedestal Moment Capacity Along X Direction: 117.002 kNm

Pedestal Moment Capacity Along Z Direction: 133.264 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 824.628 mm²

Pedestal Main/Compression Reinforcement: 32 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1106.751 kN

Critical Applied Moment Along X Direction: 22.135 kNm

Critical Applied Moment Along Z Direction: 22.135 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.240 kNm

Pedestal Moment Capacity Along Z Direction: 133.790 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 802.604 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 802.558 kN

Critical Applied Moment Along X Direction: 16.051 kNm

Critical Applied Moment Along Z Direction: 16.051 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.183 m

Position Of Neutral Axis Along Z Direction: 0.183 m

Pedestal Moment Capacity Along X Direction: 111.028 kNm

Pedestal Moment Capacity Along Z Direction: 126.226 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 590.780 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m
Position Of Neutral Axis Along Z Direction: 0.180 m
Pedestal Moment Capacity Along X Direction: 110.061 kNm
Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²
Pedestal Main/Compression Reinforcement: 12 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN
Critical Applied Moment Along X Direction: 21.591 kNm
Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m
Position Of Neutral Axis Along Z Direction: 0.235 m
Pedestal Moment Capacity Along X Direction: 116.443 kNm
Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²
Pedestal Main/Compression Reinforcement: 28 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m
Critical load Case : 3
Critical Applied Axial Load: 1108.293 kN
Critical Applied Moment Along X Direction: 22.165 kNm
Critical Applied Moment Along Z Direction: 22.165 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m
Position Of Neutral Axis Along Z Direction: 0.239 m
Pedestal Moment Capacity Along X Direction: 117.224 kNm
Pedestal Moment Capacity Along Z Direction: 133.768 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 803.721 mm²
Pedestal Main/Compression Reinforcement: 16 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m
Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN

Critical Applied Moment Along X Direction: 21.591 kNm

Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m

Position Of Neutral Axis Along Z Direction: 0.235 m

Pedestal Moment Capacity Along X Direction: 116.443 kNm

Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²

Pedestal Main/Compression Reinforcement: 28 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m

Position Of Neutral Axis Along Z Direction: 0.180 m

Pedestal Moment Capacity Along X Direction: 110.061 kNm

Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 796.824 kN

Critical Applied Moment Along X Direction: 15.936 kNm

Critical Applied Moment Along Z Direction: 15.936 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.182 m

Position Of Neutral Axis Along Z Direction: 0.182 m

Pedestal Moment Capacity Along X Direction: 110.801 kNm

Pedestal Moment Capacity Along Z Direction: 125.969 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 577.848 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

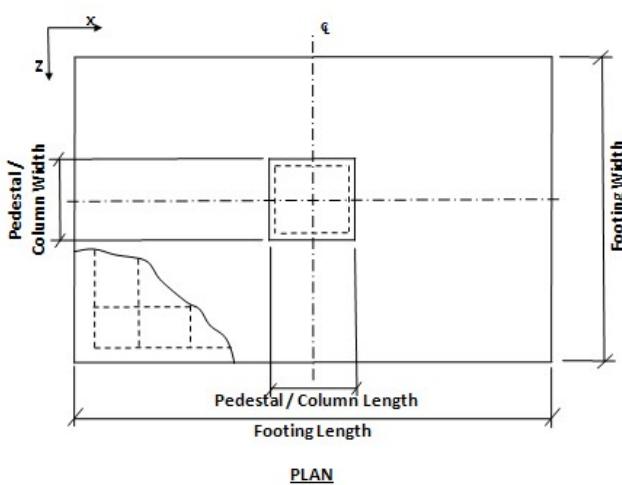
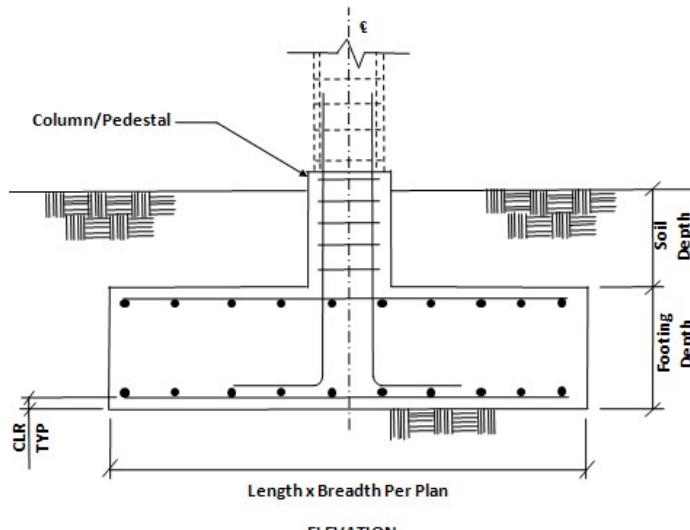
Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Isolated Footing 123



Input Values

Footing Geomtry

Design Type : Calculate Dimension
 Footing Thickness (Ft) : 12.000 in
 Footing Length - X (Fl) : 40.000 in
 Footing Width - Z (Fw) : 40.000 in
 Eccentricity along X (Oxd) : 0.000 in
 Eccentricity along Z (Ozd) : 0.000 in

Column Dimensions

Column Shape : Rectangular
 Column Length - X (Pl) : 0.450 m
 Column Width - Z (Pw) : 0.400 m

Pedestal

Include Pedestal? Yes
 Pedestal Shape : Rectangular
 Pedestal Height (Ph) : 0.015 m
 Pedestal Length - X (Pl) : 0.450 m
 Pedestal Width - Z (Pw) : 0.400 m

Design Parameters

Concrete and Rebar Properties

Unit Weight of Concrete : 150.000 lb/ft³
 Strength of Concrete : 4.000 ksi
 Yield Strength of Steel : 60.000 ksi
 Minimum Bar Size : Ø6
 Maximum Bar Size : Ø32
 Minimum Bar Spacing : 2.000 in
 Maximum Bar Spacing : 18.000 in
 Pedestal Clear Cover (P, CL) : 3.000 in
 Footing Clear Cover (F, CL) : 3.000 in

Soil Properties

Soil Type : UnDrained
 Unit Weight : 112.000 lb/ft³
 Soil Bearing Capacity : 4.000 kip/ft²
 Soil Surcharge : 0.000 kip/in²
 Depth of Soil above Footing : 0.000 in
 Undrained Shear Strength : 0.000 kip/in²
 Min Percentage of Slab : 0.000

Sliding and Overturning

Coefficient of Friction : 0.500
 Factor of Safety Against Sliding : 1.500
 Factor of Safety Against Overturning : 1.500

Load Combination/s- Service Stress Level	
Load Combination Number	Load Combination Title
1	DEAD
2	LIVE
3	COMBINATION LOAD CASE 3
101	1.000 x DL+1.000 x DL+1.000 x DL

102	0.800 x DL+0.800 x DL+0.800 x DL
Load Combination/s- Strength Level	
Load Combination Number	Load Combination Title
1	DEAD
2	LIVE
3	COMBINATION LOAD CASE 3

Applied Loads - Service Stress Level					
LC	Axial (kN)	Shear X (kN)	Shear Z (kN)	Moment X (kNm)	Moment Z (kNm)
1	458.864	0.000	2.415	2.401	0.000
2	72.352	0.000	0.806	0.802	0.000
3	796.824	0.000	4.831	4.805	0.000
101	1328.040	0.000	8.052	8.008	0.000
102	1062.432	0.000	6.442	6.406	0.000

Applied Loads - Strength Level					
LC	Axial (kN)	Shear X (kN)	Shear Z (kN)	Moment X (kNm)	Moment Z (kNm)
1	458.864	0.000	2.415	2.401	0.000
2	72.352	0.000	0.806	0.802	0.000
3	796.824	0.000	4.831	4.805	0.000

Design Calculations

Footing Size

Initial Length (L_o) = 1.016 m

Initial Width (W_o) = 1.016 m

Uplift force due to buoyancy = 0.000 kN

Effect due to adhesion = 0.000 kN

Area from initial length and width, $A_o = L_o \times W_o = 1.032 \text{ m}^2$

Min. area required from bearing pressure, $A_{\min} = P / q_{\max} = 6.974 \text{ m}^2$

Note: A_{\min} is an initial estimation.

P = Critical Factored Axial Load (without self weight/buoyancy/soil).

q_{\max} = Respective Factored Bearing Capacity.

Final Footing Size

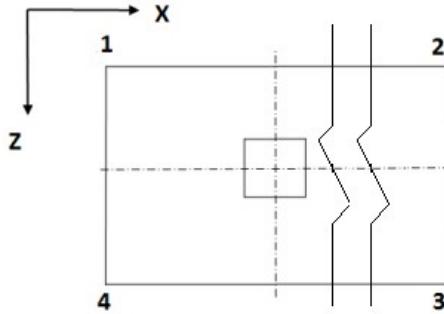
Length (L_2) = 2.743 m Governing Load Case : # 101

Width (W_2) = 2.743 m Governing Load Case : # 101

Depth (D_2) = 0.306 m Governing Load Case : # 101

$$\text{Area } (A_2) = 7.525 \text{ m}^2$$

Pressures at Four Corner



Load Case	Pressure at corner 1 (q_1) (kN/m ²)	Pressure at corner 2 (q_2) (kN/m ²)	Pressure at corner 3 (q_3) (kN/m ²)	Pressure at corner 4 (q_4) (kN/m ²)	Area of footing in uplift (A_u) (m ²)
101	180.5946	180.5946	186.7478	186.7478	0.000
101	180.5946	180.5946	186.7478	186.7478	0.000
101	180.5946	180.5946	186.7478	186.7478	0.000
101	180.5946	180.5946	186.7478	186.7478	0.000

If A_u is zero, there is no uplift and no pressure adjustment is necessary. Otherwise, to account for uplift, areas of negative pressure will be set to zero and the pressure will be redistributed to remaining corners.

