

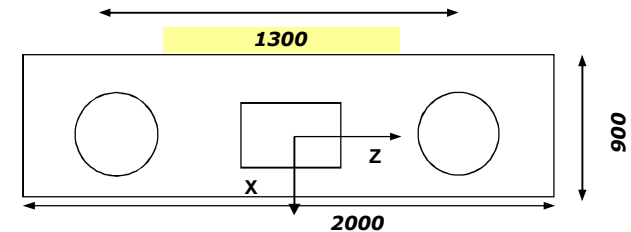
CLIENT :- SHREE BALAJI ROOFING
PILE FOUNDATION - DESIGN CAL.

Date: 12-Feb-25
Prepared by: JAI

PC2 : Pile Group With Two piles

Column/Node marks : 175

Pile cut off level from FGL	=	2000	mm
Top of pile cap from FGL	=	1400	mm
Size of Column Supported	=	600 x 800	mm
Pile Cap Size	=	2000 x 900 x 600	
Pile Cap Self	=	27.00	kN
Soil Overburden over Cap	=	33.26	kN
Comp. Capacity of	400 mm dia.=	110.0	kN
Ten. Capacity of	400 mm dia.=	-110.0	kN
Lateral Capacity of	400 mm dia.=	30.0	kN



Unfactored Force values from Staad Out-put

NODE	Load	Fx	Fy	Fz	Mom-X	Mom-Y	Mom-Z	Py Max	Py Min	Total Load Py	Check for Capacity in comp.	Check for Capacity in tens.	Hx	Hz	Resultant H	Check for Shear
No.	Case	in KN	in KN	in KN	in KN-m	in KN-m	in KN-m	in KN	in KN	in KN			in KN	in KN	in KN	
6	387 COMB -	41.224	124.654	0.870	-0.378	0.000	-210.701	62.62	62.04	92.75	SAFE	SAFE	20.61	0.44	20.62	SAFE
	432 COMB -	-53.984	17.536	0.193	-0.832	0.000	281.504	9.41	8.13	39.54	SAFE	SAFE	26.99	0.10	26.99	SAFE
	368 COMB -	14.027	195.086	1.462	-0.007	0.000	-59.885	97.55	97.54	127.68	SAFE	SAFE	7.01	0.73	7.05	SAFE
	423 COMB -	27.287	-48.798	-12.121	-17.950	-0.002	-84.570	-10.59	-38.21	19.54	SAFE	SAFE	13.64	6.06	14.93	SAFE
	444 COMB -	-3.869	60.338	13.748	18.922	0.001	18.819	44.72	15.61	74.86	SAFE	SAFE	1.93	6.87	7.14	SAFE
	448 COMB -	1.018	17.075	-13.408	-20.461	0.005	-6.433	24.28	-7.20	54.41	SAFE	SAFE	0.51	6.70	6.72	SAFE
	444 COMB -	-3.869	60.338	13.748	18.922	0.001	18.819	44.72	15.61	74.86	SAFE	SAFE	1.93	6.87	7.14	SAFE
	448 COMB -	1.018	17.075	-13.408	-20.461	0.005	-6.433	24.28	-7.20	54.41	SAFE	SAFE	0.51	6.70	6.72	SAFE
	428 COMB -	1.097	17.075	-12.969	-19.600	0.005	-7.284	23.61	-6.54	53.75	SAFE	SAFE	0.55	6.48	6.51	SAFE
	377 COMB -	-3.821	117.139	-8.488	-13.845	-0.002	44.593	69.22	47.92	99.35	SAFE	SAFE	1.91	4.24	4.65	SAFE
	432 COMB -	-53.984	17.536	0.193	-0.832	0.000	281.504	9.41	8.13	39.54	SAFE	SAFE	26.99	0.10	26.99	SAFE
	395 COMB -	38.646	48.808	0.504	-0.380	0.000	-223.178	24.70	24.11	54.83	SAFE	SAFE	19.32	0.25	19.32	SAFE
	368 COMB -	14.027	195.086	1.462	-0.007	0.000	-59.885	97.55	97.54	127.68	SAFE	SAFE	7.01	0.73	7.05	SAFE
48	433 COMB -	53.984	17.536	0.193	-0.832	0.000	-281.504	9.41	8.13	39.54	SAFE	SAFE	26.99	0.10	26.99	SAFE
	378 COMB -	-41.224	124.654	0.870	-0.378	0.000	210.701	62.62	62.04	92.75	SAFE	SAFE	20.61	0.44	20.62	SAFE
	367 COMB -	-14.027	195.086	1.462	-0.007	0.000	59.885	97.55	97.54	127.68	SAFE	SAFE	7.01	0.73	7.05	SAFE
	423 COMB -	-27.287	-48.798	-12.121	-17.950	0.002	84.570	-10.59	-38.21	19.54	SAFE	SAFE	13.64	6.06	14.93	SAFE
	444 COMB -	3.869	60.338	13.748	18.922	-0.001	-18.819	44.72	15.61	74.86	SAFE	SAFE	1.93	6.87	7.14	SAFE
	448 COMB -	-1.009	17.474	-13.340	-20.369	-0.005	6.363	24.41	-6.93	54.54	SAFE	SAFE	0.50	6.67	6.69	SAFE
	444 COMB -	3.869	60.338	13.748	18.922	-0.001	-18.819	44.72	15.61	74.86	SAFE	SAFE	1.93	6.87	7.14	SAFE
	448 COMB -	-1.009	17.474	-13.340	-20.369	-0.005	6.363	24.41	-6.93	54.54	SAFE	SAFE	0.50	6.67	6.69	SAFE
	377 COMB -	-4.459	46.019	-8.832	-13.848	0.002	39.180	33.66	12.36	63.79	SAFE	SAFE	2.23	4.42	4.95	SAFE
	428 COMB -	-1.089	17.474	-12.900	-19.508	-0.005	7.215	23.74	-6.27	53.88	SAFE	SAFE	0.54	6.45	6.47	SAFE
	370 COMB -	-38.646	48.808	0.504	-0.380	0.000	223.178	24.70	24.11	54.83	SAFE	SAFE	19.32	0.25	19.32	SAFE
	433 COMB -	53.984	17.536	0.193	-0.832	0.000	-281.504	9.41	8.13	39.54	SAFE	SAFE	26.99	0.10	26.99	SAFE
	367 COMB -	-14.027	195.086	1.462	-0.007	0.000	59.885	97.55	97.54	127.68	SAFE	SAFE	7.01	0.73	7.05	SAFE

