STRUCTURAL CALCULATIONS

Using
MASTERSERIES POWERPAD

SAMPLE OUTPUT FOR
MASTERRC PILE CAPS

Contents

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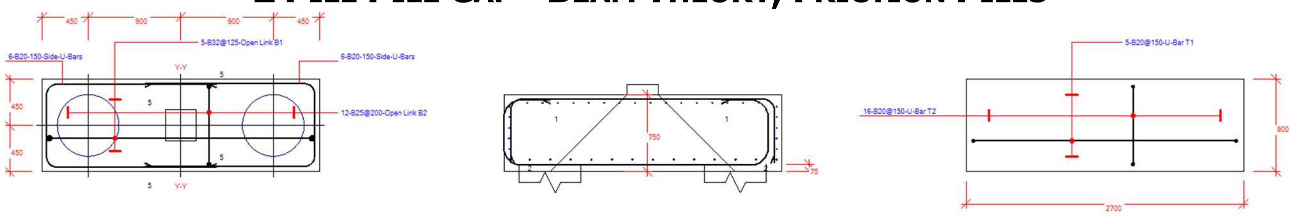
2 Pile Pile Cap - Beam Theory, Friction Piles



Summary of Design Data

Design to	BS 8110: 1997
Working vertical load per pile	1000kN
Pile dia., cap o/a depth, overhang:	600mm, 750mm, 150mm
Pile spacing, centre to centre:	3.00 • dia. (1800mm)
Column size:	300mm. (x-x) x 300mm. (y-y)
Concrete grade:	40
Concrete cover to reinforcement:	Bottom: 75mm., sides and top: 50mm.
Overall plan dimensions:	Width (x-x): 2700mm. Length (y-y): 900mm.

Calculations:

No. of piles	994/1000 = 1 (Overridden by preferred minimum!)	2	
Load per pile (service)	(550 + 400 + 44)/2	497kN	OK
Load per pile (Ultimate)	((550+43.7)•1.40 + (400•1.60))/2 = 1472/2	736kN	
Load per pile (Ultimate Net)	(550•1.40 + 400•1.60)/2 = 1410/2	705kN	
M_{yy}= Fp(L-a/2)	736.0(0.900 - 0.300/2)	552.0 kN.m	
M_{yy}sw = 1.40•24•B•D•la²/2	1.40•24•0.900•0.750•1.200²/2	16.0 kN.m	
M_{yy}res= M_{yy}- M_{yy}sw	552.0 - 16.0	536.0 kN.m	

Y-Y Axis: Layer B1

Reinf% = 100As/BD	As = 5B32@125 = 4020 => 100•4020/(900 • 750)	0.60%	OK

Beam Bending Theory

Asreq = fn(M/(B•d²), fcu, fy)	536 / (900 • 659²) = 1.37, 40, 500	1968 mm²	

Deep Beam Bending Theory

Ref:	Reynolds & Steedman 10th edition. Table 148		
As =1.9•M/(f_y•min(L,h))	1.9 • 536 / (500 • min(1800,750))	2716 mm²	OK

Deep Beam Shear Theory

V_{1c}= K_1•(h-0.35•a_1)•f_t•b	0.70 • (750 - 0.35 • 450) •3.16 • 900.00	1180 kN	
V_1= V_{1C}+ K_2• A_{sprov}• d • sin²(ϕ)/h	1180 + 225 • 4020 • 659 • Sin²(59.0) / 750	1764 kN	
V_{cap}= V_1+ K_2• A_{sv}•sin²(ϕ)/2	1764 + 225 • 3770 • Sin²(59.0) / 2	2076 kN	

Beam Shear on Y-Y plane

	Fv = 736 x 1 piles	736 kN	OK
	L=900, d=659, Av=570, AsXX=0, AsYY=4020		
	Vu = 1.241 N/mm², Enh = 2.312, Vc_{enh} = 1.325 N/mm²	0.94	OK

X-X Axis: Layer B2

Reinf% = 100As/BD	As = 12B25@200 = 5892 => 100•5892/(2700 • 750)	0.29%	OK

Punching Shear

Column Head	Fv = 736 x 2 piles - (1.40 x 43.74) selfweight	1411 kN	
	L=1200, d=659, Av=0, AsXX=0, AsYY=0		
	Vu = 1.784 N/mm², Vc_{enh} = 5.000 N/mm²	0.36	OK

Anti-Crack Steel

Top Nominal Steel	20@ 150 mm = 2094 mm²/m	0.279%	
Spacing [3.12.5.4]	20² • 500 / Min(750,500)	400	OK
Side Steel	Pile Cap 750 < 750 mm deep.20@150 mm c/c = 6 No.		No Check Req.

