SAMPLE CALCULATION OF PILE CAPACITY

CUT OFF LEVEL AT 5.00 (m)	AVG. THICK.	A_P	D in (m)	γ	N_γ	P_D	N_q	K	P_{Di}	Φ	tan δ	A_{Si}	A_P	C_p	N_c	α	C	A_S
CUT OFF	1.50			1.86							-0.05	D						D
STRATUM I	6.00			1.86	0.00	0.00	0.00	0.00	3.87	0	-0.05	D				1.00	3.00	18.85 D
STRATUM II	4.50			1.88	15.49	15.00	13.00	1.00	8.43	30	0.51	D				1.00	0.00	14.13 D
STRATUM III	3.00			1.92	20.10	15.00	18.00	1.10	11.79	32	0.55	D				1.00	0.00	9.42 D
END PROP	3.00	0.785		1.92	20.10	15.00	18.00	1.10	13.17	32	0.55	D	0.785	0.00	9.00	1.00	0.00	32.98 D
					SAND									CLAY				

Here, $A_P = \frac{\pi D^2}{4}$, $N\gamma = (N_q\text{-}1) \times \tan(1.5 \times \text{deg})$, K = 1 OR 2 , $\tan\delta = \tan(\Phi\text{-}3^0)$, $A_{Si} = \pi Dh$

Ultimate Skin Resistance

$$Q_{ult} = (\alpha \times C \times A_s) + \Sigma K \times P_{Di} \times \tan\delta \times \pi \times D \times h$$

For Cohesive Soil

$$(\alpha \times C \times A_s) = (\alpha \times C \times \pi \times D \times h)$$

Depth 1.50 m to 7.50 m - Q_{ui} = 1.00 x 3.00 x 3.141 x D x 6.00 = 56.538

For Non - Cohesive Soil

$$\Sigma K \times P_{Di} \times \tan\delta \times \pi \times D \times h$$

Depth 7.50to 12.00m - Q_{uii} = 1.00 x 8.43 x 0.510 x 3.141 x D x 4.50 = 60.712 D

Depth 12.00 m to 15.00 m - Q_{uiii} = 1.10 x 11.79 x 0.554 x 3.141 x D x 3.00 = 67.740 D

Total Ultimate Skin Resistance = 184.99 D

P_{Di} Calculation

$P_{di\ (ii)}$ = (0.860 x 1.500) + (0.860 x 6.00) + (0.880 x 2.250) = 8.43

$P_{di\ (iii)}$ = (0.860 x 1.500) + (0.860 x 6.00) + (0.880 x 4.500) + (0.920 x 1.500) = 11.79

END BEARING

For Non Cohesive Soil

$$Q_{uit} = A_p (0.5\, D\, \gamma\, N_\gamma + P_D N_q)$$

$$= \frac{\pi D^2}{4} \{(0.500 \times D \times 0.92 \times 20.100) + (15.000 \times D \times 0.800 \times 18.000)\}$$

$$= (7.2581\ D^3 + 169.560\ D^3)$$

Ultimate load carrying capcity in Compression = 176.818 D^3 + 0.000 D^2 + 184.99 D

Ultimate load carrying capcity in Tension = 184.990 D

For uniform diameter straight shaft RCC bored Pile when toe at 15.00m below EGL and cut off at 1.50 m below EGL

	450	600	750	1000
Safe load carrying capacity in Compression (MT) (Using Factor of Safety = 2.50)	40	60	85	145
Safe load carrying capacity in Tension (MT) (Using Factor of Safety = 3)	28	37	46	62

Sample Calculation of Lateral Capacity of Pile
(As per IS:2911 – Part 1 – Section2 – 2010)

Pile Dia (D) = 0.60 meter

Grade of Concrete = M 25

UCS Value = 60 KN/m^2

Depth of Fixity Calculation

Terzaghi's mod^{n} of horizontal of subgrade reaction (k_1) = 10.8 MN/m^2
(From Table of IS 2911-Part 1-Sec-2 : 2010)

Modulus of horizontal of subgrade reaction (K) = (k_1/5)x(1/B) 3.6 MN/m^2

Here, E = $5000\sqrt{f_{ck}}$ = 25000.00 MN/m^2

$$I = \frac{\pi D^4}{64}$$ = 0.006361725 m^4

Hence, relative stiffness factor R = $\sqrt[4]{\frac{EI}{KB}}$ = 2.93 meter

Unsupported length of pile(L_1) = 0 meter

Therefore, L_1/R = 0.00

From graph (L_f/R -Vs- L_1/R) for normally loaded clays and fixed head pile, L_f/R = 2.17
(From IS 2911-Part 1-Section 2 : 2010)

Therefore, depth of fixity (L_f) = 6.36 m

Considering pile as a cantilever to its point of fixity, then $L_{eff} = L_1 + L_f$ = 6.36 m

Calculation of Lateral Load Capacity

Deflection δ = 0.005 upto 500 dia pile and above 500 dia 1% of pile dia.

Here, δ = 0.006 m

Lateral Load Capcity of Pile = $[Q]_D = \frac{12EI \times \delta}{(L_f + L_1)^3}$ = 0.0445833 MN = 4.46 ton