桩承台计算\_序号90

# 一、设计资料

1、承台信息

承台底标高：-4.50m

承台上段高：550mm

承台下段高：700mm

承台x方向移心：0mm

承台y方向移心：0mm

2、桩截面信息

桩截面宽：500mm

桩截面高：0mm

单桩承载力：2500.00kN

3、承台混凝土信息

承台混凝土等级：C30

4.桩位坐标:

桩位表

| 桩序号 | 桩X坐标 | 桩Y坐标 |
| --- | --- | --- |
| 1 | -1100 | -1100 |
| 2 | -1100 | 1100 |
| 3 | 0 | 0 |
| 4 | 1100 | -1100 |
| 5 | 1100 | 1100 |

5.柱信息:

柱信息表

| 序号 | 截面宽 | 截面高 | 沿轴偏心 | 偏轴偏心 | 相对转角 |
| --- | --- | --- | --- | --- | --- |
| 柱1 | 800 | 800 | 0 | 0 | 0 |
| 外接柱 | 800 | 800 | 0 | 0 | 0 |

6.设计时执行的规范：

《建筑桩基技术规范》 （JGJ 94－2008） 以下简称 桩基规范

《混凝土结构设计规范》 （GB 50010－2010） 以下简称 混凝土规范

# 二、计算结果

1、桩承载力验算

承台及覆土重:

采用公式：

=±±

= Area×H×γ

= 13.7× 24.0

= 328.6 kN

∑ = 4840000.0 ∑ = 4840000.0

当前荷载组合

| 【2】SATWE标准组合:1.00\*恒+1.00\*风x |
| --- |

承台底面荷载 :（考虑柱底剪力的影响）

N=8223.7kN =70.1kN.m =29.3kN.m =3.5kN =-49.9kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1100.0 | -1100.0 | 1654.02 | 1719.73 | 满足 |
| 2 | -1100.0 | 1100.0 | 1622.17 | 1687.88 | 满足 |
| 3 | 0.0 | 0.0 | 1644.75 | 1710.46 | 满足 |
| 4 | 1100.0 | -1100.0 | 1667.33 | 1733.04 | 满足 |
| 5 | 1100.0 | 1100.0 | 1635.48 | 1701.19 | 满足 |

桩总反力= 8552.3 kN; 桩均反力= 1710.5 kN

当前荷载组合

| 【5】SATWE标准组合:1.00\*恒-1.00\*风y |
| --- |

承台底面荷载 :（考虑柱底剪力的影响）

N=8158.7kN =128.1kN.m =-10.5kN.m =-6.9kN =-64.6kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1100.0 | -1100.0 | 1663.24 | 1728.95 | 满足 |
| 2 | -1100.0 | 1100.0 | 1605.02 | 1670.73 | 满足 |
| 3 | 0.0 | 0.0 | 1631.74 | 1697.45 | 满足 |
| 4 | 1100.0 | -1100.0 | 1658.46 | 1724.17 | 满足 |
| 5 | 1100.0 | 1100.0 | 1600.25 | 1665.96 | 满足 |

桩总反力= 8487.3 kN; 桩均反力= 1697.5 kN

当前荷载组合

| 【13】SATWE标准组合:1.00\*恒-1.00\*风y右 |
| --- |

承台底面荷载 :（考虑柱底剪力的影响）

N=8210.1kN =103.6kN.m =-34.4kN.m =-12.9kN =-58.1kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1100.0 | -1100.0 | 1673.39 | 1739.10 | 满足 |
| 2 | -1100.0 | 1100.0 | 1626.32 | 1692.03 | 满足 |
| 3 | 0.0 | 0.0 | 1642.02 | 1707.74 | 满足 |
| 4 | 1100.0 | -1100.0 | 1657.73 | 1723.44 | 满足 |
| 5 | 1100.0 | 1100.0 | 1610.66 | 1676.38 | 满足 |