Friction Pile Spacing

Circular piles Spacing >= 3ϕ	3•600 = 1800 mm	actual = 1800 mm	OK
	see BS 8004 Clause 7.3.4.2		

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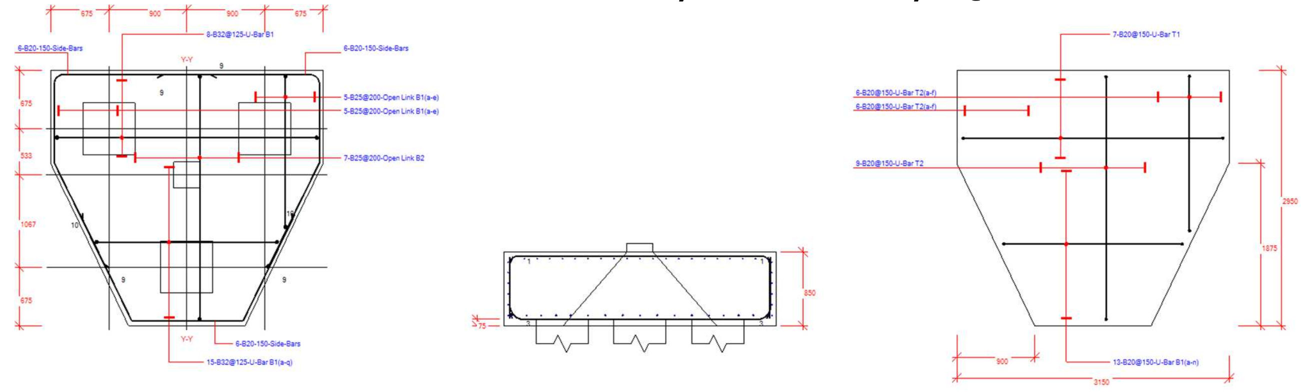
3 Pile Pile Cap- Truss Theory, End bearing, Square Piles



Summary of Design Data

Design to	BS 8110: 1997
Working vertical load per pile	1000kN
Pile size, cap o/a depth, overhang:	600mm sqr, 850mm, 375mm
Pile spacing, centre to centre:	3.00 • dia. (1800mm)
Column size:	300mm. (x-x) x 300mm. (y-y)
Concrete grade:	40
Concrete cover to reinforcement:	Bottom: 75mm., sides and top: 50mm.
Overall plan dimensions:	Width (x-x): 3150mm. Length (y-y): 2950mm.

Calculations:

No. of piles	1956/1000 = 2 (Overridden by preferred minimum!)	3	
Load per pile (service)	(1100 + 700 + 155)/3	652kN	OK
Load per pile (Ultimate)	((1100+155.1)•1.40 + (700•1.60))/3 = 2877/3	959kN	
Load per pile (Ultimate Net)	(1100•1.40 + 700•1.60)/3 = 2661/3	887kN	

Y-Y Axis: Layer B1

Reinf% = 100As/BD	As = 8B32@125 = 6432 => 100•6432/(1075 • 850)	0.70%	OK

Truss Analogy

$F_{ten} = F_{ult}/(36•ld)•(4l^2+b^2-3a^2)$	2877/(36 • 1800 • 759) • (4 • 1800² + 300² - 3 • 300²)	748 kN	
$As = F_{ten}/(0.87•f_y)$	747.6/(0.87 • 500)	1719 mm²	OK

Beam Shear on Y-Y plane

	Fv = 959 x 1 piles	959 kN	OK
	L=1948, d=745, Av=740, AsXX=1569, AsYY=8846		
	Vu = 0.661 N/mm², Enh = 2.014, Vc_{enh} = 1.141 N/mm²	0.58	OK

X-X Axis: Layer B2

Reinf% = 100As/BD	As = 7B25@200 = 3437 => 100•3437/(1350 • 850)	0.30%	OK

Truss Analogy

$F_{ten} = F_{ult}/(18•ld)•(2l^2-b^2)$	2877/(18 • 1800 • 731) • (2 • 1800² - 300²)	777 kN	
As = Ften/(0.87•fy)	776.7 / (0.87 • 500)	1786 mm²	OK

Beam Shear on X-X plane

	Fv = 959 x 1 piles	959 kN	
	L=2171, d=730, Av=737, AsXX=3437, AsYY=0		
	Vu = 0.605 N/mm², Enh = 1.982, Vc_{enh} = 0.757 N/mm²	0.80	OK

Punching Shear

Column Head	Fv = 959 x 3 piles - (1.40 x 155.14) selfweight	2660 kN	
	L=1200, d=759, Av=0, AsXX=0, AsYY=0		
	Vu = 2.920 N/mm², Vc_{enh} = 5.000 N/mm²	0.58	OK