Summary of adjusted Pressures at Four Corner

Load Case	Pressure at corner 1 (q_1) (kN/m ²)	Pressure at corner 2 (q_2) (kN/m ²)	Pressure at corner 3 (q_3) (kN/m ²)	Pressure at corner 4 (q_4) (kN/m ²)
101	180.5946	180.5946	186.7478	186.7478
101	180.5946	180.5946	186.7478	186.7478
101	180.5946	180.5946	186.7478	186.7478
101	180.5946	180.5946	186.7478	186.7478

Details of Out-of-Contact Area (If Any)

Governing load case = N/A

Plan area of footing = 7.525 sq.m

Area not in contact with soil = 0.000 sq.m

% of total area not in contact = 0.000%

Check For Stability Against Overturning And Sliding

-	Factor of safety against sliding		Factor of safety against overturning	
Load Case No.	Along X-Direction	Along Z-Direction	About X-Direction	About Z-Direction
1	N/A	106.196	221.648	N/A
2	N/A	78.491	163.700	N/A
3	N/A	88.066	183.773	N/A
101	N/A	85.826	179.098	N/A
102	N/A	86.666	180.851	N/A

Critical Load Case And The Governing Factor Of Safety For Overturning and Sliding X Direction

Critical Load Case for Sliding along X-Direction : 1

Governing Disturbing Force : 0.000 kN

Governing Restoring Force : 256.488 kN

Minimum Sliding Ratio for the Critical Load Case : 0.000

Critical Load Case for Overturning about X-Direction : 2

Governing Overturning Moment : 1.060 kNm

Governing Resisting Moment : 173.456 kNm

Minimum Overturning Ratio for the Critical Load Case : 163.700

Critical Load Case And The Governing Factor Of Safety For Overturning and Sliding Z Direction

Critical Load Case for Sliding along Z-Direction : 2

Governing Disturbing Force : 0.806 kN

Governing Restoring Force : 63.232 kN

Minimum Sliding Ratio for the Critical Load Case : 78.491

Critical Load Case for Overturning about Z-Direction : 1

Governing Overturning Moment : 0.000 kNm

Governing Resisting Moment : 703.586 kNm

Minimum Overturning Ratio for the Critical Load Case : 0.000

Moment CalculationCheck Trial Depth against moment (w.r.t. X Axis)**Critical Load Case = #3**

Effective Depth = $D - (cc + 0.5 \times d_b) = 0.226 \text{ m}$

Governing moment (M_u) = 201.842 kNm

As Per IS 456 2000 ANNEX G G-1.1C

Limiting Factor1 (K_{umax}) = $\frac{700}{(1100 + 0.87 \times f_y)} = 0.479483$

Limiting Factor2 (R_{umax}) = $0.36 \times f_{ck} \times k_{umax} \times (1 - 0.42 \times k_{umax}) = 3801.834636 \text{ kN/m}^2$

Limit Moment Of Resistance (M_{umax}) = $R_{umax} \times B \times d_e^2 = 530.787790 \text{ kNm}$

$M_u \leq M_{umax}$ hence, safe

Check Trial Depth against moment (w.r.t. Z Axis)

Critical Load Case = #3

$$\text{Effective Depth} = D - (cc + 0.5 \times d_b) = 0.226 \text{ m}$$

$$\text{Governing moment } (M_u) = 190.938 \text{ kNm}$$

As Per IS 456 2000 ANNEX G G-1.1C

$$\text{Limiting Factor1 } (K_{umax}) = \frac{700}{(1100 + 0.87 \times f_y)} = 0.479483$$

$$\text{Limiting Factor2 } (R_{umax}) = \frac{0.36 \times f_{ck} \times k_{umax} \times (1 - 0.42 \times k_{umax})}{k_{umax}} = 3801.834636 \text{ kN/m}^2$$

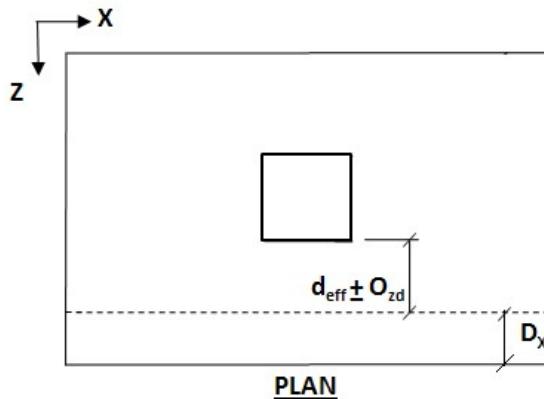
$$\text{Limit Moment Of Resistance } (M_{umax}) = \frac{R_{umax} \times B \times d_e^2}{4} = 530.787790 \text{ kNm}$$

$M_u \leq M_{umax}$ hence, safe

Shear Calculation

Check Trial Depth for one way shear (Along X Axis)

(Shear Plane Parallel to X Axis)



Critical Load Case = #3

$$D_x = 0.226 \text{ m}$$

$$\text{Shear Force}(S) = 277.926 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 449.088471 \text{ kN/m}^2$$

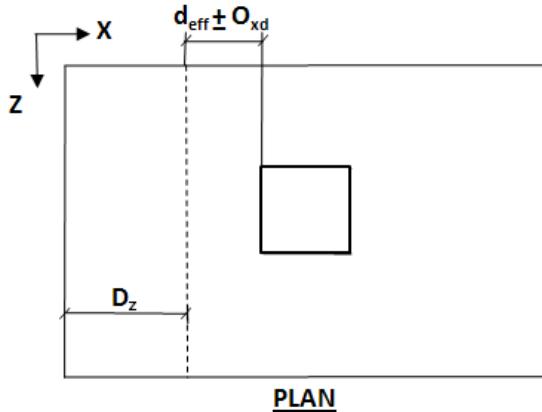
$$\text{Percentage Of Steel}(P_t) = 0.4045$$

As Per IS 456 2000 Clause 40 Table 19

$$\text{Shear Strength Of Concrete}(T_c) = 451.437 \text{ kN/m}^2$$

$T_v < T_c$ hence, safe

Check Trial Depth for one way shear (Along Z Axis)
(Shear Plane Parallel to Z Axis)



Critical Load Case = #3

$$D_z = 0.226 \text{ m}$$

$$\text{Shear Force}(S) = 267.525 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 432.283198 \text{ kN/m}^2$$

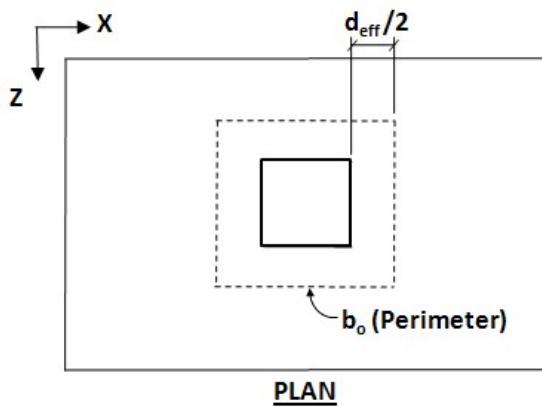
$$\text{Percentage Of Steel}(P_t) = 0.4293$$

As Per IS 456 2000 Clause 40 Table 19

$$\text{Shear Strength Of Concrete}(T_c) = 462.873 \text{ kN/m}^2$$

$T_v < T_c$ hence, safe

Check Trial Depth for two way shear



Critical Load Case = #3

$$\text{Shear Force}(S) = 752.070 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 1280.990 \text{ kN/m}^2$$

As Per IS 456 2000 Clause 31.6.3.1

$$K_s = \min[0.5 + \beta, 1] = 1.000$$

$$\text{Shear Strength}(T_c) = 0.25 \times \sqrt{f_{ck}} = 1312.8936 \text{ kN/m}^2$$

$$K_s \times T_c = 1312.8936 \text{ kN/m}^2$$

$$T_v \leq K_s \times T_c \text{ hence, safe}$$

Reinforcement Calculation

Calculation of Maximum Bar Size

Along X Axis

Bar diameter corresponding to max bar size (d_b) = 25 mm

As Per IS 456 2000 Clause 26.2.1

$$\text{Development Length}(l_d) = \frac{d_b \times 0.87 \times f_y}{4 \times \gamma_{bd}} = 0.956 \text{ m}$$

$$\text{Allowable Length}(l_{db}) = \left[\frac{(B - b)}{2} - cc \right] = 1.070 \text{ m}$$

$$l_{db} \geq l_d \text{ hence, safe}$$

Along Z Axis

Bar diameter corresponding to max bar size(d_b) = 25 mm

As Per IS 456 2000 Clause 26.2.1

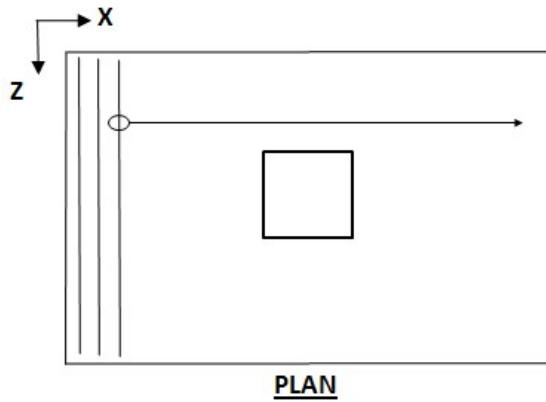
$$\text{Development Length}(l_d) = \frac{d_b \times 0.87 \times f_y}{4 \times \gamma_{bd}} = 0.956 \text{ m}$$

$$\text{Allowable Length}(l_{db}) = \left[\frac{(H - h)}{2} - cc \right] = 1.095 \text{ m}$$

$$l_{db} \geq l_d \text{ hence, safe}$$

Bottom Reinforcement Design

Along Z Axis



For moment w.r.t. X Axis (M_x)

As Per IS 456 2000 Clause 26.5.2.1

Critical Load Case = #3

Minimum Area of Steel ($A_{st,min}$) = 1009.936 mm²

Calculated Area of Steel (A_{st}) = 2657.064 mm²

Provided Area of Steel ($A_{st,Provided}$) = 2657.064 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Selected bar Size (d_b) = Ø10

Minimum spacing allowed (S_{min}) = 0.050 m

Selected spacing (S) = 0.078 m

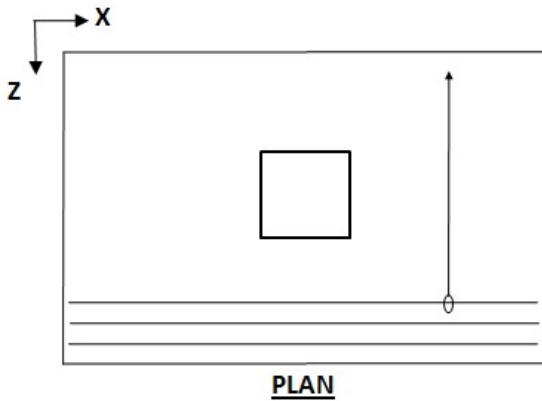
$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø10 @ 0.075 m o.c.

