桩承台计算\_序号14

# 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

| 【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=5672.1kN =21.5kN.m =-33.0kN.m =-91.5kN =-5.2kN

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 | 1431.64 | 1485.64 | 满足 |
| 2 | -1000.0 | 1000.0 | 1420.88 | 1474.88 | 满足 |
| 3 | 1000.0 | -1000.0 | 1415.16 | 1469.16 | 满足 |
| 4 | 1000.0 | 1000.0 | 1404.40 | 1458.40 | 满足 |

桩总反力= 5888.1 kN; 桩均反力= 1472.0 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=5694.2kN =10.7kN.m =-44.4kN.m =-99.5kN =2.6kN

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 | 1437.31 | 1491.31 | 满足 |
| 2 | -1000.0 | 1000.0 | 1431.95 | 1485.95 | 满足 |
| 3 | 1000.0 | -1000.0 | 1415.13 | 1469.13 | 满足 |
| 4 | 1000.0 | 1000.0 | 1409.78 | 1463.78 | 满足 |

桩总反力= 5910.2 kN; 桩均反力= 1477.5 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=7469.8kN =-24.4kN.m =-36.6kN.m =-101.4kN =29.4kN

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 | 1870.49 | 1924.49 | 满足 |
| 2 | -1000.0 | 1000.0 | 1882.71 | 1936.71 | 满足 |
| 3 | 1000.0 | -1000.0 | 1852.20 | 1906.20 | 满足 |
| 4 | 1000.0 | 1000.0 | 1864.42 | 1918.42 | 满足 |

桩总反力= 7685.8 kN; 桩均反力= 1921.5 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=7456.6kN =-17.9kN.m =-29.8kN.m =-96.6kN =24.7kN

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 | 1867.09 | 1921.09 | 满足 |
| 2 | -1000.0 | 1000.0 | 1876.07 | 1930.07 | 满足 |
| 3 | 1000.0 | -1000.0 | 1852.22 | 1906.22 | 满足 |
| 4 | 1000.0 | 1000.0 | 1861.19 | 1915.19 | 满足 |

桩总反力= 7672.6 kN; 桩均反力= 1918.1 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=7110.7kN =-102.4kN.m =-30.0kN.m =-92.9kN =88.6kN

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 | 1759.58 | 1813.58 | 满足 |
| 2 | -1000.0 | 1000.0 | 1810.78 | 1864.78 | 满足 |
| 3 | 1000.0 | -1000.0 | 1744.59 | 1798.59 | 满足 |
| 4 | 1000.0 | 1000.0 | 1795.79 | 1849.79 | 满足 |

桩总反力= 7326.7 kN; 桩均反力= 1831.7 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=6096.7kN =88.3kN.m =-39.5kN.m =-100.0kN =-56.2kN

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 | 1556.13 | 1610.13 | 满足 |
| 2 | -1000.0 | 1000.0 | 1511.99 | 1565.99 | 满足 |
| 3 | 1000.0 | -1000.0 | 1536.37 | 1590.37 | 满足 |
| 4 | 1000.0 | 1000.0 | 1492.22 | 1546.22 | 满足 |

桩总反力= 6312.7 kN; 桩均反力= 1578.2 kN

当前荷载组合

| 【52】SATWE标准组合:1.00\*恒+0.50\*活+0.20\*风y右+1.00\*地y |
| --- |

承台底面荷载 :（考虑柱底剪力的影响）

N=7106.3kN =-100.2kN.m =-27.7kN.m =-91.3kN =87.1kN

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 | 1758.45 | 1812.45 | 满足 |
| 2 | -1000.0 | 1000.0 | 1808.56 | 1862.56 | 满足 |
| 3 | 1000.0 | -1000.0 | 1744.60 | 1798.60 | 满足 |
| 4 | 1000.0 | 1000.0 | 1794.72 | 1848.72 | 满足 |

桩总反力= 7322.3 kN; 桩均反力= 1830.6 kN

当前荷载组合

| 【53】SATWE标准组合:1.00\*恒+0.50\*活-0.20\*风y右-1.00\*地y |
| --- |

承台底面荷载 :（考虑柱底剪力的影响）

N=6101.1kN =86.1kN.m =-41.8kN.m =-101.6kN =-54.7kN

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 | 1557.27 | 1611.27 | 满足 |
| 2 | -1000.0 | 1000.0 | 1514.20 | 1568.20 | 满足 |
| 3 | 1000.0 | -1000.0 | 1536.36 | 1590.36 | 满足 |
| 4 | 1000.0 | 1000.0 | 1493.30 | 1547.30 | 满足 |