Anti-Crack Steel

Top Nominal Steel	20@ 150 mm = 2094 mm²/m	0.246%	
Spacing [3.12.5.4]	20² • 500 / Min(850,500)	400	OK
Side Steel	20@ 150 mm = 2094 mm²/m	0.071%	
Spacing [3.12.5.4]	20² • 500 / Min(2950,500)	400	OK

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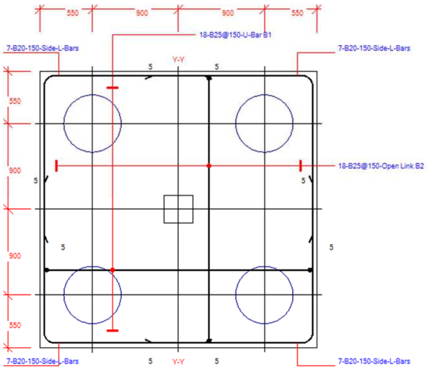
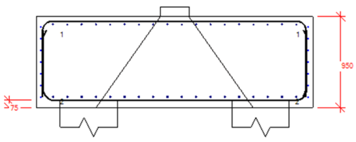
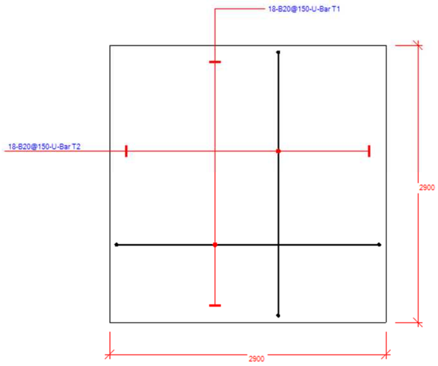
4 PILE PILE CAP TO DEEP BEAM THEORY







Summary of Design Data

Design to	BS 8110: 1997
Working vertical load per pile	1000kN
Pile dia., cap o/a depth, overhang:	600mm, 950mm, 250mm
Pile spacing, centre to centre:	3.00 • dia. (1800mm)
Column size:	300mm. (x-x) x 300mm. (y-y)
Concrete grade:	40
Concrete cover to reinforcement:	Bottom: 75mm., sides and top: 50mm.
Overall plan dimensions:	Width (x-x): 2900mm. Length (y-y): 2900mm.

Calculations:

No. of piles	3592/1000	4	
Load per pile (service)	(1600 + 1800 + 192)/4	898kN	OK
Load per pile (Ultimate)	((1600+191.7)•1.40 + (1800•1.60))/4 = 5388/4	1347kN	
Load per pile (Ultimate Net)	(1600•1.40 + 1800•1.60)/4 = 5120/4	1280kN	

Pile Cap NetDesign Moments

M_{xx}= 2Fp(L-b/2)	2•1280.0(0.900 - 0.300/2)	1920.0 kN.m	
M_{yy}= 2Fp(L-a/2)	2•1280.0(0.900 - 0.300/2)	1920.0 kN.m	

Y-Y Axis: Layer B1

Reinf% = 100As/BD	As = 18B25@150 = 8838 => 100•8838/(2900 • 950)	0.32%	OK

Beam Bending Theory

Asreq = fn(M/(B•d²), fcu, fy)	1920 / (2900 • 863²) = 0.89, 40, 500	5387 mm²	

Deep Beam Bending Theory

Ref:	Reynolds & Steedman 10th edition. Table 148		
As =1.9•M/(f_y•min(L,h))	1.9 • 1920 / (500 • min(1800,950))	7680 mm²	OK

Deep Beam Shear Theory

V_{1c}= K_1•(h-0.35•a_1)•f_t•b	0.70 • (950 - 0.35 • 450) •3.16 • 2900.00	5084 kN	
V_1= V_{1C}+ K_2• A_{sprov}• d • sin²(ϕ)/h	5084 + 225 • 8838 • 863 • Sin²(64.7) / 950	6558 kN	
V_{cap}= V_1+ K_2• A_{sv}•sin²(ϕ)/2	6558 + 225 • 4398 • Sin²(64.7) / 2	6962 kN	

Beam Shear on Y-Y plane

	Fv = 1347 x 2 piles	2694 kN	OK
	L=2900, d=862, Av=570, AsXX=0, AsYY=8838		
	Vu = 1.078 N/mm², Enh = 3.025, Vc_{enh} = 1.305 N/mm²	0.83	OK

X-X Axis: Layer B2

Reinf% = 100As/BD	As = 18B25@150 = 8838 => 100•8838/(2900 • 950)	0.32%	OK

Beam Bending Theory

Asreq = fn(M/(B•d²), fcu, fy)	1920 / (2900 • 838²) = 0.94, 40, 500	5548 mm²	

Deep Beam Bending Theory

Ref:	Reynolds & Steedman 10th edition. Table 148		
As =1.9•M/(f_y•min(L,h))	1.9 • 1920 / (500 • min(1800,950))	7680 mm²	OK