桩总反力= 8538.7 kN; 桩均反力= 1707.7 kN

当前荷载组合

| 【15】SATWE标准组合:1.00\*恒+1.00\*活-0.60\*风x |
| --- |

承台底面荷载 :（考虑柱底剪力的影响）

N=10725.9kN =87.4kN.m =-34.5kN.m =-13.6kN =-62.2kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1100.0 | -1100.0 | 2172.90 | 2238.61 | 满足 |
| 2 | -1100.0 | 1100.0 | 2133.16 | 2198.87 | 满足 |
| 3 | 0.0 | 0.0 | 2145.19 | 2210.90 | 满足 |
| 4 | 1100.0 | -1100.0 | 2157.21 | 2222.92 | 满足 |
| 5 | 1100.0 | 1100.0 | 2117.48 | 2183.19 | 满足 |

桩总反力= 11054.5 kN; 桩均反力= 2210.9 kN

当前荷载组合

| 【18】SATWE标准组合:1.00\*恒+1.00\*活+0.60\*风y |
| --- |

承台底面荷载 :（考虑柱底剪力的影响）

N=10765.0kN =52.6kN.m =-10.6kN.m =-7.3kN =-53.4kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1100.0 | -1100.0 | 2167.37 | 2233.08 | 满足 |
| 2 | -1100.0 | 1100.0 | 2143.45 | 2209.16 | 满足 |
| 3 | 0.0 | 0.0 | 2152.99 | 2218.70 | 满足 |
| 4 | 1100.0 | -1100.0 | 2162.53 | 2228.24 | 满足 |
| 5 | 1100.0 | 1100.0 | 2138.61 | 2204.33 | 满足 |

桩总反力= 11093.5 kN; 桩均反力= 2218.7 kN

当前荷载组合

| 【34】SATWE标准组合:1.00\*恒+1.00\*活+0.60\*风y右 |
| --- |

承台底面荷载 :（考虑柱底剪力的影响）

N=10734.1kN =67.3kN.m =3.7kN.m =-3.8kN =-57.3kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1100.0 | -1100.0 | 2161.28 | 2226.99 | 满足 |
| 2 | -1100.0 | 1100.0 | 2130.67 | 2196.39 | 满足 |
| 3 | 0.0 | 0.0 | 2146.82 | 2212.53 | 满足 |
| 4 | 1100.0 | -1100.0 | 2162.97 | 2228.68 | 满足 |
| 5 | 1100.0 | 1100.0 | 2132.36 | 2198.08 | 满足 |

桩总反力= 11062.7 kN; 桩均反力= 2212.5 kN

当前荷载组合

| 【42】SATWE标准组合:1.00\*恒+0.50\*活+0.20\*风x+1.00\*地x |
| --- |

承台底面荷载 :（考虑柱底剪力的影响）

N=9383.1kN =62.8kN.m =186.7kN.m =44.4kN =-61.2kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1100.0 | -1100.0 | 1848.46 | 1914.17 | 满足 |
| 2 | -1100.0 | 1100.0 | 1819.92 | 1885.64 | 满足 |
| 3 | 0.0 | 0.0 | 1876.62 | 1942.33 | 满足 |
| 4 | 1100.0 | -1100.0 | 1933.31 | 1999.02 | 满足 |
| 5 | 1100.0 | 1100.0 | 1904.78 | 1970.49 | 满足 |

桩总反力= 9711.7 kN; 桩均反力= 1942.3 kN

当前荷载组合

| 【43】SATWE标准组合:1.00\*恒+0.50\*活-0.20\*风x-1.00\*地x |
| --- |

承台底面荷载 :（考虑柱底剪力的影响）

N=9576.3kN =94.2kN.m =-207.3kN.m =-58.4kN =-50.6kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1100.0 | -1100.0 | 1983.78 | 2049.49 | 满足 |
| 2 | -1100.0 | 1100.0 | 1940.97 | 2006.68 | 满足 |
| 3 | 0.0 | 0.0 | 1915.25 | 1980.96 | 满足 |
| 4 | 1100.0 | -1100.0 | 1889.53 | 1955.24 | 满足 |
| 5 | 1100.0 | 1100.0 | 1846.73 | 1912.44 | 满足 |