Along X Axis



For moment w.r.t. Z Axis (M_z)

As Per IS 456 2000 Clause 26.5.2.1

Critical Load Case = #3

Minimum Area of Steel ($A_{st,min}$) = 1006.645 mm²

Calculated Area of Steel (A_{st}) = 2503.557 mm²

Provided Area of Steel ($A_{st,Provided}$) = 2503.557 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.053 m

$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

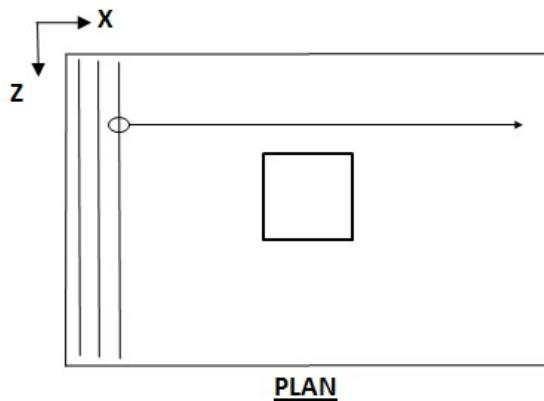
The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0.050 m o.c.

[Top Reinforcement Design](#)

[Along Z Axis](#)



Minimum Area of Steel ($A_{st,min}$) = 1009.936 mm²

Calculated Area of Steel (A_{st}) = 1003.353 mm²

Provided Area of Steel ($A_{st,Provided}$) = 1009.936 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Governing Moment = 15.024 kNm

Selected bar Size (d_b) = Ø6

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.074 m

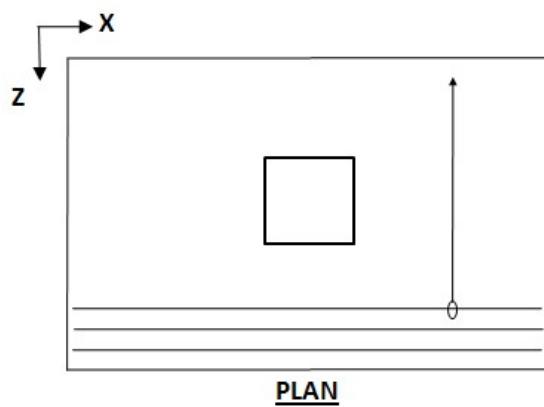
$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø6 @ 0 m o.c.

Along X Axis



Minimum Area of Steel ($A_{st,min}$) = 1006.645 mm²

Calculated Area of Steel (A_{st}) = 2503.557 mm²

Provided Area of Steel ($A_{st,Provided}$) = 2503.557 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Governing Moment = 14.390 kNm

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.053 m

$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0 m o.c.

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 796.824 kN

Critical Applied Moment Along X Direction: 15.936 kNm

Critical Applied Moment Along Z Direction: 15.936 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.182 m

Position Of Neutral Axis Along Z Direction: 0.182 m

Pedestal Moment Capacity Along X Direction: 110.801 kNm

Pedestal Moment Capacity Along Z Direction: 125.969 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 577.848 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m
Position Of Neutral Axis Along Z Direction: 0.137 m
Pedestal Moment Capacity Along X Direction: 93.412 kNm
Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²
Pedestal Main/Compression Reinforcement: 16 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 783.137 kN
Critical Applied Moment Along X Direction: 15.662 kNm
Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m
Position Of Neutral Axis Along Z Direction: 0.180 m
Pedestal Moment Capacity Along X Direction: 110.061 kNm
Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²
Pedestal Main/Compression Reinforcement: 12 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN
Critical Applied Moment Along X Direction: 21.591 kNm
Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m
Position Of Neutral Axis Along Z Direction: 0.235 m
Pedestal Moment Capacity Along X Direction: 116.443 kNm
Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²
Pedestal Main/Compression Reinforcement: 28 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1108.293 kN

Critical Applied Moment Along X Direction: 22.165 kNm

Critical Applied Moment Along Z Direction: 22.165 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.224 kNm

Pedestal Moment Capacity Along Z Direction: 133.768 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 803.721 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1079.582 kN

Critical Applied Moment Along X Direction: 21.591 kNm

Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m

Position Of Neutral Axis Along Z Direction: 0.235 m

Pedestal Moment Capacity Along X Direction: 116.443 kNm

Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²

Pedestal Main/Compression Reinforcement: 28 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m

Position Of Neutral Axis Along Z Direction: 0.180 m

Pedestal Moment Capacity Along X Direction: 110.061 kNm

Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 802.558 kN

Critical Applied Moment Along X Direction: 16.051 kNm

Critical Applied Moment Along Z Direction: 16.051 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.183 m

Position Of Neutral Axis Along Z Direction: 0.183 m

Pedestal Moment Capacity Along X Direction: 111.028 kNm

Pedestal Moment Capacity Along Z Direction: 126.226 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 590.780 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1106.751 kN

Critical Applied Moment Along X Direction: 22.135 kNm

Critical Applied Moment Along Z Direction: 22.135 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.240 kNm

Pedestal Moment Capacity Along Z Direction: 133.790 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 802.604 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1137.123 kN

Critical Applied Moment Along X Direction: 22.742 kNm

Critical Applied Moment Along Z Direction: 22.742 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.244 m

Position Of Neutral Axis Along Z Direction: 0.244 m

Pedestal Moment Capacity Along X Direction: 117.002 kNm

Pedestal Moment Capacity Along Z Direction: 133.264 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 824.628 mm²

Pedestal Main/Compression Reinforcement: 32 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1106.751 kN

Critical Applied Moment Along X Direction: 22.135 kNm

Critical Applied Moment Along Z Direction: 22.135 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.240 kNm

Pedestal Moment Capacity Along Z Direction: 133.790 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 802.604 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 802.558 kN

Critical Applied Moment Along X Direction: 16.051 kNm

Critical Applied Moment Along Z Direction: 16.051 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.183 m

Position Of Neutral Axis Along Z Direction: 0.183 m

Pedestal Moment Capacity Along X Direction: 111.028 kNm

Pedestal Moment Capacity Along Z Direction: 126.226 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 590.780 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m
Position Of Neutral Axis Along Z Direction: 0.180 m
Pedestal Moment Capacity Along X Direction: 110.061 kNm
Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²
Pedestal Main/Compression Reinforcement: 12 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN
Critical Applied Moment Along X Direction: 21.591 kNm
Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m
Position Of Neutral Axis Along Z Direction: 0.235 m
Pedestal Moment Capacity Along X Direction: 116.443 kNm
Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²
Pedestal Main/Compression Reinforcement: 28 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m
Critical load Case : 3
Critical Applied Axial Load: 1108.293 kN
Critical Applied Moment Along X Direction: 22.165 kNm
Critical Applied Moment Along Z Direction: 22.165 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m
Position Of Neutral Axis Along Z Direction: 0.239 m
Pedestal Moment Capacity Along X Direction: 117.224 kNm
Pedestal Moment Capacity Along Z Direction: 133.768 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 803.721 mm²
Pedestal Main/Compression Reinforcement: 16 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m
Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN

Critical Applied Moment Along X Direction: 21.591 kNm

Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m

Position Of Neutral Axis Along Z Direction: 0.235 m

Pedestal Moment Capacity Along X Direction: 116.443 kNm

Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²

Pedestal Main/Compression Reinforcement: 28 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m

Position Of Neutral Axis Along Z Direction: 0.180 m

Pedestal Moment Capacity Along X Direction: 110.061 kNm

Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 796.824 kN

Critical Applied Moment Along X Direction: 15.936 kNm

Critical Applied Moment Along Z Direction: 15.936 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.182 m

Position Of Neutral Axis Along Z Direction: 0.182 m

Pedestal Moment Capacity Along X Direction: 110.801 kNm

Pedestal Moment Capacity Along Z Direction: 125.969 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 577.848 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

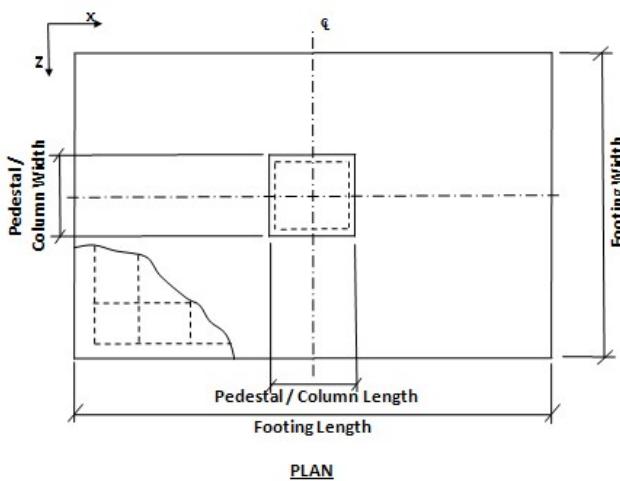
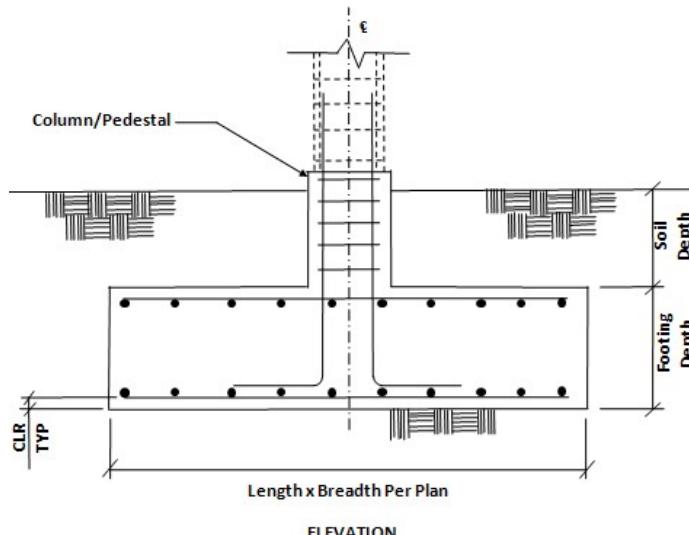
Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Isolated Footing 124



Input Values

Footing Geomtry

Design Type : Calculate Dimension
 Footing Thickness (Ft) : 12.000 in
 Footing Length - X (Fl) : 40.000 in
 Footing Width - Z (Fw) : 40.000 in
 Eccentricity along X (Oxd) : 0.000 in
 Eccentricity along Z (Ozd) : 0.000 in