Deep Beam Shear Theory

V_{1c}= K_1•(h-0.35•a_1)•f_t•b	0.70 • (950 - 0.35 • 450) •3.16 • 2900.00	5084 kN	
V_1= V_{1C}+ K_2• A_{sprov}• d • sin²(ϕ)/h	5084 + 225 • 8838 • 838 • Sin²(64.7) / 950	6516 kN	
V_{cap}= V_1+ K_2• A_{sv}•sin²(ϕ)/2	6516 + 225 • 4398 • Sin²(64.7) / 2	6920 kN	

Beam Shear on X-X plane

	Fv = 1347 x 2 piles	2694 kN	OK

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	L=2900, d=838, Av=570, AsXX=8838, AsYY=0		
	Vu = 1.109 N/mm², Enh = 2.940, Vc_{enh} = 1.290 N/mm²	0.86	OK

Punching Shear

Column Head	Fv = 1347 x 4 piles - (1.40 x 191.75) selfweight	5120 kN	
	L=1200, d=862, Av=0, AsXX=0, AsYY=0		
	Vu = 4.949 N/mm², Vc_{enh} = 5.000 N/mm²	0.99	OK
Shear perimeter	Perimeter Less than 1.5 dia from load centre		N/A

Anti-Crack Steel

Top Nominal Steel	20@ 150 mm = 2094 mm²/m	0.22%	
Spacing [3.12.5.4]	20² • 500 / Min(950,500)	400	OK
Side Steel	20@ 150 mm = 2094 mm²/m	0.072%	
Spacing [3.12.5.4]	20² • 500 / Min(2900,500)	400	OK

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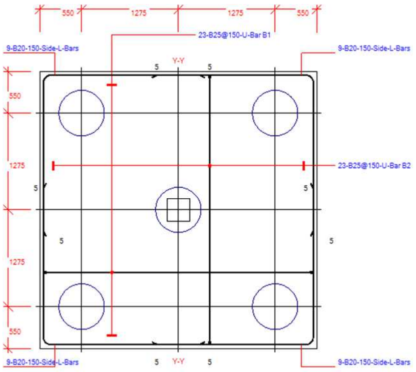
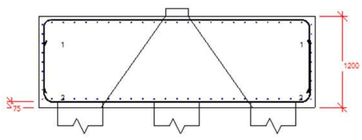
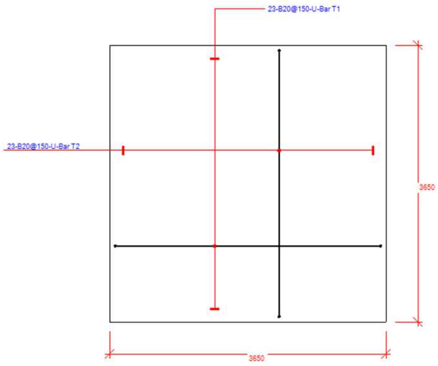
5 Pile Pile Cap to Deep Beam Theory







Summary of Design Data

Design to	BS 8110: 1997
Working vertical load per pile	1000kN
Pile dia., cap o/a depth, overhang:	600mm, 1200mm, 250mm
Pile spacing, centre to centre:	3.00 • dia. (1800mm)
Column size:	300mm. (x-x) x 300mm. (y-y)
Concrete grade:	40
Concrete cover to reinforcement:	Bottom: 75mm., sides and top: 50mm.
Overall plan dimensions:	Width (x-x): 3650mm. Length (y-y): 3650mm.

Calculations:

No. of piles	2835/1000 = 3 (Overridden by preferred minimum!)	5	
Load per pile (service)	(1100 + 1350 + 384)/5	567kN	OK
Load per pile (Ultimate)	((1100+383.7)•1.40 + (1350•1.60))/5 = 4235/5	847kN	
Load per pile (Ultimate Net)	(1100•1.40 + 1350•1.60)/5 = 3700/5	740kN	

Pile Cap NetDesign Moments

M_{xx}= 2Fp(L-b/2)	2•740.0(1.273 - 0.300/2)	1661.0 kN.m
M_{yy}= 2Fp(L-a/2)	2•740.0(1.273 - 0.300/2)	1661.0 kN.m

Y-Y Axis: Layer B1

Reinf% = 100As/BD	As = 23B25@150 = 11293 => 100•11293/(3650 • 1200)	0.26%	OK

Beam Bending Theory

Asreq = fn(M/(B•d²), fcu, fy)	1661 / (3650 • 1113²) = 0.37, 40, 500	3613 mm²

Deep Beam Bending Theory

Ref:	Reynolds & Steedman 10th edition. Table 148		
As =1.9•M/(f_y•min(L,h))	1.9 • 1661 / (500 • min(2545,1200))	5260 mm²	OK

