桩承台计算\_序号8

# 一、设计资料

1、承台信息

承台底标高：-4.50m

承台上段高：600mm

承台下段高：900mm

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 | -1000 | -1000 |
| 2 | -1000 | 1000 |
| 3 | 1000 | -1000 |
| 4 | 1000 | 1000 |

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 | 700 | 700 | 0 | 0 | 0 |
| 外接柱 | 700 | 700 | 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

= 9.0× 24.0

= 216.0 kN

∑ = 4000000.0 ∑ = 4000000.0

当前荷载组合

| 【3】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=6525.6kN =-3.9kN.m =-22.8kN.m =-20.7kN =5.7kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1000.0 | -1000.0 | 1636.11 | 1690.11 | 满足 |
| 2 | -1000.0 | 1000.0 | 1638.07 | 1692.07 | 满足 |
| 3 | 1000.0 | -1000.0 | 1624.71 | 1678.71 | 满足 |
| 4 | 1000.0 | 1000.0 | 1626.67 | 1680.67 | 满足 |

桩总反力= 6741.6 kN; 桩均反力= 1685.4 kN

当前荷载组合

| 【4】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=6555.8kN =-30.3kN.m =-5.5kN.m =-10.5kN =23.3kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1000.0 | -1000.0 | 1632.75 | 1686.75 | 满足 |
| 2 | -1000.0 | 1000.0 | 1647.91 | 1701.91 | 满足 |
| 3 | 1000.0 | -1000.0 | 1629.99 | 1683.99 | 满足 |
| 4 | 1000.0 | 1000.0 | 1645.15 | 1699.15 | 满足 |

桩总反力= 6771.8 kN; 桩均反力= 1692.9 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=6542.8kN =24.8kN.m =-4.8kN.m =-7.7kN =-15.1kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1000.0 | -1000.0 | 1643.10 | 1697.10 | 满足 |
| 2 | -1000.0 | 1000.0 | 1630.69 | 1684.69 | 满足 |
| 3 | 1000.0 | -1000.0 | 1640.72 | 1694.72 | 满足 |
| 4 | 1000.0 | 1000.0 | 1628.31 | 1682.31 | 满足 |

桩总反力= 6758.8 kN; 桩均反力= 1689.7 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=6530.0kN =13.1kN.m =-16.1kN.m =-15.6kN =-6.5kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1000.0 | -1000.0 | 1639.79 | 1693.79 | 满足 |
| 2 | -1000.0 | 1000.0 | 1633.25 | 1687.25 | 满足 |
| 3 | 1000.0 | -1000.0 | 1631.74 | 1685.74 | 满足 |
| 4 | 1000.0 | 1000.0 | 1625.20 | 1679.20 | 满足 |

桩总反力= 6746.0 kN; 桩均反力= 1686.5 kN

当前荷载组合

| 【14】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=8163.8kN =-4.0kN.m =3.9kN.m =-5.5kN =7.3kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1000.0 | -1000.0 | 2038.95 | 2092.95 | 满足 |
| 2 | -1000.0 | 1000.0 | 2040.97 | 2094.97 | 满足 |
| 3 | 1000.0 | -1000.0 | 2040.91 | 2094.91 | 满足 |
| 4 | 1000.0 | 1000.0 | 2042.93 | 2096.93 | 满足 |

桩总反力= 8379.8 kN; 桩均反力= 2094.9 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=8153.4kN =-21.3kN.m =-6.9kN.m =-13.2kN =19.7kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1000.0 | -1000.0 | 2034.75 | 2088.75 | 满足 |
| 2 | -1000.0 | 1000.0 | 2045.40 | 2099.40 | 满足 |
| 3 | 1000.0 | -1000.0 | 2031.31 | 2085.31 | 满足 |
| 4 | 1000.0 | 1000.0 | 2041.95 | 2095.95 | 满足 |

桩总反力= 8369.4 kN; 桩均反力= 2092.4 kN

当前荷载组合

| 【19】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=8145.6kN =11.8kN.m =-6.4kN.m =-11.5kN =-3.3kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1000.0 | -1000.0 | 2040.96 | 2094.96 | 满足 |
| 2 | -1000.0 | 1000.0 | 2035.07 | 2089.07 | 满足 |
| 3 | 1000.0 | -1000.0 | 2037.75 | 2091.75 | 满足 |
| 4 | 1000.0 | 1000.0 | 2031.85 | 2085.85 | 满足 |

桩总反力= 8361.6 kN; 桩均反力= 2090.4 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=8161.1kN =-14.2kN.m =-0.1kN.m =-8.5kN =14.5kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1000.0 | -1000.0 | 2036.74 | 2090.74 | 满足 |
| 2 | -1000.0 | 1000.0 | 2043.86 | 2097.86 | 满足 |
| 3 | 1000.0 | -1000.0 | 2036.70 | 2090.70 | 满足 |
| 4 | 1000.0 | 1000.0 | 2043.82 | 2097.82 | 满足 |