Column Dimensions

Column Shape : Rectangular
 Column Length - X (Pl) : 0.450 m
 Column Width - Z (Pw) : 0.400 m

Pedestal

Include Pedestal? Yes
 Pedestal Shape : Rectangular
 Pedestal Height (Ph) : 0.015 m
 Pedestal Length - X (Pl) : 0.450 m
 Pedestal Width - Z (Pw) : 0.400 m

Design Parameters

Concrete and Rebar Properties

Unit Weight of Concrete : 150.000 lb/ft³
 Strength of Concrete : 4.000 ksi
 Yield Strength of Steel : 60.000 ksi
 Minimum Bar Size : Ø6
 Maximum Bar Size : Ø32
 Minimum Bar Spacing : 2.000 in
 Maximum Bar Spacing : 18.000 in
 Pedestal Clear Cover (P, CL) : 3.000 in
 Footing Clear Cover (F, CL) : 3.000 in

Soil Properties

Soil Type : UnDrained
 Unit Weight : 112.000 lb/ft³
 Soil Bearing Capacity : 4.000 kip/ft²
 Soil Surcharge : 0.000 kip/in²
 Depth of Soil above Footing : 0.000 in
 Undrained Shear Strength : 0.000 kip/in²
 Min Percentage of Slab : 0.000

Sliding and Overturning

Coefficient of Friction : 0.500
 Factor of Safety Against Sliding : 1.500
 Factor of Safety Against Overturning : 1.500

Load Combination/s- Service Stress Level	
Load Combination Number	Load Combination Title
1	DEAD
2	LIVE
3	COMBINATION LOAD CASE 3
101	1.000 x DL+1.000 x DL+1.000 x DL

102	0.800 x DL+0.800 x DL+0.800 x DL
Load Combination/s- Strength Level	
Load Combination Number	Load Combination Title
1	DEAD
2	LIVE
3	COMBINATION LOAD CASE 3

Applied Loads - Service Stress Level					
LC	Axial (kN)	Shear X (kN)	Shear Z (kN)	Moment X (kNm)	Moment Z (kNm)
1	448.716	0.215	2.379	2.365	-0.234
2	68.982	0.073	0.781	0.777	-0.078
3	776.547	0.433	4.740	4.713	-0.467
101	1294.245	0.721	7.900	7.855	-0.778
102	1035.396	0.577	6.320	6.284	-0.623

Applied Loads - Strength Level					
LC	Axial (kN)	Shear X (kN)	Shear Z (kN)	Moment X (kNm)	Moment Z (kNm)
1	448.716	0.215	2.379	2.365	-0.234
2	68.982	0.073	0.781	0.777	-0.078
3	776.547	0.433	4.740	4.713	-0.467

Design Calculations

Footing Size

Initial Length (L_o) = 1.016 m

Initial Width (W_o) = 1.016 m

Uplift force due to buoyancy = 0.000 kN

Effect due to adhesion = 0.000 kN

Area from initial length and width, $A_o = L_o \times W_o = 1.032 \text{ m}^2$

Min. area required from bearing pressure, $A_{\min} = P / q_{\max} = 6.797 \text{ m}^2$

Note: A_{\min} is an initial estimation.

P = Critical Factored Axial Load (without self weight/buoyancy/soil).

q_{\max} = Respective Factored Bearing Capacity.

Final Footing Size

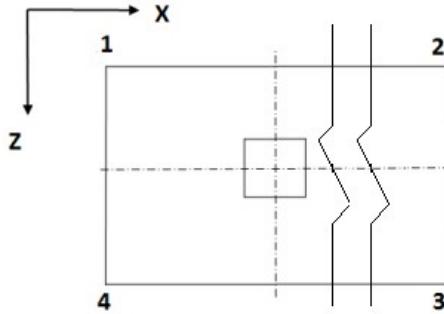
Length (L_2) = 2.692 m Governing Load Case : # 101

Width (W_2) = 2.692 m Governing Load Case : # 101

Depth (D_2) = 0.306 m Governing Load Case : # 101

$$\text{Area } (A_2) = 7.249 \text{ m}^2$$

Pressures at Four Corner



Load Case	Pressure at corner 1 (q_1) (kN/m ²)	Pressure at corner 2 (q_2) (kN/m ²)	Pressure at corner 3 (q_3) (kN/m ²)	Pressure at corner 4 (q_4) (kN/m ²)	Area of footing in uplift (A_u) (m ²)
101	182.2296	182.8500	189.2342	188.6138	0.000
101	182.2296	182.8500	189.2342	188.6138	0.000
101	182.2296	182.8500	189.2342	188.6138	0.000
101	182.2296	182.8500	189.2342	188.6138	0.000

If A_u is zero, there is no uplift and no pressure adjustment is necessary. Otherwise, to account for uplift, areas of negative pressure will be set to zero and the pressure will be redistributed to remaining corners.

Summary of adjusted Pressures at Four Corner

Load Case	Pressure at corner 1 (q_1) (kN/m ²)	Pressure at corner 2 (q_2) (kN/m ²)	Pressure at corner 3 (q_3) (kN/m ²)	Pressure at corner 4 (q_4) (kN/m ²)
101	182.2296	182.8500	189.2342	188.6138
101	182.2296	182.8500	189.2342	188.6138
101	182.2296	182.8500	189.2342	188.6138
101	182.2296	182.8500	189.2342	188.6138

Details of Out-of-Contact Area (If Any)

Governing load case = N/A

Plan area of footing = 7.249 sq.m

Area not in contact with soil = 0.000 sq.m

% of total area not in contact = 0.000%

Check For Stability Against Overturning And Sliding

-	Factor of safety against sliding		Factor of safety against overturning	
Load Case No.	Along X-Direction	Along Z-Direction	About X-Direction	About Z-Direction
1	1165.119	105.271	215.685	2229.547
2	824.985	77.504	158.697	1610.403
3	958.002	87.409	179.060	1842.451
101	933.896	85.209	174.555	1796.091
102	942.936	86.034	176.244	1813.476

Critical Load Case And The Governing Factor Of Safety For Overturning and Sliding X Direction

Critical Load Case for Sliding along X-Direction : 2

Governing Disturbing Force : 0.073 kN

Governing Restoring Force : 60.556 kN

Minimum Sliding Ratio for the Critical Load Case : 824.985

Critical Load Case for Overturning about X-Direction : 2

Governing Overturning Moment : 1.027 kNm

Governing Resisting Moment : 163.037 kNm

Minimum Overturning Ratio for the Critical Load Case : 158.697

Critical Load Case And The Governing Factor Of Safety For Overturning and Sliding Z Direction

Critical Load Case for Sliding along Z-Direction : 2

Governing Disturbing Force : 0.781 kN

Governing Restoring Force : 60.556 kN

Minimum Sliding Ratio for the Critical Load Case : 77.504

Critical Load Case for Overturning about Z-Direction : 2

Governing Overturning Moment : -0.101 kNm

Governing Resisting Moment : 163.037 kNm

Minimum Overturning Ratio for the Critical Load Case : 1610.403

Moment CalculationCheck Trial Depth against moment (w.r.t. X Axis)**Critical Load Case = #3**

Effective Depth = $D - (cc + 0.5 \times d_b) = 0.226 \text{ m}$

Governing moment (M_u) = 191.885 kNm

As Per IS 456 2000 ANNEX G G-1.1C

Limiting Factor1 (K_{umax}) = $\frac{700}{(1100 + 0.87 \times f_y)} = 0.479483$

Limiting Factor2 (R_{umax}) = $0.36 \times f_{ck} \times k_{umax} \times (1 - 0.42 \times k_{umax}) = 3801.834636 \text{ kN/m}^2$

Limit Moment Of Resistance (M_{umax}) = $R_{umax} \times B \times d_e^2 = 520.958387 \text{ kNm}$

$M_u \leq M_{umax}$ hence, safe

Check Trial Depth against moment (w.r.t. Z Axis)

Critical Load Case = #3

$$\text{Effective Depth} = D - (cc + 0.5 \times d_b) = 0.226 \text{ m}$$

$$\text{Governing moment } (M_u) = 181.511 \text{ kNm}$$

As Per IS 456 2000 ANNEX G G-1.1C

$$\text{Limiting Factor1 } (K_{umax}) = \frac{700}{(1100 + 0.87 \times f_y)} = 0.479483$$

$$\text{Limiting Factor2 } (R_{umax}) = \frac{0.36 \times f_{ck} \times k_{umax} \times (1 - 0.42 \times k_{umax})}{k_{umax}} = 3801.834636 \text{ kN/m}^2$$

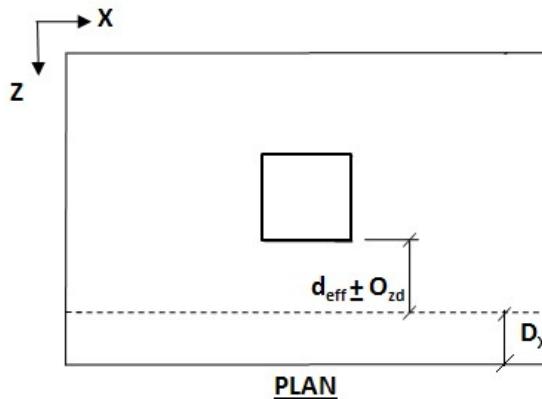
$$\text{Limit Moment Of Resistance } (M_{umax}) = \frac{R_{umax} \times B \times d_e^2}{4} = 520.958387 \text{ kNm}$$

$M_u \leq M_{umax}$ hence, safe

Shear Calculation

Check Trial Depth for one way shear (Along X Axis)

(Shear Plane Parallel to X Axis)



Critical Load Case = #3

$$D_X = 0.226 \text{ m}$$

$$\text{Shear Force}(S) = 268.645 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 442.283184 \text{ kN/m}^2$$

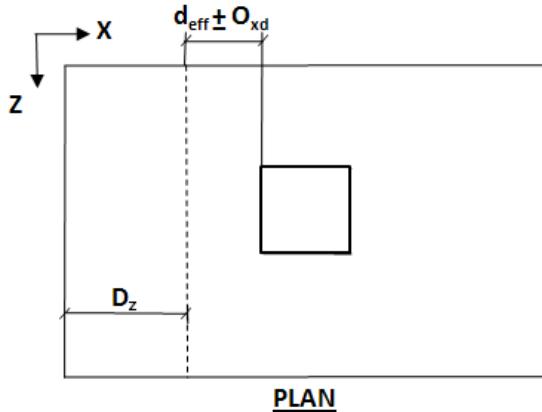
$$\text{Percentage Of Steel}(P_t) = 0.3910$$