Deep Beam Shear Theory

V_{1c}= K_1•(h-0.35•a_1)•f_t•b	0.70 • (1200 - 0.35 • 823) •3.16 • 3650.00	7364 kN
V_1= V_{1C}+ K_2• A_{sprov}• d • sin²(ϕ)/h	7364 + 225 • 11293 • 1113 • Sin²(55.6) / 1200	8967 kN
V_{cap}= V_1+ K_2• A_{sv}•sin²(ϕ)/2	8967 + 225 • 5655 • Sin²(55.6) / 2	9399 kN

Beam Shear on Y-Y plane

	Fv = 847 x 2 piles	1694 kN	OK
	L=3650, d=1112, Av=945, AsXX=0, AsYY=11293		
Vc ave=(VcEnh•Benh + Vc•Bnet)/B	(0.880•2900 + 0.374•750)/3650	0.776 N/mm²	
	Vu = 0.417 N/mm², Enh = 2.353, Vc_{ave} = 0.776 N/mm²	0.54	OK

X-X Axis: Layer B2

Reinf% = 100As/BD	As = 23B25@150 = 11293 => 100•11293/(3650 • 1200)	0.26%	OK

Beam Bending Theory

Asreq = fn(M/(B•d²), fcu, fy)	1661 / (3650 • 1088²) = 0.38, 40, 500	3696 mm²

Deep Beam Bending Theory

Ref:	Reynolds & Steedman 10th edition. Table 148		
As =1.9•M/(f_y•min(L,h))	1.9 • 1661 / (500 • min(2545,1200))	5260 mm²	OK

Deep Beam Shear Theory

V_{1c}= K_1•(h-0.35•a_1)•f_t•b	0.70 • (1200 - 0.35 • 823) •3.16 • 3650.00	7364 kN
V_1= V_{1C}+ K_2• A_{sprov}• d • sin²(ϕ)/h	7364 + 225 • 11293 • 1088 • Sin²(55.6) / 1200	8931 kN
V_{cap}= V_1+ K_2• A_{sv}•sin²(ϕ)/2	8931 + 225 • 5655 • Sin²(55.6) / 2	9363 kN

Beam Shear on X-X plane

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	Fv = 847 x 2 piles	1694 kN	OK
	L=3650, d=1088, Av=945, AsXX=11293, AsYY=0		
Vc ave=(VcEnh•Benh + Vc•Bnet)/B	(0.872•2900 + 0.379•750)/3650	0.770 N/mm²	
	Vu = 0.427 N/mm², Enh = 2.303, Vc_{ave} = 0.770 N/mm²	0.55	OK

Punching Shear

Column Head	Fv = 847 x 4 piles - (1.40 x 383.69) selfweight	2851 kN	
	L=1200, d=1112, Av=0, AsXX=0, AsYY=0		
	Vu = 2.136 N/mm², Vc_{enh} = 5.000 N/mm²	0.43	OK
Shear perimeter	Fv = 847 x 4 piles	3388 kN	
	L=8760, d=1100, Av=945, AsXX=11293, AsYY=9787		
	Vu = 0.352 N/mm², Enh = 1.746, Vc_{enh} = 0.604 N/mm²	0.58	OK

Anti-Crack Steel

Top Nominal Steel	20@ 150 mm = 2094 mm²/m	0.175%	
Spacing [3.12.5.4]	20² • 500 / Min(1200,500)	400	OK
Side Steel	20@ 150 mm = 2094 mm²/m	0.057%	
Spacing [3.12.5.4]	20² • 500 / Min(3650,500)	400	OK

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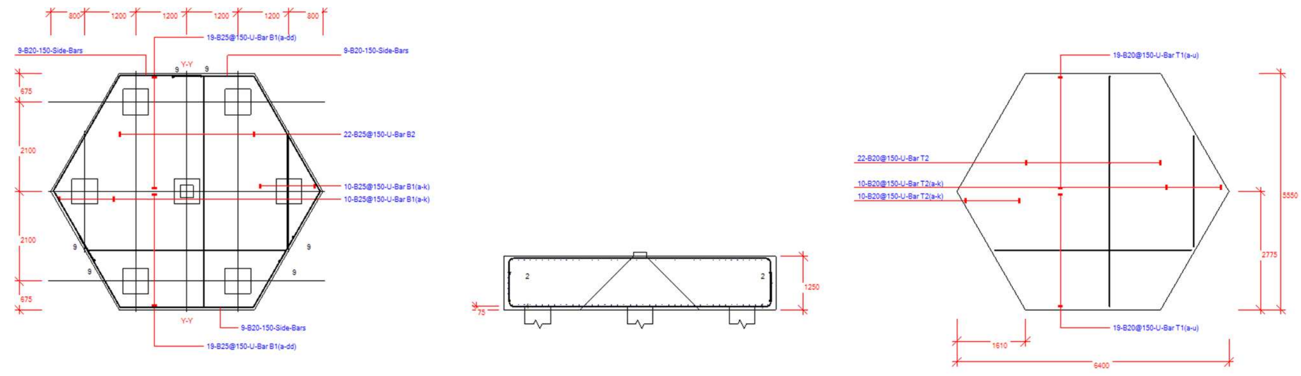
7 PILE PILE CAP - TRUSS THEORY & FRICTION PILES