桩总反力= 8377.1 kN; 桩均反力= 2094.3 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=7472.9kN =5.0kN.m =89.5kN.m =54.0kN =-2.5kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1000.0 | -1000.0 | 1847.11 | 1901.11 | 满足 |
| 2 | -1000.0 | 1000.0 | 1844.59 | 1898.59 | 满足 |
| 3 | 1000.0 | -1000.0 | 1891.85 | 1945.85 | 满足 |
| 4 | 1000.0 | 1000.0 | 1889.33 | 1943.33 | 满足 |

桩总反力= 7688.9 kN; 桩均反力= 1922.2 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=7226.0kN =-12.5kN.m =-101.3kN.m =-75.5kN =14.8kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1000.0 | -1000.0 | 1828.68 | 1882.68 | 满足 |
| 2 | -1000.0 | 1000.0 | 1834.95 | 1888.95 | 满足 |
| 3 | 1000.0 | -1000.0 | 1778.03 | 1832.03 | 满足 |
| 4 | 1000.0 | 1000.0 | 1784.30 | 1838.30 | 满足 |

桩总反力= 7442.0 kN; 桩均反力= 1860.5 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=7387.7kN =-98.6kN.m =-10.8kN.m =-15.9kN =75.1kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1000.0 | -1000.0 | 1824.98 | 1878.98 | 满足 |
| 2 | -1000.0 | 1000.0 | 1874.26 | 1928.26 | 满足 |
| 3 | 1000.0 | -1000.0 | 1819.58 | 1873.58 | 满足 |
| 4 | 1000.0 | 1000.0 | 1868.85 | 1922.85 | 满足 |

桩总反力= 7603.7 kN; 桩均反力= 1900.9 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=7311.2kN =91.1kN.m =-1.0kN.m =-5.6kN =-62.8kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1000.0 | -1000.0 | 1850.80 | 1904.80 | 满足 |
| 2 | -1000.0 | 1000.0 | 1805.27 | 1859.27 | 满足 |
| 3 | 1000.0 | -1000.0 | 1850.31 | 1904.31 | 满足 |
| 4 | 1000.0 | 1000.0 | 1804.78 | 1858.78 | 满足 |

桩总反力= 7527.2 kN; 桩均反力= 1881.8 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=10409.8kN =-5.7kN.m =-8.4kN.m =-15.5kN =9.6kN

承台及覆土重:

= 216.0×1.35= 291.6

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) |
| --- | --- | --- | --- | --- |
| 1 | -1000.0 | -1000.0 | 2603.13 | 2676.03 |
| 2 | -1000.0 | 1000.0 | 2605.97 | 2678.87 |
| 3 | 1000.0 | -1000.0 | 2598.92 | 2671.82 |
| 4 | 1000.0 | 1000.0 | 2601.75 | 2674.65 |

桩总反力= 10701.4 kN; 桩均反力= 2675.3 kN

台阶1 H = 900.00 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

= 400. =0.28 = 700.

= 400. =0.28 = 700.

= 850. =1.1768 = 1.177 =0.99 = 1.433

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

= 3260.77 kN > = 2603.13(×1.00) kN

角桩No.=2

= 400. =0.28 = 700.

= 400. =0.28 = 700.

= 850. =1.1768 = 1.177 =0.99 = 1.433

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

= 3260.77 kN > = 2598.92(×1.00) kN

角桩No.=3

= 400. =0.28 = 700.

= 400. =0.28 = 700.

= 850. =1.1768 = 1.177 =0.99 = 1.433

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

= 3260.77 kN > = 2601.75(×1.00) kN

角桩No.=4

= 400. =0.28 = 700.

= 400. =0.28 = 700.

= 850. =1.1768 = 1.177 =0.99 = 1.433

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

= 3260.77 kN > = 2605.97(×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=1450.mm

X正方向:= 400. =0.276

X负方向:= 400. =0.276

Y正方向:= 400. =0.276

Y负方向:= 400. =0.276

= 800. = 800. = 1.77 = 1.77 = 1.43 =0.942

=2[( + ) + ( + )]

=16577.45 kN > =10409.77 × 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

=1450. = 802. =0.276

= [1.75/(+1.0)]

=0.862\*[1.75/(0.276+1.0)]\*2545.\*1450.\*1.4329\*1.e-3

= 6250.4 kN

> = 5209.10 (\* 1.00) kN

2、右侧抗剪计算

=1450. = 400. =0.276

= [1.75/(+1.0)]

=0.862\*[1.75/(0.276+1.0)]\*2545.\*1450.\*1.4329\*1.e-3

= 6250.4 kN

> = 5200.67 (\* 1.00) kN

3、下侧抗剪计算

=1450. = 400. =0.276

= [1.75/(+1.0)]

=0.862\*[1.75/(0.276+1.0)]\*2545.\*1450.\*1.4329\*1.e-3

= 6250.4 kN

> = 5202.05 (\* 1.00) kN

4、上侧抗剪计算

=1450. = 400. =0.276

= [1.75/(+1.0)]