桩总反力= 9904.8 kN; 桩均反力= 1981.0 kN

当前荷载组合

| 【44】SATWE标准组合:1.00\*恒+0.50\*活+0.20\*风y+1.00\*地y |
| --- |

承台底面荷载 :（考虑柱底剪力的影响）

N=9764.0kN =-117.8kN.m =-0.2kN.m =-4.1kN =-3.9kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1100.0 | -1100.0 | 1926.07 | 1991.79 | 满足 |
| 2 | -1100.0 | 1100.0 | 1979.63 | 2045.34 | 满足 |
| 3 | 0.0 | 0.0 | 1952.80 | 2018.51 | 满足 |
| 4 | 1100.0 | -1100.0 | 1925.97 | 1991.68 | 满足 |
| 5 | 1100.0 | 1100.0 | 1979.52 | 2045.24 | 满足 |

桩总反力= 10092.6 kN; 桩均反力= 2018.5 kN

当前荷载组合

| 【45】SATWE标准组合:1.00\*恒+0.50\*活-0.20\*风y-1.00\*地y |
| --- |

承台底面荷载 :（考虑柱底剪力的影响）

N=9195.4kN =274.8kN.m =-20.4kN.m =-10.0kN =-108.0kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1100.0 | -1100.0 | 1906.16 | 1971.87 | 满足 |
| 2 | -1100.0 | 1100.0 | 1781.26 | 1846.98 | 满足 |
| 3 | 0.0 | 0.0 | 1839.07 | 1904.78 | 满足 |
| 4 | 1100.0 | -1100.0 | 1896.88 | 1962.59 | 满足 |
| 5 | 1100.0 | 1100.0 | 1771.98 | 1837.69 | 满足 |

桩总反力= 9523.9 kN; 桩均反力= 1904.8 kN

当前荷载组合

| 【46】SATWE标准组合:1.00\*恒+0.50\*活+0.20\*风x左+1.00\*地x |
| --- |

承台底面荷载 :（考虑柱底剪力的影响）

N=9391.6kN =58.4kN.m =183.7kN.m =43.6kN =-60.1kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1100.0 | -1100.0 | 1849.85 | 1915.56 | 满足 |
| 2 | -1100.0 | 1100.0 | 1823.30 | 1889.01 | 满足 |
| 3 | 0.0 | 0.0 | 1878.32 | 1944.03 | 满足 |
| 4 | 1100.0 | -1100.0 | 1933.34 | 1999.05 | 满足 |
| 5 | 1100.0 | 1100.0 | 1906.79 | 1972.51 | 满足 |

桩总反力= 9720.2 kN; 桩均反力= 1944.0 kN

当前荷载组合

| 【47】SATWE标准组合:1.00\*恒+0.50\*活-0.20\*风x左-1.00\*地x |
| --- |

承台底面荷载 :（考虑柱底剪力的影响）

N=9567.7kN =98.5kN.m =-204.3kN.m =-57.7kN =-51.8kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1100.0 | -1100.0 | 1982.38 | 2048.10 | 满足 |
| 2 | -1100.0 | 1100.0 | 1937.59 | 2003.31 | 满足 |
| 3 | 0.0 | 0.0 | 1913.55 | 1979.26 | 满足 |
| 4 | 1100.0 | -1100.0 | 1889.50 | 1955.21 | 满足 |
| 5 | 1100.0 | 1100.0 | 1844.71 | 1910.42 | 满足 |

桩总反力= 9896.3 kN; 桩均反力= 1979.3 kN

2、承台内力配筋计算

当前荷载组合

| 【55】SATWE基本组合:1.35\*恒+0.98\*活 |
| --- |

承台底面荷载 :（考虑柱底剪力的影响）

N=13548.9kN =111.9kN.m =-14.6kN.m =-9.9kN =-79.6kN

承台及覆土重:

= 328.6×1.35= 443.6

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) |
| --- | --- | --- | --- | --- |
| 1 | -1100.0 | -1100.0 | 2738.53 | 2827.24 |
| 2 | -1100.0 | 1100.0 | 2687.67 | 2776.38 |
| 3 | 0.0 | 0.0 | 2709.78 | 2798.50 |
| 4 | 1100.0 | -1100.0 | 2731.90 | 2820.61 |
| 5 | 1100.0 | 1100.0 | 2681.04 | 2769.75 |

桩总反力= 13992.5 kN; 桩均反力= 2798.5 kN

台阶1 H = 700.00 mm

a、角桩冲切计算：

采用“桩基规范”5.9.8条,公式如下：

≤[

=, =

角桩No.=1

= 450. =0.38 = 950.