Summary of Design Data

Design to	BS 8110: 1997
Working vertical load per pile	1000kN
Pile size, cap o/a depth, overhang:	600mm sqr, 1250mm, 375mm
Pile spacing, centre to centre:	4.00 • dia. (2400mm)
Column size:	300mm. (x-x) x 300mm. (y-y)
Concrete grade:	40
Concrete cover to reinforcement:	Bottom: 75mm., sides and top: 50mm.
Overall plan dimensions:	Width (x-x): 6400mm. Length (y-y): 5550mm.

Calculations:

No. of piles	3241/1000 = 4 (Overridden by preferred minimum!)	7	
Load per pile (service)	(1100 + 1350 + 794)/7	463kN	OK
Load per pile (Ultimate)	((1100+794.1)•1.40 + (1350•1.60))/7 = 4809/7	687kN	
Load per pile (Ultimate Net)	(1100•1.40 + 1350•1.60)/7 = 3703/7	529kN	

Y-Y Axis: Layer B1

Reinf% = 100As/BD	As = 36B25@150 = 17676 => 100•17676/(5550 • 1250)	0.25%	OK

Truss Analogy

$F_{ten} = F_{ult}$•l/(3.5•d)	4809 • 2400 / (3.5 • 1163)	2837 kN	
banding Ratio br = B/b_{eff}	5550/4950	1.121	
As = br • F_{ten}/(0.87•f_y)	1.121 • 2836.6/(0.87 • 500)	7311 mm²	OK

Beam Shear on Y-Y plane

	Fv = 687 x 3 piles	2061 kN	OK
	L=5550, d=1162, Av=870, AsXX=0, AsYY=17676		
Vc ave=(VcEnh•Benh + Vc•Bnet)/B	(0.982•4950 + 0.368•600)/5550	0.916 N/mm²	
	Vu = 0.320 N/mm², Enh = 2.671, Vc_{ave} = 0.916 N/mm²	0.35	OK

X-X Axis: Layer B2

Reinf% = 100As/BD	As = 37B25@150 = 18167 => 100•18167/(6400 • 1250)	0.23%	OK

Truss Analogy

$F_{ten} = F_{ult}$•l/(4•d)	4809 • 2400 / (4 • 1138)	2537 kN	
banding Ratio br = B/beff	3200/3150	1.016	
As = br • Ften/(0.87•fy)	1.016 • 2536.6 / (0.87 • 500)	9019 mm²	OK

Beam Shear on X-X plane

	Fv = 687 x 2 piles	1374 kN	OK
	L=4208, d=1138, Av=1954, AsXX=9084, AsYY=0		
Vc ave=(VcEnh•Benh + Vc•Bnet)/B	(0.381•3150 + 0.327•50)/3200	0.380 N/mm²	
	Vu = 0.287 N/mm², Enh = 1.165, Vc_{ave} = 0.380 N/mm²	0.75	OK

Punching Shear

Column Head	Fv = 687 x 6 piles - (1.40 x 794.06) selfweight	3010 kN	
	L=1200, d=1162, Av=0, AsXX=0, AsYY=0		
	Vu = 2.159 N/mm², Vc_{enh} = 5.000 N/mm²	0.43	OK
Shear perimeter	Fv = 687 x 6 piles	4122 kN	
	L=13320, d=1150, Av=1850, AsXX=13625, AsYY=10205		
	Vu = 0.269 N/mm², Enh = 0.933, Vc_{enh} = 0.305 N/mm²	0.88	OK

Anti-Crack Steel

Top Nominal Steel	20@ 150 mm = 2094 mm²/m	0.168%	

Spacing [3.12.5.4]	20² • 500 / Min(1250,500)	400	OK
Bottom Nominal Steel	20@ 100 mm = 3142 mm²/m	0.251%	
Spacing [3.12.5.4]	20² • 500 / Min(1250,500)	400	OK
Side Steel	20@ 150 mm = 2094 mm²/m	0.038%	
Spacing [3.12.5.4]	20² • 500 / Min(5550,500)	400	OK