桩总反力= 6317.1 kN; 桩均反力= 1579.3 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=9383.4kN =-9.9kN.m =-48.1kN.m =-133.3kN =22.3kN

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 | 2355.39 | 2428.29 |
| 2 | -1000.0 | 1000.0 | 2360.33 | 2433.23 |
| 3 | 1000.0 | -1000.0 | 2331.35 | 2404.25 |
| 4 | 1000.0 | 1000.0 | 2336.29 | 2409.19 |

桩总反力= 9675.0 kN; 桩均反力= 2418.7 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 > = 2355.39(×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 > = 2331.35(×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 > = 2336.29(×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 > = 2360.33(×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 > = 9383.36 × 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

> = 4715.72 (\* 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

> = 4667.64 (\* 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

> = 4686.74 (\* 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

> = 4696.62 (\* 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 > = 9383.36 × 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

> = 4715.72 (\* 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

> = 4667.64 (\* 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

> = 4686.74 (\* 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

> = 4696.62 (\* 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：

= 3065.22\*1.00= 3065.22 X = -350. H = 1450.

= /(0.9\*\*)/YS = 3065.22/(0.9\*1450.0\*360.0)/3.0= 2174.8 /m

= 3033.97\*1.00= 3033.97 X = 350. H = 1450.

= /(0.9\*\*)/YS = 3033.97/(0.9\*1450.0\*360.0)/3.0= 2152.7 /m

= 3065.22\*1.00= 3065.22 X = -350. H = 1450.

= /(0.9\*\*)/YS = 3065.22/(0.9\*1450.0\*360.0)/3.0= 2174.8 /m

Y方向配筋计算：

= 3046.38\*1.00= 3046.38 Y = -350. H = 1450.

= /(0.9\*\*)/XS = 3046.38/(0.9\*1450.0\*360.0)/3.0= 2161.5 /m

= 3052.80\*1.00= 3052.80 Y = 350. H = 1450.

= /(0.9\*\*)/XS = 3052.80/(0.9\*1450.0\*360.0)/3.0= 2166.0 /m

= 3052.80\*1.00= 3052.80 Y = 350. H = 1450.

= /(0.9\*\*)/XS = 3052.80/(0.9\*1450.0\*360.0)/3.0= 2166.0 /m

计算的钢筋面积：

= 2175./m = 2166./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 | 1924.49 (18) | 1485.64 (5) | 1813.58 (44) | 1610.13 (45) |
| 2 | 1936.71 (18) | 1474.88 (5) | 1864.78 (44) | 1565.99 (45) |
| 3 | 1906.22 (34) | 1469.13 (13) | 1798.60 (52) | 1590.36 (53) |
| 4 | 1918.42 (18) | 1458.40 (5) | 1849.79 (44) | 1546.22 (45) |

桩平均反力最大值1921.46 (非震)(Load 18)

桩平均反力最小值1472.02 (非震)(Load 5)

桩平均反力最大值1831.69 (震)(Load 44)

桩平均反力最小值1578.18 (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3260.77 kN 冲切力2355.39 kN ：850 mm (Load:55)

桩 2: 抗力3260.77 kN 冲切力2331.35 kN ：850 mm (Load:55)

桩 3: 抗力3260.77 kN 冲切力2336.29 kN ：850 mm (Load:55)

桩 4: 抗力3260.77 kN 冲切力2360.33 kN ：850 mm (Load:55)

柱冲切计算：

抗力14813.30 kN 冲切力9383.36 kN ：1450 mm Load：55

抗剪计算：

1左边： 抗力6085.87kN 剪力4715.72kN ：1450mm (Load:55)

2右边： 抗力6085.87kN 剪力4667.64kN ：1450mm (Load:55)

3上边： 抗力6085.87kN 剪力4686.74kN ：1450mm (Load:55)

4下边： 抗力6085.87kN 剪力4696.62kN ：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3065.22 kN.m 计算钢筋面积2175 /m Load： 55

Y方向：弯矩3052.80 kN.m 计算钢筋面积2166 /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