DESIGN OF PILE CAP FOR TWO PILE GROUP

Assume 400 mm dia. Bored cast-in-situ piles - two per column spaced at a distance 1300 mm. forming a rectangle

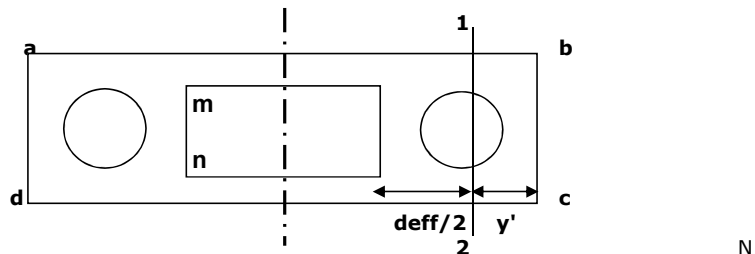
VERTICAL LOADS DUE TO CAP-SELF AND SOIL-OVERBURDEN

a) Length & width of pile-cap	:	2000	x	900
b) Pile Cap area	:	1.800	sqmt.	
c) C/C distance between piles	:	1300	mm.	
d) Assumed thickness of Cap	:	600	mm.	
e) Size of column supported	:	600	x	800
f) Depth of pile cap top from FFL	:	1400	mm.	
g) Volume of Pile Cap (d) x (b)	:	1.08	cum.	
h) Self weight of Cap => (g) x 25	:	27.00	kN	
i) Soil overburden on pile cap	:	33.26	kN	
j) Total load per 2 piles	:	60.26	kN	
k) Total load per pile	:	30.13	kN	
l) Grade of Concrete	:	35.00	N/mm ²	
l) Grade of Steel	:	500.00	N/mm ²	