As Per IS 456 2000 Clause 40 Table 19

$$\text{Shear Strength Of Concrete}(T_c) = 444.984 \text{ kN/m}^2$$

$T_v < T_c$ hence, safe

Check Trial Depth for one way shear (Along Z Axis)
(Shear Plane Parallel to Z Axis)



Critical Load Case = #3

$$D_z = 0.226 \text{ m}$$

$$\text{Shear Force}(S) = 258.610 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 425.762071 \text{ kN/m}^2$$

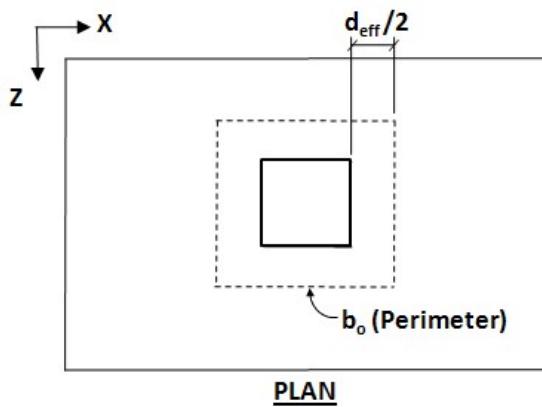
$$\text{Percentage Of Steel}(P_t) = 0.4149$$

As Per IS 456 2000 Clause 40 Table 19

$$\text{Shear Strength Of Concrete}(T_c) = 456.271 \text{ kN/m}^2$$

$T_v < T_c$ hence, safe

Check Trial Depth for two way shear



Critical Load Case = #3

$$\text{Shear Force}(S) = 731.270 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 1245.562 \text{ kN/m}^2$$

As Per IS 456 2000 Clause 31.6.3.1

$$K_s = \min[0.5 + \beta, 1] = 1.000$$

$$\text{Shear Strength}(T_c) = 0.25 \times \sqrt{f_{ck}} = 1312.8936 \text{ kN/m}^2$$

$$K_s \times T_c = 1312.8936 \text{ kN/m}^2$$

$$T_v \leq K_s \times T_c \text{ hence, safe}$$

Reinforcement Calculation

Calculation of Maximum Bar Size

Along X Axis

Bar diameter corresponding to max bar size (d_b) = 25 mm

As Per IS 456 2000 Clause 26.2.1

$$\text{Development Length}(l_d) = \frac{d_b \times 0.87 \times f_y}{4 \times \gamma_{bd}} = 0.956 \text{ m}$$

$$\text{Allowable Length}(l_{db}) = \left[\frac{(B - b)}{2} - cc \right] = 1.045 \text{ m}$$

$$l_{db} \geq l_d \text{ hence, safe}$$

Along Z Axis

Bar diameter corresponding to max bar size(d_b) = 25 mm

As Per IS 456 2000 Clause 26.2.1

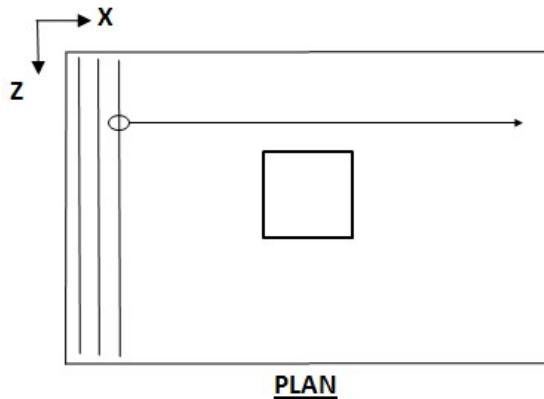
$$\text{Development Length}(l_d) = \frac{d_b \times 0.87 \times f_y}{4 \times \gamma_{bd}} = 0.956 \text{ m}$$

$$\text{Allowable Length}(l_{db}) = \left[\frac{(H - h)}{2} - cc \right] = 1.070 \text{ m}$$

$$l_{db} \geq l_d \text{ hence, safe}$$

Bottom Reinforcement Design

Along Z Axis



For moment w.r.t. X Axis (M_x)

As Per IS 456 2000 Clause 26.5.2.1

Critical Load Case = #3

Minimum Area of Steel ($A_{st,min}$) = 991.234 mm²

Calculated Area of Steel (A_{st}) = 2520.152 mm²

Provided Area of Steel ($A_{st,Provided}$) = 2520.152 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Selected bar Size (d_b) = Ø10

Minimum spacing allowed (S_{min}) = 0.050 m

Selected spacing (S) = 0.079 m

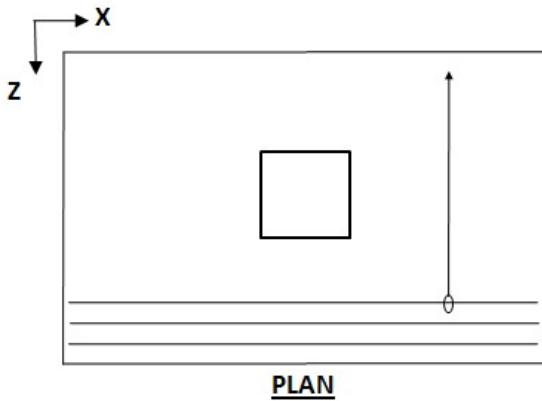
$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø10 @ 0.075 m o.c.

[Along X Axis](#)



For moment w.r.t. Z Axis (M_z)

As Per IS 456 2000 Clause 26.5.2.1

Critical Load Case = #3

Minimum Area of Steel ($A_{st,min}$) = 988.003 mm²

Calculated Area of Steel (A_{st}) = 2374.807 mm²

Provided Area of Steel ($A_{st,Provided}$) = 2374.807 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.054 m

$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

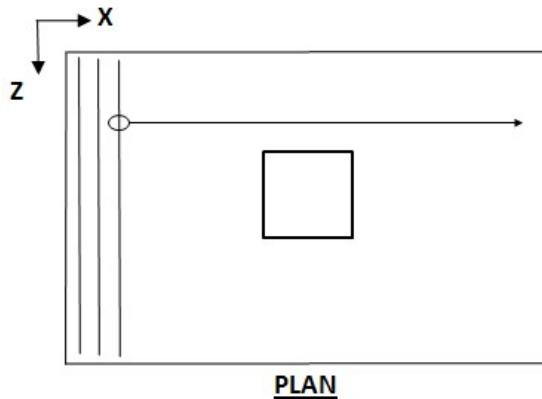
The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0.050 m o.c.

[Top Reinforcement Design](#)

[Along Z Axis](#)



Minimum Area of Steel ($A_{st,min}$) = 991.234 mm²

Calculated Area of Steel (A_{st}) = 984.772 mm²

Provided Area of Steel ($A_{st,Provided}$) = 991.234 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Governing Moment = 14.114 kNm

Selected bar Size (d_b) = Ø6

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.075 m

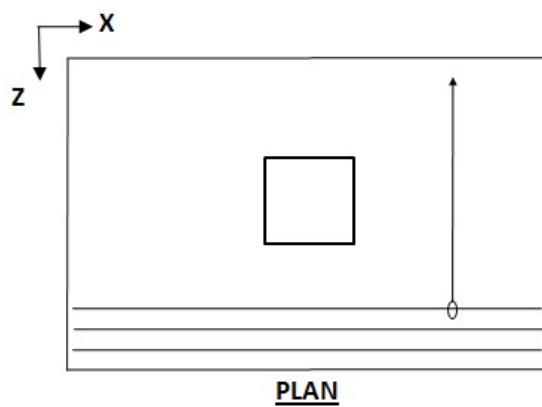
$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø6 @ 0 m o.c.

Along X Axis



Minimum Area of Steel ($A_{st,min}$) = 988.003 mm²

Calculated Area of Steel (A_{st}) = 2374.807 mm²

Provided Area of Steel ($A_{st,Provided}$) = 2374.807 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Governing Moment = 13.505 kNm

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.054 m

$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0 m o.c.

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 796.824 kN

Critical Applied Moment Along X Direction: 15.936 kNm

Critical Applied Moment Along Z Direction: 15.936 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.182 m

Position Of Neutral Axis Along Z Direction: 0.182 m

Pedestal Moment Capacity Along X Direction: 110.801 kNm

Pedestal Moment Capacity Along Z Direction: 125.969 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 577.848 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m
Position Of Neutral Axis Along Z Direction: 0.137 m
Pedestal Moment Capacity Along X Direction: 93.412 kNm
Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²
Pedestal Main/Compression Reinforcement: 16 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 783.137 kN
Critical Applied Moment Along X Direction: 15.662 kNm
Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m
Position Of Neutral Axis Along Z Direction: 0.180 m
Pedestal Moment Capacity Along X Direction: 110.061 kNm
Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²
Pedestal Main/Compression Reinforcement: 12 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN
Critical Applied Moment Along X Direction: 21.591 kNm
Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m
Position Of Neutral Axis Along Z Direction: 0.235 m
Pedestal Moment Capacity Along X Direction: 116.443 kNm
Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²
Pedestal Main/Compression Reinforcement: 28 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1108.293 kN

Critical Applied Moment Along X Direction: 22.165 kNm

Critical Applied Moment Along Z Direction: 22.165 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.224 kNm

Pedestal Moment Capacity Along Z Direction: 133.768 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 803.721 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1079.582 kN

Critical Applied Moment Along X Direction: 21.591 kNm

Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m

Position Of Neutral Axis Along Z Direction: 0.235 m

Pedestal Moment Capacity Along X Direction: 116.443 kNm

Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²

Pedestal Main/Compression Reinforcement: 28 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m

Position Of Neutral Axis Along Z Direction: 0.180 m

Pedestal Moment Capacity Along X Direction: 110.061 kNm

Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 802.558 kN

Critical Applied Moment Along X Direction: 16.051 kNm

Critical Applied Moment Along Z Direction: 16.051 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.183 m

Position Of Neutral Axis Along Z Direction: 0.183 m

Pedestal Moment Capacity Along X Direction: 111.028 kNm

Pedestal Moment Capacity Along Z Direction: 126.226 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 590.780 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1106.751 kN

Critical Applied Moment Along X Direction: 22.135 kNm

Critical Applied Moment Along Z Direction: 22.135 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.240 kNm