Friction Pile Spacing

Square piles Spacing >= 4•ϕ	4•600 = 2400 mm see BS 8004 Clause 7.3.4.2	actual = 2400 mm	OK

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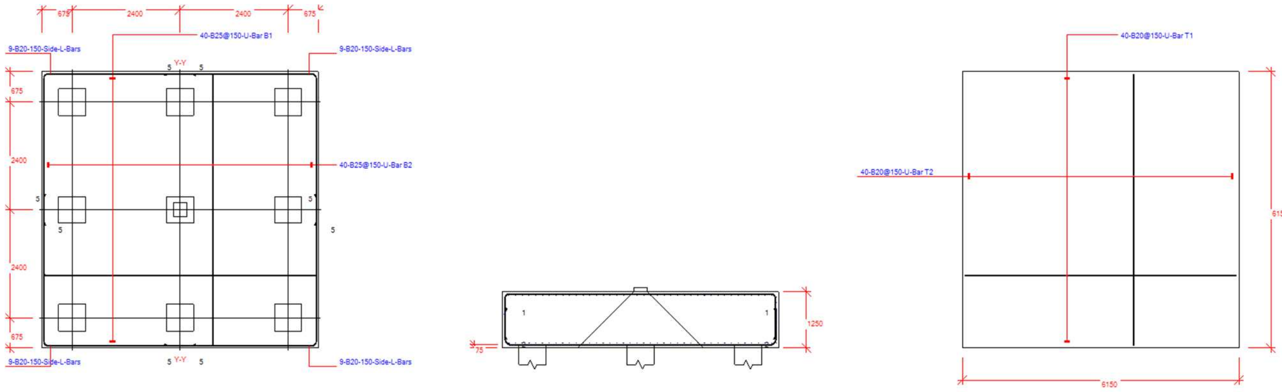
9 Pile Pile Cap - Truss theory & Friction Piles



Summary of Design Data

Design to	BS 8110: 1997
Working vertical load per pile	1000kN
Pile size, cap o/a depth, overhang:	600mm sqr, 1250mm, 375mm
Pile spacing, centre to centre:	4.00 • dia. (2400mm)
Column size:	300mm. (x-x) x 300mm. (y-y)
Concrete grade:	40
Concrete cover to reinforcement:	Bottom: 75mm., sides and top: 50mm.
Overall plan dimensions:	Width (x-x): 6150mm. Length (y-y): 6150mm.

Calculations:

No. of piles	3582/1000 = 4 (Overridden by preferred minimum!)	9	
Load per pile (service)	(1100 + 1350 + 1135)/9	398kN	OK
Load per pile (Ultimate)	((1100+1134.7)•1.40 + (1350•1.60))/9 = 5292/9	588kN	
Load per pile (Ultimate Net)	(1100•1.40 + 1350•1.60)/9 = 3699/9	411kN	

Y-Y Axis: Layer B1

Reinf% = 100As/BD	As = 40B25@150 = 19640 => 100•19640/(6150 • 1250)	0.26%	OK

Truss Analogy

$F_{ten} = F_{ult} \cdot l/(3 \cdot d)$	5292 • 2400 / (3 • 1163)	3642 kN	
banding Ratio br = B/b_{eff}	6150/4950	1.242	
As = br • $F_{ten}/(0.87 \cdot f_y)$	1.242 • 3641.8/(0.87 • 500)	10402 mm²	OK

Beam Shear on Y-Y plane

	Fv = 588 x 3 piles	1764 kN	OK
	L=6150, d=1162, Av=2070, AsXX=0, AsYY=19640		
Vc ave=(VcEnh•Benh + Vc•Bnet)/B	(0.413•4950 + 0.368•1200)/6150	0.404 N/mm²	
	Vu = 0.247 N/mm², Enh = 1.123, Vc_{ave} = 0.404 N/mm²	0.61	OK

X-X Axis: Layer B2

Reinf% = 100As/BD	As = 40B25@150 = 19640 => 100•19640/(6150 • 1250)	0.26%	OK

Truss Analogy

$F_{ten} = F_{ult} \cdot l/(3 \cdot d)$	5292 • 2400 / (3 • 1138)	3722 kN	
banding Ratio br = B/beff	6150/4950	1.242	
As = br • Ften/(0.87•fy)	1.242 • 3721.8 / (0.87 • 500)	10630 mm²	OK

Beam Shear on X-X plane

	Fv = 588 x 3 piles	1764 kN	OK
	L=6150, d=1138, Av=2070, AsXX=19640, AsYY=0		
Vc ave=(VcEnh•Benh + Vc•Bnet)/B	(0.410•4950 + 0.373•1200)/6150	0.402 N/mm²	
	Vu = 0.252 N/mm², Enh = 1.100, Vc_{ave} = 0.402 N/mm²	0.63	OK