= 450. =0.38 = 950.

= 650. =0.9739 = 0.974 =1.00 = 1.433

=[( +/2)+ (+/2)]

= 2860.80 kN > = 2738.53(×1.00) kN

角桩No.=2

= 450. =0.38 = 950.

= 450. =0.38 = 950.

= 650. =0.9739 = 0.974 =1.00 = 1.433

=[( +/2)+ (+/2)]

= 2860.80 kN > = 2731.90(×1.00) kN

角桩No.=3

= 450. =0.38 = 950.

= 450. =0.38 = 950.

= 650. =0.9739 = 0.974 =1.00 = 1.433

=[( +/2)+ (+/2)]

= 2860.80 kN > = 2681.04(×1.00) kN

角桩No.=4

= 450. =0.38 = 950.

= 450. =0.38 = 950.

= 650. =0.9739 = 0.974 =1.00 = 1.433

=[( +/2)+ (+/2)]

= 2860.80 kN > = 2687.67(×1.00) kN

b、柱冲切计算：

采用“桩基规范”5.9.7条,公式如下：

≤2[

=, =

截面净高=1200.mm

X正方向:= 450. =0.375

X负方向:= 450. =0.375

Y正方向:= 450. =0.375

Y负方向:= 450. =0.375

= 900. = 900. = 1.46 = 1.46 = 1.43 =0.962

=2[( + ) + ( + )]

=13055.71 kN > =10839.14 × 1.00 kN

c、承台抗剪计算

采用“桩基规范”5.9.9条,公式如下：

V<=

a=

=()

1、左侧抗剪计算

=1200. = 902. =0.375

= [1.75/(+1.0)]

=0.904\*[1.75/(0.375+1.0)]\*3058.\*1200.\*1.4329\*1.e-3

= 6047.7 kN

> = 5426.19 (\* 1.00) kN

2、右侧抗剪计算

=1200. = 450. =0.375

= [1.75/(+1.0)]

=0.904\*[1.75/(0.375+1.0)]\*3058.\*1200.\*1.4329\*1.e-3

= 6047.7 kN

> = 5412.94 (\* 1.00) kN

3、下侧抗剪计算

=1200. = 450. =0.375

= [1.75/(+1.0)]

=0.904\*[1.75/(0.375+1.0)]\*3058.\*1200.\*1.4329\*1.e-3

= 6047.7 kN

> = 5470.43 (\* 1.00) kN

4、上侧抗剪计算

=1200. = 450. =0.375

= [1.75/(+1.0)]

=0.904\*[1.75/(0.375+1.0)]\*3058.\*1200.\*1.4329\*1.e-3

= 6047.7 kN

> = 5368.71 (\* 1.00) kN

台阶2 H = 1250.00 mm

b、柱冲切计算：

截面净高=1200.mm

X正方向:= 500. =0.417

X负方向:= 500. =0.417

Y正方向:= 500. =0.417

Y负方向:= 500. =0.417

= 800. = 800. = 1.36 = 1.36 = 1.43 =0.962

=2[( + ) + ( + )]

=11722.69 kN > =10839.14 × 1.00 kN

c、承台抗剪计算

1、左侧抗剪计算

=1200. = 903. =0.417

= [1.75/(+1.0)]

=0.904\*[1.75/(0.417+1.0)]\*3058.\*1200.\*1.4329\*1.e-3

= 5869.8 kN

> = 5426.19 (\* 1.00) kN

2、右侧抗剪计算

=1200. = 500. =0.417

= [1.75/(+1.0)]

=0.904\*[1.75/(0.417+1.0)]\*3058.\*1200.\*1.4329\*1.e-3

= 5869.8 kN

> = 5412.94 (\* 1.00) kN

3、下侧抗剪计算

=1200. = 500. =0.417

= [1.75/(+1.0)]

=0.904\*[1.75/(0.417+1.0)]\*3058.\*1200.\*1.4329\*1.e-3

= 5869.8 kN

> = 5470.43 (\* 1.00) kN

4、上侧抗剪计算

=1200. = 500. =0.417

= [1.75/(+1.0)]

=0.904\*[1.75/(0.417+1.0)]\*3058.\*1200.\*1.4329\*1.e-3

= 5869.8 kN

> = 5368.71 (\* 1.00) kN

承台阶梯高度：

1阶高： 700mm

2阶高： 550mm

3、承台板抗弯计算

X方向配筋计算：

= 3798.34\*1.00= 3798.34 X = -400. H = 1200.