Pedestal Moment Capacity Along Z Direction: 133.790 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 802.604 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1137.123 kN

Critical Applied Moment Along X Direction: 22.742 kNm

Critical Applied Moment Along Z Direction: 22.742 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.244 m

Position Of Neutral Axis Along Z Direction: 0.244 m

Pedestal Moment Capacity Along X Direction: 117.002 kNm

Pedestal Moment Capacity Along Z Direction: 133.264 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 824.628 mm²

Pedestal Main/Compression Reinforcement: 32 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1106.751 kN

Critical Applied Moment Along X Direction: 22.135 kNm

Critical Applied Moment Along Z Direction: 22.135 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.240 kNm

Pedestal Moment Capacity Along Z Direction: 133.790 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 802.604 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 802.558 kN

Critical Applied Moment Along X Direction: 16.051 kNm

Critical Applied Moment Along Z Direction: 16.051 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.183 m

Position Of Neutral Axis Along Z Direction: 0.183 m

Pedestal Moment Capacity Along X Direction: 111.028 kNm

Pedestal Moment Capacity Along Z Direction: 126.226 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 590.780 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m
Position Of Neutral Axis Along Z Direction: 0.180 m
Pedestal Moment Capacity Along X Direction: 110.061 kNm
Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²
Pedestal Main/Compression Reinforcement: 12 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN
Critical Applied Moment Along X Direction: 21.591 kNm
Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m
Position Of Neutral Axis Along Z Direction: 0.235 m
Pedestal Moment Capacity Along X Direction: 116.443 kNm
Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²
Pedestal Main/Compression Reinforcement: 28 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m
Critical load Case : 3
Critical Applied Axial Load: 1108.293 kN
Critical Applied Moment Along X Direction: 22.165 kNm
Critical Applied Moment Along Z Direction: 22.165 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m
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Pedestal Moment Capacity Along X Direction: 117.224 kNm
Pedestal Moment Capacity Along Z Direction: 133.768 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 803.721 mm²
Pedestal Main/Compression Reinforcement: 16 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m
Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN

Critical Applied Moment Along X Direction: 21.591 kNm

Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m

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Required Main Reinforcement: 782.901 mm²

Pedestal Main/Compression Reinforcement: 28 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m

Position Of Neutral Axis Along Z Direction: 0.180 m

Pedestal Moment Capacity Along X Direction: 110.061 kNm

Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 796.824 kN

Critical Applied Moment Along X Direction: 15.936 kNm

Critical Applied Moment Along Z Direction: 15.936 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.182 m

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IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 577.848 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

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Critical Applied Moment Along X Direction: 15.531 kNm

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Required Main Reinforcement: 563.143 mm²

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Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

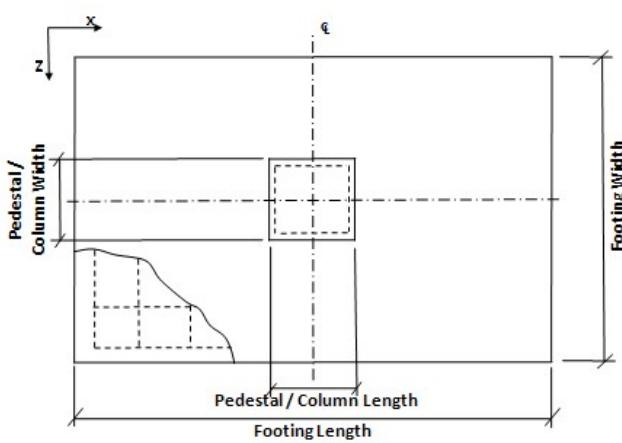
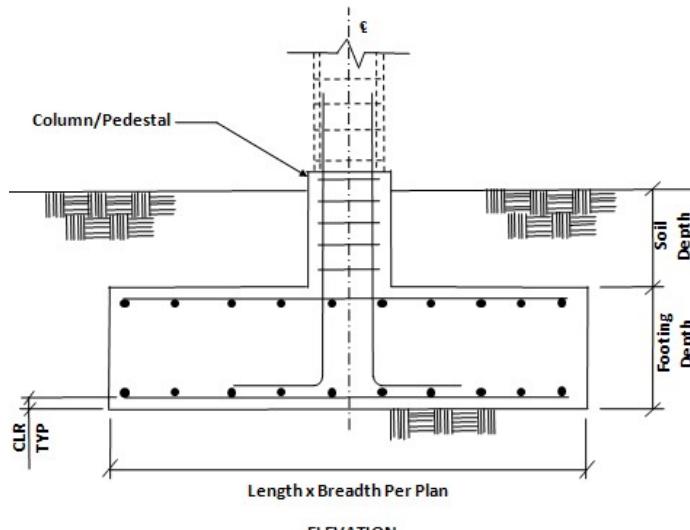
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IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Isolated Footing 125



Input Values

Footing Geomtry

Design Type : Calculate Dimension
 Footing Thickness (Ft) : 12.000 in
 Footing Length - X (Fl) : 40.000 in
 Footing Width - Z (Fw) : 40.000 in
 Eccentricity along X (Oxd) : 0.000 in
 Eccentricity along Z (Ozd) : 0.000 in

Column Dimensions

Column Shape : Rectangular
 Column Length - X (Pl) : 0.450 m
 Column Width - Z (Pw) : 0.400 m

Pedestal

Include Pedestal? Yes
 Pedestal Shape : Rectangular
 Pedestal Height (Ph) : 0.015 m
 Pedestal Length - X (Pl) : 0.450 m
 Pedestal Width - Z (Pw) : 0.400 m

Design Parameters

Concrete and Rebar Properties

Unit Weight of Concrete : 150.000 lb/ft³
 Strength of Concrete : 4.000 ksi
 Yield Strength of Steel : 60.000 ksi
 Minimum Bar Size : Ø6
 Maximum Bar Size : Ø32
 Minimum Bar Spacing : 2.000 in
 Maximum Bar Spacing : 18.000 in
 Pedestal Clear Cover (P, CL) : 3.000 in
 Footing Clear Cover (F, CL) : 3.000 in

Soil Properties

Soil Type : UnDrained
 Unit Weight : 112.000 lb/ft³
 Soil Bearing Capacity : 4.000 kip/ft²
 Soil Surcharge : 0.000 kip/in²
 Depth of Soil above Footing : 0.000 in
 Undrained Shear Strength : 0.000 kip/in²
 Min Percentage of Slab : 0.000

Sliding and Overturning

Coefficient of Friction : 0.500
 Factor of Safety Against Sliding : 1.500
 Factor of Safety Against Overturning : 1.500

Load Combination/s- Service Stress Level	
Load Combination Number	Load Combination Title
1	DEAD
2	LIVE
3	COMBINATION LOAD CASE 3
101	1.000 x DL+1.000 x DL+1.000 x DL

102	0.800 x DL+0.800 x DL+0.800 x DL
Load Combination/s- Strength Level	
Load Combination Number	Load Combination Title
1	DEAD
2	LIVE
3	COMBINATION LOAD CASE 3

Applied Loads - Service Stress Level					
LC	Axial (kN)	Shear X (kN)	Shear Z (kN)	Moment X (kNm)	Moment Z (kNm)
1	343.039	1.982	1.854	1.843	-1.966
2	38.969	0.459	0.432	0.430	-0.456
3	573.013	3.661	3.428	3.410	-3.634
101	955.021	6.102	5.714	5.683	-6.057
102	764.017	4.882	4.571	4.546	-4.845

Applied Loads - Strength Level					
LC	Axial (kN)	Shear X (kN)	Shear Z (kN)	Moment X (kNm)	Moment Z (kNm)
1	343.039	1.982	1.854	1.843	-1.966
2	38.969	0.459	0.432	0.430	-0.456
3	573.013	3.661	3.428	3.410	-3.634

Design Calculations

Footing Size

Initial Length (L_o) = 1.016 m

Initial Width (W_o) = 1.016 m

Uplift force due to buoyancy = 0.000 kN

Effect due to adhesion = 0.000 kN

Area from initial length and width, $A_o = L_o \times W_o = 1.032 \text{ m}^2$

Min. area required from bearing pressure, $A_{\min} = P / q_{\max} = 5.026 \text{ m}^2$

Note: A_{\min} is an initial estimation.

P = Critical Factored Axial Load (without self weight/buoyancy/soil).

q_{\max} = Respective Factored Bearing Capacity.

Final Footing Size

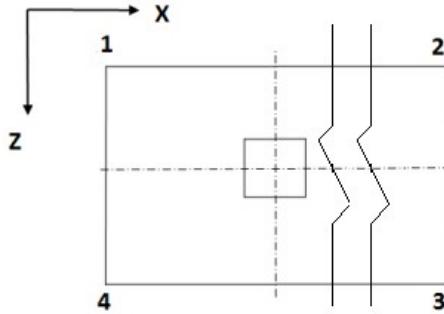
Length (L_2) = 2.337 m Governing Load Case : # 101

Width (W_2) = 2.337 m Governing Load Case : # 101

Depth (D_2) = 0.306 m Governing Load Case : # 101

$$\text{Area } (A_2) = 5.461 \text{ m}^2$$

Pressures at Four Corner



Load Case	Pressure at corner 1 (q_1) (kN/m ²)	Pressure at corner 2 (q_2) (kN/m ²)	Pressure at corner 3 (q_3) (kN/m ²)	Pressure at corner 4 (q_4) (kN/m ²)	Area of footing in uplift (A_u) (m ²)
101	174.7877	182.3203	189.3844	181.8519	0.000
101	174.7877	182.3203	189.3844	181.8519	0.000
101	174.7877	182.3203	189.3844	181.8519	0.000
101	174.7877	182.3203	189.3844	181.8519	0.000

If A_u is zero, there is no uplift and no pressure adjustment is necessary. Otherwise, to account for uplift, areas of negative pressure will be set to zero and the pressure will be redistributed to remaining corners.