Punching Shear

Column Head	Fv = 588 x 8 piles - (1.40 x 1134.68) selfweight	3115 kN	
	L=1200, d=1162, Av=0, AsXX=0, AsYY=0		
	Vu = 2.234 N/mm², Vc_{enh} = 5.000 N/mm²	0.45	OK
Shear perimeter	Fv = 588 x 9 piles	5292 kN	
	L=12558, d=1150, Av=1358, AsXX=13885, AsYY=13885		
	Vu = 0.366 N/mm², Enh = 1.271, Vc_{enh} = 0.416 N/mm²	0.88	OK

Truss Concrete Compression

Fc = Fpile•√(d² + l²)/d	588.0•√(1137.5² + 3394.1²)/1137.5	1850.4 kN	
Fcap = pi•dia²/4•0.6•fcu	pi•600²/4•0.6•40	6785.8 kN	OK

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Job ref	: **Job Ref**
Sheet	: **Sheet Ref / 11 -**
Made By	:
Date	**: 23 Nov 2017/ Version 2017.11**
Checked	**:**
Approved	:

Anti-Crack Steel

Top Nominal Steel	20@ 150 mm = 2094 mm²/m	0.168%	
Spacing [3.12.5.4]	20² • 500 / Min(1250,500)	400	OK
Side Steel	20@ 150 mm = 2094 mm²/m	0.034%	
Spacing [3.12.5.4]	20² • 500 / Min(6150,500)	400	OK

Friction Pile Spacing

Square piles Spacing >= 4•ϕ	4•600 = 2400 mm see BS 8004 Clause 7.3.4.2	actual = 2400 mm	OK

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Job ref	: **Job Ref**
Sheet	: **Sheet Ref / 12 -**
Made By	:
Date	: **23 Nov 2017/ Version 2017.11**
Checked	:
Approved	:

Bar Schedule

Member	Bar mark	Type and size	No. of mbrs	No.of bars in each	Total no.	Length of each bar + mm	Shape code	A* mm	B* mm	C* mm	D* mm	E/R* mm	Rev
2 Pile Pile Cap													
	01	B32	4	5	20	4350	41	465	615	2530	615	465	
	02	B20	4	5	20	3675	21	620	2530	620			
	03	B25	4	12	48	2350	41	365	560	750	560	365	
	04	B20	4	16	64	1750	21	555	750	555			
	05	B20	4	12	48	4000	21	1650	795	1650			
4 Pile Pile Cap													
	06	B25	12	18	216	4075	21	735	2730	735			
	07	B20	12	18	216	4200	21	790	2730	790			
	08	B25	12	18	216	4575	41	365	685	2730	685	365	
	09	B20	12	18	216	4125	21	745	2730	745			
	10	B20	12	28	336	3450	11	1750	1750				
5 Pile Pile Cap													
	11	B25	1	23	23	4975	21	815	3480	815			
	12	B20	1	23	23	5300	21	960	3480	960			
	13	B25	1	23	23	4900	21	770	3480	770			
	14	B20	1	23	23	5200	21	915	3480	915			
	15	B20	1	36	36	4200	11	2125	2125				
9 Pile Pile Cap													
	16	B25	2	40	80	7475	21	815	5980	815			
	17	B20	2	40	80	7900	21	1010	5980	1010			
	18	B25	2	40	80	7400	21	770	5980	770			
	19	B20	2	40	80	7800	21	965	5980	965			
	20	B20	2	36	72	6700	11	3375	3375				

Note: 3 & 7 Pile Pile-Caps omitted as MasterRC is required to Schedule varying Bars.

Bar Weights

Bar grade & diameter	No Bars	Straight bars tonnes	Bent bars (except links) tonnes	Links (51,33,47,63,22) tonnes	Total tonnes
B20	1214	0.000	13.480	0.000	13.480
B25	686	0.000	13.095	0.000	13.095
B32	20	0.000	0.549	0.000	0.549
Total bars	1920			Total Weight	27.124

Weights per element

Element	No Bars	Straight bars tonnes	Bent bars (except links) tonnes	Links (51,33,47,63,22) tonnes	Total tonnes
Pile Group 1: 2 Pile Pile Cap	200	0.000	1.915	0.000	1.915
Pile Group 3: 4 Pile Pile Cap	1200	0.000	14.493	0.000	14.493
Pile Group 4: 5 Pile Pile Cap	128	0.000	1.844	0.000	1.844
Pile Group 6: 9 Pile Pile Cap	392	0.000	8.873	0.000	8.873
Total bars	1920			Total Weight	27.124