桩承台计算\_序号9

# 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

| 【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=6212.5kN =1.2kN.m =16.9kN.m =13.1kN =-9.7kN

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 | 1549.22 | 1603.22 | 满足 |
| 2 | -1000.0 | 1000.0 | 1548.61 | 1602.61 | 满足 |
| 3 | 1000.0 | -1000.0 | 1557.66 | 1611.66 | 满足 |
| 4 | 1000.0 | 1000.0 | 1557.05 | 1611.05 | 满足 |

桩总反力= 6428.5 kN; 桩均反力= 1607.1 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=6223.7kN =-25.5kN.m =-2.2kN.m =-0.4kN =9.4kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1000.0 | -1000.0 | 1550.12 | 1604.12 | 满足 |
| 2 | -1000.0 | 1000.0 | 1562.85 | 1616.85 | 满足 |
| 3 | 1000.0 | -1000.0 | 1549.01 | 1603.01 | 满足 |
| 4 | 1000.0 | 1000.0 | 1561.75 | 1615.75 | 满足 |

桩总反力= 6439.7 kN; 桩均反力= 1609.9 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=6238.1kN =29.6kN.m =-1.0kN.m =3.6kN =-29.1kN

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 | 1567.16 | 1621.16 | 满足 |
| 2 | -1000.0 | 1000.0 | 1552.37 | 1606.37 | 满足 |
| 3 | 1000.0 | -1000.0 | 1566.68 | 1620.68 | 满足 |
| 4 | 1000.0 | 1000.0 | 1551.89 | 1605.89 | 满足 |

桩总反力= 6454.1 kN; 桩均反力= 1613.5 kN

当前荷载组合

| 【12】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=6214.8kN =-15.0kN.m =9.7kN.m =7.6kN =1.8kN

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 | 1547.53 | 1601.53 | 满足 |
| 2 | -1000.0 | 1000.0 | 1555.01 | 1609.01 | 满足 |
| 3 | 1000.0 | -1000.0 | 1552.39 | 1606.39 | 满足 |
| 4 | 1000.0 | 1000.0 | 1559.86 | 1613.86 | 满足 |

桩总反力= 6430.8 kN; 桩均反力= 1607.7 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=7934.5kN =2.7kN.m =-13.2kN.m =-5.8kN =-12.1kN

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 | 1987.60 | 2041.60 | 满足 |
| 2 | -1000.0 | 1000.0 | 1986.28 | 2040.28 | 满足 |
| 3 | 1000.0 | -1000.0 | 1980.98 | 2034.98 | 满足 |
| 4 | 1000.0 | 1000.0 | 1979.65 | 2033.65 | 满足 |

桩总反力= 8150.5 kN; 桩均反力= 2037.6 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=7919.2kN =-14.4kN.m =-2.5kN.m =-0.1kN =-0.5kN

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 | 1976.84 | 2030.84 | 满足 |
| 2 | -1000.0 | 1000.0 | 1984.02 | 2038.02 | 满足 |
| 3 | 1000.0 | -1000.0 | 1975.56 | 2029.56 | 满足 |
| 4 | 1000.0 | 1000.0 | 1982.75 | 2036.75 | 满足 |

桩总反力= 8135.2 kN; 桩均反力= 2033.8 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=7927.8kN =18.7kN.m =-1.8kN.m =2.3kN =-23.6kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1000.0 | -1000.0 | 1987.06 | 2041.06 | 满足 |
| 2 | -1000.0 | 1000.0 | 1977.73 | 2031.73 | 满足 |
| 3 | 1000.0 | -1000.0 | 1986.17 | 2040.17 | 满足 |
| 4 | 1000.0 | 1000.0 | 1976.83 | 2030.83 | 满足 |

桩总反力= 8143.8 kN; 桩均反力= 2035.9 kN

当前荷载组合

| 【35】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=7933.2kN =12.4kN.m =-8.9kN.m =-2.5kN =-19.0kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1000.0 | -1000.0 | 1988.62 | 2042.62 | 满足 |
| 2 | -1000.0 | 1000.0 | 1982.44 | 2036.44 | 满足 |
| 3 | 1000.0 | -1000.0 | 1984.14 | 2038.14 | 满足 |
| 4 | 1000.0 | 1000.0 | 1977.96 | 2031.96 | 满足 |

桩总反力= 8149.2 kN; 桩均反力= 2037.3 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=6978.7kN =-7.3kN.m =96.3kN.m =65.2kN =-18.1kN

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 | 1718.80 | 1772.80 | 满足 |
| 2 | -1000.0 | 1000.0 | 1722.43 | 1776.43 | 满足 |
| 3 | 1000.0 | -1000.0 | 1766.94 | 1820.94 | 满足 |
| 4 | 1000.0 | 1000.0 | 1770.57 | 1824.57 | 满足 |

桩总反力= 7194.7 kN; 桩均反力= 1798.7 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=7175.7kN =11.5kN.m =-100.0kN.m =-62.5kN =-3.8kN

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 | 1821.79 | 1875.79 | 满足 |
| 2 | -1000.0 | 1000.0 | 1816.06 | 1870.06 | 满足 |
| 3 | 1000.0 | -1000.0 | 1771.77 | 1825.77 | 满足 |
| 4 | 1000.0 | 1000.0 | 1766.04 | 1820.04 | 满足 |