Summary of adjusted Pressures at Four Corner

Load Case	Pressure at corner 1 (q_1) (kN/m ²)	Pressure at corner 2 (q_2) (kN/m ²)	Pressure at corner 3 (q_3) (kN/m ²)	Pressure at corner 4 (q_4) (kN/m ²)
101	174.7877	182.3203	189.3844	181.8519
101	174.7877	182.3203	189.3844	181.8519
101	174.7877	182.3203	189.3844	181.8519
101	174.7877	182.3203	189.3844	181.8519

Details of Out-of-Contact Area (If Any)

Governing load case = N/A

Plan area of footing = 5.461 sq.m

Area not in contact with soil = 0.000 sq.m

% of total area not in contact = 0.000%

Check For Stability Against Overturning And Sliding

-	Factor of safety against sliding		Factor of safety against overturning	
Load Case No.	Along X-Direction	Along Z-Direction	About X-Direction	About Z-Direction
1	96.450	103.102	183.315	171.761
2	85.263	90.675	161.000	151.581
3	83.617	89.298	158.729	148.860
101	81.471	87.006	154.656	145.040
102	82.276	87.865	156.183	146.472

Critical Load Case And The Governing Factor Of Safety For Overturning and Sliding X Direction

Critical Load Case for Sliding along X-Direction : 101

Governing Disturbing Force : 6.102 kN

Governing Restoring Force : 497.153 kN

Minimum Sliding Ratio for the Critical Load Case : 81.471

Critical Load Case for Overturning about X-Direction : 101

Governing Overturning Moment : 7.512 kNm

Governing Resisting Moment : 1161.725 kNm

Minimum Overturning Ratio for the Critical Load Case : 154.656

Critical Load Case And The Governing Factor Of Safety For Overturning and Sliding Z Direction

Critical Load Case for Sliding along Z-Direction : 101

Governing Disturbing Force : 5.714 kN

Governing Restoring Force : 497.153 kN

Minimum Sliding Ratio for the Critical Load Case : 87.006

Critical Load Case for Overturning about Z-Direction : 101

Governing Overturning Moment : -8.010 kNm

Governing Resisting Moment : 1161.725 kNm

Minimum Overturning Ratio for the Critical Load Case : 145.040

Moment CalculationCheck Trial Depth against moment (w.r.t. X Axis)**Critical Load Case = #3**

Effective Depth = $D - (cc + 0.5 \times d_b) = 0.226 \text{ m}$

Governing moment (M_u) = 116.660 kNm

As Per IS 456 2000 ANNEX G G-1.1C

Limiting Factor1 (K_{umax}) = $\frac{700}{(1100 + 0.87 \times f_y)} = 0.479483$

Limiting Factor2 (R_{umax}) = $0.36 \times f_{ck} \times k_{umax} \times (1 - 0.42 \times k_{umax}) = 3801.834636 \text{ kN/m}^2$

Limit Moment Of Resistance (M_{umax}) = $R_{umax} \times B \times d_e^2 = 452.152562 \text{ kNm}$

$M_u \leq M_{umax}$ hence, safe

Check Trial Depth against moment (w.r.t. Z Axis)

Critical Load Case = #3

$$\text{Effective Depth} = D - (cc + 0.5 \times d_b) = 0.226 \text{ m}$$

$$\text{Governing moment } (M_u) = 110.837 \text{ kNm}$$

As Per IS 456 2000 ANNEX G G-1.1C

$$\text{Limiting Factor1 } (K_{umax}) = \frac{700}{(1100 + 0.87 \times f_y)} = 0.479483$$

$$\text{Limiting Factor2 } (R_{umax}) = \frac{0.36 \times f_{ck} \times k_{umax} \times (1 - 0.42 \times k_{umax})}{k_{umax}} = 3801.834636 \text{ kN/m}^2$$

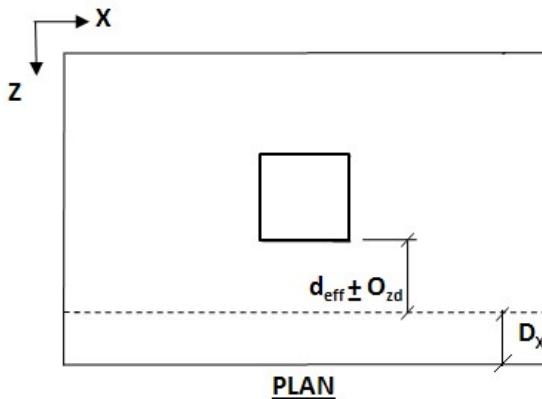
$$\text{Limit Moment Of Resistance } (M_{umax}) = \frac{R_{umax} \times B \times d_e^2}{4} = 452.152562 \text{ kNm}$$

$M_u \leq M_{umax}$ hence, safe

Shear Calculation

Check Trial Depth for one way shear (Along X Axis)

(Shear Plane Parallel to X Axis)



Critical Load Case = #3

$$D_X = 0.226 \text{ m}$$

$$\text{Shear Force}(S) = 184.653 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 350.264546 \text{ kN/m}^2$$

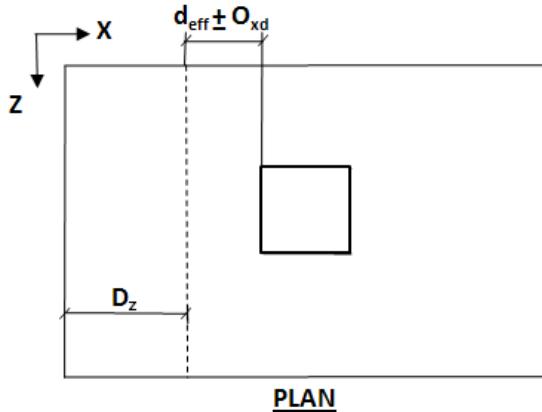
$$\text{Percentage Of Steel}(P_t) = 0.2699$$

As Per IS 456 2000 Clause 40 Table 19

$$\text{Shear Strength Of Concrete}(T_c) = 379.500 \text{ kN/m}^2$$

$T_v < T_c$ hence, safe

Check Trial Depth for one way shear (Along Z Axis)
(Shear Plane Parallel to Z Axis)



Critical Load Case = #3

$$D_z = 0.226 \text{ m}$$

$$\text{Shear Force}(S) = 178.640 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 338.857786 \text{ kN/m}^2$$

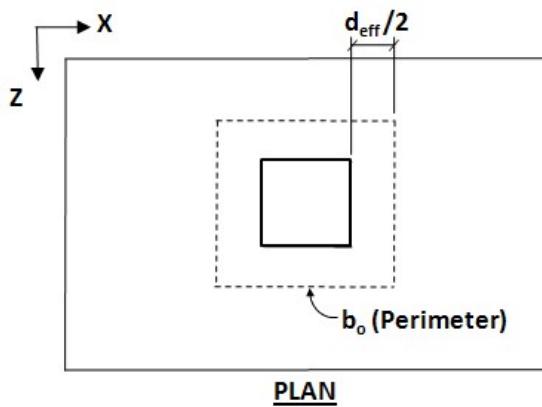
$$\text{Percentage Of Steel}(P_t) = 0.2847$$

As Per IS 456 2000 Clause 40 Table 19

$$\text{Shear Strength Of Concrete}(T_c) = 388.434 \text{ kN/m}^2$$

$T_v < T_c$ hence, safe

Check Trial Depth for two way shear



Critical Load Case = #3

$$\text{Shear Force}(S) = 528.661 \text{ kN}$$

$$\text{Shear Stress}(T_v) = 900.461 \text{ kN/m}^2$$

As Per IS 456 2000 Clause 31.6.3.1

$$K_s = \min[0.5 + \beta, 1] = 1.000$$

$$\text{Shear Strength}(T_c) = 0.25 \times \sqrt{f_{ck}} = 1312.8936 \text{ kN/m}^2$$

$$K_s \times T_c = 1312.8936 \text{ kN/m}^2$$

$$T_v \leq K_s \times T_c \text{ hence, safe}$$

Reinforcement Calculation

Calculation of Maximum Bar Size

Along X Axis

Bar diameter corresponding to max bar size (d_b) = 20 mm

As Per IS 456 2000 Clause 26.2.1

$$\text{Development Length}(l_d) = \frac{d_b \times 0.87 \times f_y}{4 \times \gamma_{bd}} = 0.765 \text{ m}$$

$$\text{Allowable Length}(l_{db}) = \left[\frac{(B - b)}{2} - cc \right] = 0.867 \text{ m}$$

$$l_{db} \geq l_d \text{ hence, safe}$$

Along Z Axis

Bar diameter corresponding to max bar size(d_b) = 20 mm

As Per IS 456 2000 Clause 26.2.1

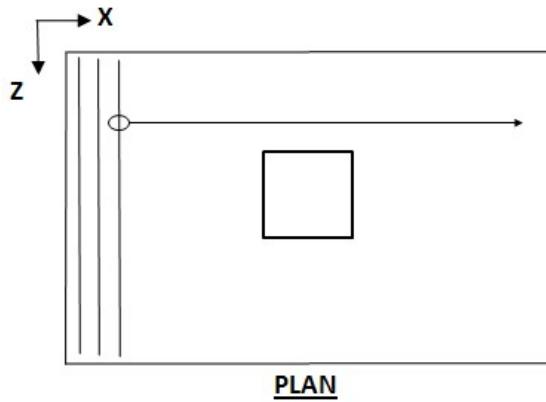
$$\text{Development Length}(l_d) = \frac{d_b \times 0.87 \times f_y}{4 \times \gamma_{bd}} = 0.765 \text{ m}$$

$$\text{Allowable Length}(l_{db}) = \left[\frac{(H - h)}{2} - cc \right] = 0.892 \text{ m}$$

$$l_{db} \geq l_d \text{ hence, safe}$$

Bottom Reinforcement Design

Along Z Axis



For moment w.r.t. X Axis (M_x)

As Per IS 456 2000 Clause 26.5.2.1

Critical Load Case = #3

Minimum Area of Steel ($A_{st,min}$) = 857.512 mm²

Calculated Area of Steel (A_{st}) = 1500.913 mm²

Provided Area of Steel ($A_{st,Provided}$) = 1500.913 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.048 m

Selected spacing (S) = 0.075 m

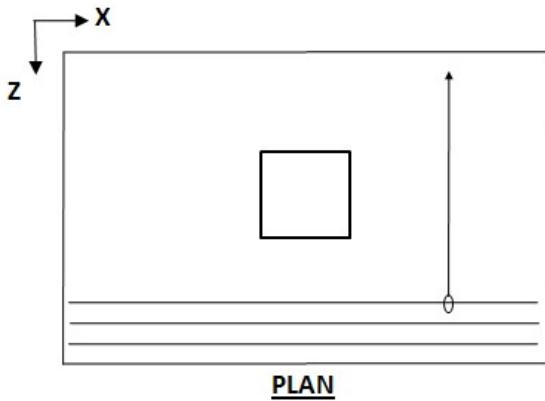
$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0.075 m o.c.