DESIGN OF PILE CAP :

Critical Section for Shear @ deff/2 from face "mn" :

Assume 600 mm deep Pilecap with eff. depth, deff = 519 mm
 $y' = 340.50$ mm
 $x' = 900$ mm
 Resisting width of Cap for Moment @ face "mn" = 900 mm



CAP SELF :

SEC. 1-b-c-2 => Area = $0.3405 \times 0.9000 = 0.3065$ sqmt. per pile
 $W2 = 4.5968 + 7.7225 = 12.32$ KN
 Critical section for Shear - perpendicular to face "mn", lies on Pile
 Pdes. shear = $190.50 / 400 \times \text{COMP./TENSION} - W2 \times 1.5$

Refer Pile Load/capacity Analysis

	Case 1	Case 2
Factored Load per Pile excluding cap self	191.52 ;	0.00 KN
Factored value of Cap Self + Overburden	18.48 ;	18.48 KN on sec. '1-b-c-2'
Factored Torsional moment on Cap, Tu	422.26 ;	422.26 KN-m on pilecap

PILE	Maximum Compression	Tension	Shear For Bottom Reinf.
Case 1	191.52	0.00	72.73
Case 2	0.00	0.00	-18.48

BOTTOM REINFORCEMENT PERPENDICULAR TO FACE "mn"

			Case 1	Case 2
Direct Moment, 'Mu'	=	Max. Comp. x 0.2500	= 47.88	0.00 KN-m
Mt' due to Tu	=	{ Tu [1+ D/B] / 1.7 }	= 413.98	413.98 KN-m
Equi. Moment, 'Me'	=	Mu + Mt	= 461.86	413.98 KN-m
K - value	=	Me / b.d.d	= 1.905	1.708 N/mm ²
% of Rein. Pt	=	corresponding to K-value	= 0.477	0.425 %
		(Table-3,SP-16)	2229	1986
Try bar of dia	=	12 - 6 no.		
Area of Rein.	=	(of reinf. Provided as above)	= 679	679 mm ²
% of Rein. Pt	=	(of reinf. Provided as above)	= 0.145	0.145 %

DESIGN FOR ONE-WAY SHEAR

			Case 1	Case 2
Direct Shear Vu	=		72.73	-18.48 KN
Shear due to Tu, Vt	=	1.6 Tu / b	= 750.68	750.68 KN (at each pile centre line)
Equiv. Shear Ve	=	Vu + Vt	= 823.41	732.20 KN
TAU-v lim.	=	Ve / b.d	= 1.76	1.57 N/mm ²
0.8Fck/6.89Pt	=	27.97 (beta)		Trial spacing = 125 mm
TAU-c lim.	=	0.2913 N/mm ²		
Asv = (Tve-Tc)b.sv / 0.87 fy	=		381 mm ² (for spacing 125mm)	
			Refer Clause : 48.4.2.1 IS : 456 - 1978	
Asv = Tu.sv / b1.d1 (0.87fy)	=		355 mm ² (for spacing 125mm)	
+ Vu.sv / 2.5.d1.(0.87fy)	=			Refer Clause : 48.4.2.1 IS : 456 - 1978
where,				
b1	=	784 mm		
d1	=	459 mm		
Thus provide	T 10 mm dia.	6 legged stps i.e. provided area =		471 mm ²
Provided stirrup is	Adequate	@ 125 mm c/c		

DESIGN FOR TWO-WAY SHEAR

			Case 1	Case 2
Vu max	=		191.52 KN	0 KN
developed shear stress	(N/mm ²)		0.13	0.00
Ks	=	min((0.5+βs),1) =	1.00	
where βs	=	1		
Allowable shear stress = Ks x 0.25*√fck	=		1.48	1.48
N/mm ²			> 0.13	> 0.00
		SAFE		SAFE