桩总反力= 7391.7 kN; 桩均反力= 1847.9 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=7039.9kN =-91.6kN.m =-7.3kN.m =-5.2kN =57.2kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1000.0 | -1000.0 | 1738.93 | 1792.93 | 满足 |
| 2 | -1000.0 | 1000.0 | 1784.71 | 1838.71 | 满足 |
| 3 | 1000.0 | -1000.0 | 1735.27 | 1789.27 | 满足 |
| 4 | 1000.0 | 1000.0 | 1781.04 | 1835.04 | 满足 |

桩总反力= 7255.9 kN; 桩均反力= 1814.0 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=7114.5kN =95.8kN.m =3.6kN.m =7.9kN =-79.1kN

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 | 1801.66 | 1855.66 | 满足 |
| 2 | -1000.0 | 1000.0 | 1753.78 | 1807.78 | 满足 |
| 3 | 1000.0 | -1000.0 | 1803.45 | 1857.45 | 满足 |
| 4 | 1000.0 | 1000.0 | 1755.57 | 1809.57 | 满足 |

桩总反力= 7330.5 kN; 桩均反力= 1832.6 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=10070.5kN =2.9kN.m =-2.7kN.m =1.7kN =-15.4kN

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 | 2519.01 | 2591.91 |
| 2 | -1000.0 | 1000.0 | 2517.57 | 2590.47 |
| 3 | 1000.0 | -1000.0 | 2517.65 | 2590.55 |
| 4 | 1000.0 | 1000.0 | 2516.22 | 2589.12 |

桩总反力= 10362.1 kN; 桩均反力= 2590.5 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 > = 2519.01(×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 > = 2517.65(×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 > = 2516.22(×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 > = 2517.57(×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 > =10070.45 × 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

> = 5036.58 (\* 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

> = 5033.87 (\* 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

> = 5036.66 (\* 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

> = 5033.79 (\* 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 > =10070.45 × 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

> = 5036.58 (\* 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

> = 5033.87 (\* 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

> = 5036.66 (\* 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

> = 5033.79 (\* 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：

= 3273.78\*1.00= 3273.78 X = -350. H = 1450.

= /(0.9\*\*)/YS = 3273.78/(0.9\*1450.0\*360.0)/3.0= 2322.8 /m

= 3272.02\*1.00= 3272.02 X = 350. H = 1450.

= /(0.9\*\*)/YS = 3272.02/(0.9\*1450.0\*360.0)/3.0= 2321.6 /m

= 3273.78\*1.00= 3273.78 X = -350. H = 1450.

= /(0.9\*\*)/YS = 3273.78/(0.9\*1450.0\*360.0)/3.0= 2322.8 /m

Y方向配筋计算：

= 3273.83\*1.00= 3273.83 Y = -350. H = 1450.

= /(0.9\*\*)/XS = 3273.83/(0.9\*1450.0\*360.0)/3.0= 2322.9 /m

= 3271.96\*1.00= 3271.96 Y = 350. H = 1450.

= /(0.9\*\*)/XS = 3271.96/(0.9\*1450.0\*360.0)/3.0= 2321.5 /m

= 3273.83\*1.00= 3273.83 Y = -350. H = 1450.

= /(0.9\*\*)/XS = 3273.83/(0.9\*1450.0\*360.0)/3.0= 2322.9 /m

计算的钢筋面积：

= 2323./m = 2323./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 | 2042.62 (35) | 1601.53 (12) | 1875.79 (43) | 1772.80 (42) |
| 2 | 2040.28 (15) | 1602.61 (2) | 1870.06 (43) | 1776.43 (42) |
| 3 | 2040.17 (19) | 1603.01 (4) | 1857.45 (45) | 1789.27 (44) |
| 4 | 2036.75 (18) | 1605.89 (5) | 1835.04 (44) | 1809.57 (45) |

桩平均反力最大值2037.63 (非震)(Load 15)

桩平均反力最小值1607.13 (非震)(Load 2)

桩平均反力最大值1847.92 (震)(Load 43)

桩平均反力最小值1798.69 (震)(Load 42)

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2519.01 kN ：850 mm (Load:55)

桩 2: 抗力3260.77 kN 冲切力2517.65 kN ：850 mm (Load:55)

桩 3: 抗力3260.77 kN 冲切力2516.22 kN ：850 mm (Load:55)

桩 4: 抗力3260.77 kN 冲切力2517.57 kN ：850 mm (Load:55)

柱冲切计算：

抗力14813.30 kN 冲切力10070.45 kN ：1450 mm Load：55

抗剪计算：

1左边： 抗力6085.87kN 剪力5036.58kN ：1450mm (Load:55)

2右边： 抗力6085.87kN 剪力5033.87kN ：1450mm (Load:55)

3上边： 抗力6085.87kN 剪力5036.66kN ：1450mm (Load:55)

4下边： 抗力6085.87kN 剪力5033.79kN ：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3273.78 kN.m 计算钢筋面积2323 /m Load： 55

Y方向：弯矩3273.83 kN.m 计算钢筋面积2323 /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