= /(0.9\*\*)/YS = 3798.34/(0.9\*1200.0\*360.0)/3.7= 2640.4 /m

= 3789.06\*1.00= 3789.06 X = 400. H = 1200.

= /(0.9\*\*)/YS = 3789.06/(0.9\*1200.0\*360.0)/3.7= 2633.9 /m

= 3798.34\*1.00= 3798.34 X = -400. H = 1200.

= /(0.9\*\*)/YS = 3798.34/(0.9\*1200.0\*360.0)/3.7= 2640.4 /m

Y方向配筋计算：

= 3829.30\*1.00= 3829.30 Y = -400. H = 1200.

= /(0.9\*\*)/XS = 3829.30/(0.9\*1200.0\*360.0)/3.7= 2661.9 /m

= 3758.10\*1.00= 3758.10 Y = 400. H = 1200.

= /(0.9\*\*)/XS = 3758.10/(0.9\*1200.0\*360.0)/3.7= 2612.4 /m

= 3829.30\*1.00= 3829.30 Y = -400. H = 1200.

= /(0.9\*\*)/XS = 3829.30/(0.9\*1200.0\*360.0)/3.7= 2661.9 /m

计算的钢筋面积：

= 2640./m = 2662./m

# 三、结果汇总

标准组合下桩反力:

最大最小桩反力及对应的标准组合

| 桩号 | 最大反力（非震）(Load) | 最小反力（非震）(Load) | 最大反力（震）(Load) | 最小反力（震）(Load) |
| --- | --- | --- | --- | --- |
| 1 | 2238.61 (15) | 1719.73 (2) | 2049.49 (43) | 1914.17 (42) |
| 2 | 2209.16 (18) | 1670.73 (5) | 2045.34 (44) | 1846.98 (45) |
| 3 | 2218.70 (18) | 1697.45 (5) | 2018.51 (44) | 1904.78 (45) |
| 4 | 2228.68 (34) | 1723.44 (13) | 1999.05 (46) | 1955.21 (47) |
| 5 | 2204.33 (18) | 1665.96 (5) | 2045.24 (44) | 1837.69 (45) |

桩平均反力最大值2218.70 (非震)(Load 18)

桩平均反力最小值1697.45 (非震)(Load 5)

桩平均反力最大值2018.51 (震)(Load 44)

桩平均反力最小值1904.78 (震)(Load 45)

基本组合下承台冲切、剪切、配筋计算:

角桩冲切计算：

桩 1: 抗力2860.80 kN 冲切力2738.53 kN ：650 mm (Load:55)

桩 2: 抗力2860.80 kN 冲切力2731.90 kN ：650 mm (Load:55)

桩 3: 抗力2860.80 kN 冲切力2681.04 kN ：650 mm (Load:55)

桩 4: 抗力2860.80 kN 冲切力2687.67 kN ：650 mm (Load:55)

柱冲切计算：

抗力11722.69 kN 冲切力10839.14 kN ：1200 mm Load：55

抗剪计算：

1左边： 抗力5869.85kN 剪力5426.19kN ：1200mm (Load:55)

2右边： 抗力5869.85kN 剪力5412.94kN ：1200mm (Load:55)

3上边： 抗力5869.85kN 剪力5470.43kN ：1200mm (Load:55)

4下边： 抗力5869.85kN 剪力5368.71kN ：1200mm (Load:55)

承台高度：

一阶高700 二阶高550

底板配筋计算：

X方向：弯矩3798.34 kN.m 计算钢筋面积2640 /m Load： 55

Y方向：弯矩3829.30 kN.m 计算钢筋面积2662 /m Load： 55

根据最小配筋率计算承台最小配筋：

= 1563. /m

= 1563. /m

原钢筋x方向配筋量不满足

原钢筋y方向配筋量不满足

计算的配筋方案为：

Agx: HRB400 20@100

Agy: HRB400 20@100