[Along X Axis](#)



For moment w.r.t. Z Axis (M_z)

As Per IS 456 2000 Clause 26.5.2.1

Critical Load Case = #3

Minimum Area of Steel ($A_{st,min}$) = 857.512 mm²

Calculated Area of Steel (A_{st}) = 1422.691 mm²

Provided Area of Steel ($A_{st,Provided}$) = 1422.691 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.078 m

$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

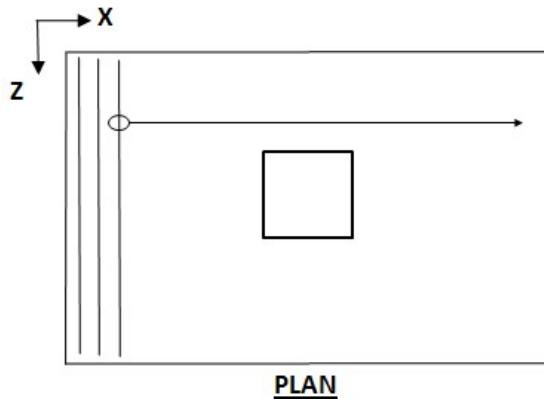
The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0.075 m o.c.

[Top Reinforcement Design](#)

[Along Z Axis](#)



Minimum Area of Steel ($A_{st,min}$) = 857.512 mm²

Calculated Area of Steel (A_{st}) = 854.708 mm²

Provided Area of Steel ($A_{st,Provided}$) = 857.512 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Governing Moment = 8.744 kNm

Selected bar Size (d_b) = Ø6

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.073 m

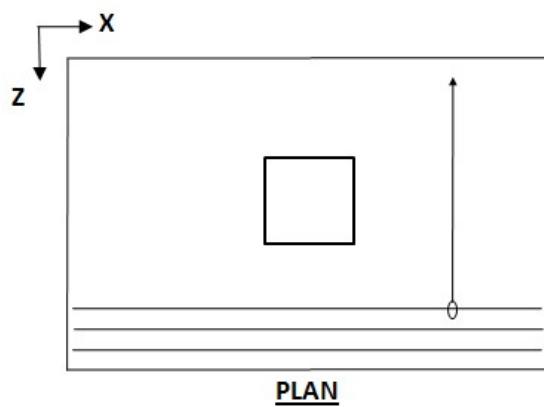
$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø6 @ 0 m o.c.

Along X Axis



Minimum Area of Steel ($A_{st,min}$) = 857.512 mm²

Calculated Area of Steel (A_{st}) = 1422.691 mm²

Provided Area of Steel ($A_{st,Provided}$) = 1422.691 mm²

$A_{st,min} \leq A_{st,Provided}$ Steel area is accepted

Governing Moment = 8.298 kNm

Selected bar Size (d_b) = Ø8

Minimum spacing allowed (S_{min}) = 0.051 m

Selected spacing (S) = 0.078 m

$S_{min} \leq S \leq S_{max}$ and selected bar size < selected maximum bar size...

The reinforcement is accepted.

Based on spacing reinforcement increment; provided reinforcement is

Ø8 @ 0 m o.c.

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 796.824 kN

Critical Applied Moment Along X Direction: 15.936 kNm

Critical Applied Moment Along Z Direction: 15.936 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.182 m

Position Of Neutral Axis Along Z Direction: 0.182 m

Pedestal Moment Capacity Along X Direction: 110.801 kNm

Pedestal Moment Capacity Along Z Direction: 125.969 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 577.848 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

[Pedestal Reinforcement Design](#)

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m
Position Of Neutral Axis Along Z Direction: 0.137 m
Pedestal Moment Capacity Along X Direction: 93.412 kNm
Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²
Pedestal Main/Compression Reinforcement: 16 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 783.137 kN
Critical Applied Moment Along X Direction: 15.662 kNm
Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m
Position Of Neutral Axis Along Z Direction: 0.180 m
Pedestal Moment Capacity Along X Direction: 110.061 kNm
Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²
Pedestal Main/Compression Reinforcement: 12 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN
Critical Applied Moment Along X Direction: 21.591 kNm
Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m
Position Of Neutral Axis Along Z Direction: 0.235 m
Pedestal Moment Capacity Along X Direction: 116.443 kNm
Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²
Pedestal Main/Compression Reinforcement: 28 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1108.293 kN

Critical Applied Moment Along X Direction: 22.165 kNm

Critical Applied Moment Along Z Direction: 22.165 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.224 kNm

Pedestal Moment Capacity Along Z Direction: 133.768 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 803.721 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1079.582 kN

Critical Applied Moment Along X Direction: 21.591 kNm

Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m

Position Of Neutral Axis Along Z Direction: 0.235 m

Pedestal Moment Capacity Along X Direction: 116.443 kNm

Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²

Pedestal Main/Compression Reinforcement: 28 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m

Position Of Neutral Axis Along Z Direction: 0.180 m

Pedestal Moment Capacity Along X Direction: 110.061 kNm

Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 802.558 kN

Critical Applied Moment Along X Direction: 16.051 kNm

Critical Applied Moment Along Z Direction: 16.051 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.183 m

Position Of Neutral Axis Along Z Direction: 0.183 m

Pedestal Moment Capacity Along X Direction: 111.028 kNm

Pedestal Moment Capacity Along Z Direction: 126.226 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 590.780 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1106.751 kN

Critical Applied Moment Along X Direction: 22.135 kNm

Critical Applied Moment Along Z Direction: 22.135 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.240 kNm

Pedestal Moment Capacity Along Z Direction: 133.790 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 802.604 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1137.123 kN

Critical Applied Moment Along X Direction: 22.742 kNm

Critical Applied Moment Along Z Direction: 22.742 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.244 m

Position Of Neutral Axis Along Z Direction: 0.244 m

Pedestal Moment Capacity Along X Direction: 117.002 kNm

Pedestal Moment Capacity Along Z Direction: 133.264 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 824.628 mm²

Pedestal Main/Compression Reinforcement: 32 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 1106.751 kN

Critical Applied Moment Along X Direction: 22.135 kNm

Critical Applied Moment Along Z Direction: 22.135 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m

Position Of Neutral Axis Along Z Direction: 0.239 m

Pedestal Moment Capacity Along X Direction: 117.240 kNm

Pedestal Moment Capacity Along Z Direction: 133.790 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 802.604 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 802.558 kN

Critical Applied Moment Along X Direction: 16.051 kNm

Critical Applied Moment Along Z Direction: 16.051 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.183 m

Position Of Neutral Axis Along Z Direction: 0.183 m

Pedestal Moment Capacity Along X Direction: 111.028 kNm

Pedestal Moment Capacity Along Z Direction: 126.226 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 590.780 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m
Position Of Neutral Axis Along Z Direction: 0.180 m
Pedestal Moment Capacity Along X Direction: 110.061 kNm
Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²
Pedestal Main/Compression Reinforcement: 12 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN
Critical Applied Moment Along X Direction: 21.591 kNm
Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m
Position Of Neutral Axis Along Z Direction: 0.235 m
Pedestal Moment Capacity Along X Direction: 116.443 kNm
Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²
Pedestal Main/Compression Reinforcement: 28 - Ø6
Pedestal Tie Detail: Ø6 @ 0 m
Critical load Case : 3
Critical Applied Axial Load: 1108.293 kN
Critical Applied Moment Along X Direction: 22.165 kNm
Critical Applied Moment Along Z Direction: 22.165 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.239 m
Position Of Neutral Axis Along Z Direction: 0.239 m
Pedestal Moment Capacity Along X Direction: 117.224 kNm
Pedestal Moment Capacity Along Z Direction: 133.768 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 803.721 mm²
Pedestal Main/Compression Reinforcement: 16 - Ø8
Pedestal Tie Detail: Ø6 @ 0 m
Critical load Case : 3
Critical Applied Axial Load: 1079.582 kN

Critical Applied Moment Along X Direction: 21.591 kNm

Critical Applied Moment Along Z Direction: 21.591 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.235 m

Position Of Neutral Axis Along Z Direction: 0.235 m

Pedestal Moment Capacity Along X Direction: 116.443 kNm

Pedestal Moment Capacity Along Z Direction: 132.757 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 782.901 mm²

Pedestal Main/Compression Reinforcement: 28 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 783.137 kN

Critical Applied Moment Along X Direction: 15.662 kNm

Critical Applied Moment Along Z Direction: 15.662 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.180 m

Position Of Neutral Axis Along Z Direction: 0.180 m

Pedestal Moment Capacity Along X Direction: 110.061 kNm

Pedestal Moment Capacity Along Z Direction: 125.303 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 567.922 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 796.824 kN

Critical Applied Moment Along X Direction: 15.936 kNm

Critical Applied Moment Along Z Direction: 15.936 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.182 m

Position Of Neutral Axis Along Z Direction: 0.182 m

Pedestal Moment Capacity Along X Direction: 110.801 kNm

Pedestal Moment Capacity Along Z Direction: 125.969 kNm

Minimum longitudinal pedestal reinforcement is calculated based on

IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 577.848 mm²

Pedestal Main/Compression Reinforcement: 12 - Ø8

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 776.547 kN

Critical Applied Moment Along X Direction: 15.531 kNm

Critical Applied Moment Along Z Direction: 15.531 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.178 m

Position Of Neutral Axis Along Z Direction: 0.178 m

Pedestal Moment Capacity Along X Direction: 108.152 kNm

Pedestal Moment Capacity Along Z Direction: 122.899 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 563.143 mm²

Pedestal Main/Compression Reinforcement: 20 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

Pedestal Reinforcement Design

Critical load Case : 3

Critical Applied Axial Load: 573.013 kN

Critical Applied Moment Along X Direction: 11.460 kNm

Critical Applied Moment Along Z Direction: 11.460 kNm

Pedestal design is performed in accordance with IS 456 Section 39

Position Of Neutral Axis Along X Direction: 0.137 m

Position Of Neutral Axis Along Z Direction: 0.137 m

Pedestal Moment Capacity Along X Direction: 93.412 kNm

Pedestal Moment Capacity Along Z Direction: 105.889 kNm

Minimum longitudinal pedestal reinforcement is calculated based on
IS-456-2000 Section 26.5.3.1 (Clause 26.5.3.1.a to Clause 26.5.3.1.h)

Required Main Reinforcement: 415.542 mm²

Pedestal Main/Compression Reinforcement: 16 - Ø6

Pedestal Tie Detail: Ø6 @ 0 m

[Print Calculation Sheet](#)