=0.862\*[1.75/(0.276+1.0)]\*2545.\*1450.\*1.4329\*1.e-3

= 6250.4 kN

> = 5207.72 (\* 1.00) kN

台阶2 H = 1500.00 mm

b、柱冲切计算：

截面净高=1450.mm

X正方向:= 450. =0.310

X负方向:= 450. =0.310

Y正方向:= 450. =0.310

Y负方向:= 450. =0.310

= 700. = 700. = 1.65 = 1.65 = 1.43 =0.942

=2[( + ) + ( + )]

=14813.30 kN > =10409.77 × 1.00 kN

c、承台抗剪计算

1、左侧抗剪计算

=1450. = 803. =0.310

= [1.75/(+1.0)]

=0.862\*[1.75/(0.310+1.0)]\*2545.\*1450.\*1.4329\*1.e-3

= 6085.9 kN

> = 5209.10 (\* 1.00) kN

2、右侧抗剪计算

=1450. = 450. =0.310

= [1.75/(+1.0)]

=0.862\*[1.75/(0.310+1.0)]\*2545.\*1450.\*1.4329\*1.e-3

= 6085.9 kN

> = 5200.67 (\* 1.00) kN

3、下侧抗剪计算

=1450. = 450. =0.310

= [1.75/(+1.0)]

=0.862\*[1.75/(0.310+1.0)]\*2545.\*1450.\*1.4329\*1.e-3

= 6085.9 kN

> = 5202.05 (\* 1.00) kN

4、上侧抗剪计算

=1450. = 450. =0.310

= [1.75/(+1.0)]

=0.862\*[1.75/(0.310+1.0)]\*2545.\*1450.\*1.4329\*1.e-3

= 6085.9 kN

> = 5207.72 (\* 1.00) kN

承台阶梯高度：

1阶高： 900mm

2阶高： 600mm

3、承台板抗弯计算

X方向配筋计算：

= 3385.92\*1.00= 3385.92 X = -350. H = 1450.

= /(0.9\*\*)/YS = 3385.92/(0.9\*1450.0\*360.0)/3.0= 2402.4 /m

= 3380.44\*1.00= 3380.44 X = 350. H = 1450.

= /(0.9\*\*)/YS = 3380.44/(0.9\*1450.0\*360.0)/3.0= 2398.5 /m

= 3385.92\*1.00= 3385.92 X = -350. H = 1450.

= /(0.9\*\*)/YS = 3385.92/(0.9\*1450.0\*360.0)/3.0= 2402.4 /m

Y方向配筋计算：

= 3381.34\*1.00= 3381.34 Y = -350. H = 1450.

= /(0.9\*\*)/XS = 3381.34/(0.9\*1450.0\*360.0)/3.0= 2399.1 /m

= 3385.02\*1.00= 3385.02 Y = 350. H = 1450.

= /(0.9\*\*)/XS = 3385.02/(0.9\*1450.0\*360.0)/3.0= 2401.7 /m

= 3385.02\*1.00= 3385.02 Y = 350. H = 1450.

= /(0.9\*\*)/XS = 3385.02/(0.9\*1450.0\*360.0)/3.0= 2401.7 /m

计算的钢筋面积：

= 2402./m = 2402./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 | 2094.96 (19) | 1686.75 (4) | 1904.80 (45) | 1878.98 (44) |
| 2 | 2099.40 (18) | 1684.69 (5) | 1928.26 (44) | 1859.27 (45) |
| 3 | 2094.91 (14) | 1678.71 (3) | 1945.85 (42) | 1832.03 (43) |
| 4 | 2097.82 (34) | 1679.20 (13) | 1943.33 (42) | 1838.30 (43) |

桩平均反力最大值2094.94 (非震)(Load 14)

桩平均反力最小值1685.39 (非震)(Load 3)

桩平均反力最大值1922.22 (震)(Load 42)

桩平均反力最小值1860.49 (震)(Load 43)

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3260.77 kN 冲切力2603.13 kN ：850 mm (Load:55)

桩 2: 抗力3260.77 kN 冲切力2598.92 kN ：850 mm (Load:55)

桩 3: 抗力3260.77 kN 冲切力2601.75 kN ：850 mm (Load:55)

桩 4: 抗力3260.77 kN 冲切力2605.97 kN ：850 mm (Load:55)

柱冲切计算：

抗力14813.30 kN 冲切力10409.77 kN ：1450 mm Load：55

抗剪计算：

1左边： 抗力6085.87kN 剪力5209.10kN ：1450mm (Load:55)

2右边： 抗力6085.87kN 剪力5200.67kN ：1450mm (Load:55)

3上边： 抗力6085.87kN 剪力5202.05kN ：1450mm (Load:55)

4下边： 抗力6085.87kN 剪力5207.72kN ：1450mm (Load:55)

承台高度：

一阶高900 二阶高600

底板配筋计算：

X方向：弯矩3385.92 kN.m 计算钢筋面积2402 /m Load： 55

Y方向：弯矩3385.02 kN.m 计算钢筋面积2402 /m Load： 55

根据最小配筋率计算承台最小配筋：

= 1920. /m

= 1920. /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 18@100

Agy: HRB400 18@100