桩承台计算\_序号13

# 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=6100.1kN =22.1kN.m =23.8kN.m =77.0kN =-6.9kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1000.0 | -1000.0 | 1524.60 | 1578.60 | 满足 |
| 2 | -1000.0 | 1000.0 | 1513.58 | 1567.58 | 满足 |
| 3 | 1000.0 | -1000.0 | 1536.49 | 1590.49 | 满足 |
| 4 | 1000.0 | 1000.0 | 1525.47 | 1579.47 | 满足 |

桩总反力= 6316.1 kN; 桩均反力= 1579.0 kN

当前荷载组合

| 【11】SATWE标准组合:1.00\*恒-1.00\*风y左 |
| --- |

承台底面荷载 :（考虑柱底剪力的影响）

N=6118.1kN =11.2kN.m =35.2kN.m =85.0kN =0.9kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1000.0 | -1000.0 | 1523.52 | 1577.52 | 满足 |
| 2 | -1000.0 | 1000.0 | 1517.93 | 1571.93 | 满足 |
| 3 | 1000.0 | -1000.0 | 1541.14 | 1595.14 | 满足 |
| 4 | 1000.0 | 1000.0 | 1535.54 | 1589.54 | 满足 |

桩总反力= 6334.1 kN; 桩均反力= 1583.5 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=7814.4kN =-23.3kN.m =27.0kN.m =87.3kN =25.9kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1000.0 | -1000.0 | 1941.02 | 1995.02 | 满足 |
| 2 | -1000.0 | 1000.0 | 1952.69 | 2006.69 | 满足 |
| 3 | 1000.0 | -1000.0 | 1954.50 | 2008.50 | 满足 |
| 4 | 1000.0 | 1000.0 | 1966.16 | 2020.16 | 满足 |

桩总反力= 8030.4 kN; 桩均反力= 2007.6 kN

当前荷载组合

| 【30】SATWE标准组合:1.00\*恒+1.00\*活+0.60\*风y左 |
| --- |

承台底面荷载 :（考虑柱底剪力的影响）

N=7803.6kN =-16.8kN.m =20.1kN.m =82.5kN =21.3kN

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 | 1941.67 | 1995.67 | 满足 |
| 2 | -1000.0 | 1000.0 | 1950.08 | 2004.08 | 满足 |
| 3 | 1000.0 | -1000.0 | 1951.71 | 2005.71 | 满足 |
| 4 | 1000.0 | 1000.0 | 1960.12 | 2014.12 | 满足 |

桩总反力= 8019.6 kN; 桩均反力= 2004.9 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=7433.2kN =-101.1kN.m =20.6kN.m =78.6kN =83.5kN

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 | 1827.86 | 1881.86 | 满足 |
| 2 | -1000.0 | 1000.0 | 1878.43 | 1932.43 | 满足 |
| 3 | 1000.0 | -1000.0 | 1838.19 | 1892.19 | 满足 |
| 4 | 1000.0 | 1000.0 | 1888.76 | 1942.76 | 满足 |

桩总反力= 7649.2 kN; 桩均反力= 1912.3 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=6537.5kN =88.8kN.m =30.1kN.m =85.6kN =-56.6kN

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 | 1649.04 | 1703.04 | 满足 |
| 2 | -1000.0 | 1000.0 | 1604.65 | 1658.65 | 满足 |
| 3 | 1000.0 | -1000.0 | 1664.09 | 1718.09 | 满足 |
| 4 | 1000.0 | 1000.0 | 1619.70 | 1673.70 | 满足 |

桩总反力= 6753.5 kN; 桩均反力= 1688.4 kN

当前荷载组合

| 【48】SATWE标准组合:1.00\*恒+0.50\*活+0.20\*风x右+1.00\*地x |
| --- |

承台底面荷载 :（考虑柱底剪力的影响）

N=6699.9kN =1.3kN.m =121.0kN.m =150.8kN =7.9kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1000.0 | -1000.0 | 1645.04 | 1699.04 | 满足 |
| 2 | -1000.0 | 1000.0 | 1644.40 | 1698.40 | 满足 |
| 3 | 1000.0 | -1000.0 | 1705.55 | 1759.55 | 满足 |
| 4 | 1000.0 | 1000.0 | 1704.92 | 1758.92 | 满足 |

桩总反力= 6915.9 kN; 桩均反力= 1729.0 kN

当前荷载组合

| 【49】SATWE标准组合:1.00\*恒+0.50\*活-0.20\*风x右-1.00\*地x |
| --- |

承台底面荷载 :（考虑柱底剪力的影响）

N=7270.8kN =-13.6kN.m =-70.3kN.m =13.4kN =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 | 1831.87 | 1885.87 | 满足 |
| 2 | -1000.0 | 1000.0 | 1838.68 | 1892.68 | 满足 |
| 3 | 1000.0 | -1000.0 | 1796.73 | 1850.73 | 满足 |
| 4 | 1000.0 | 1000.0 | 1803.54 | 1857.54 | 满足 |

桩总反力= 7486.8 kN; 桩均反力= 1871.7 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=9884.5kN =-8.7kN.m =35.2kN.m =114.1kN =18.5kN

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 | 2460.16 | 2533.06 |
| 2 | -1000.0 | 1000.0 | 2464.49 | 2537.39 |
| 3 | 1000.0 | -1000.0 | 2477.76 | 2550.66 |
| 4 | 1000.0 | 1000.0 | 2482.09 | 2554.99 |

桩总反力= 10176.1 kN; 桩均反力= 2544.0 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 > = 2460.16(×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 > = 2477.76(×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 > = 2482.09(×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 > = 2464.49(×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 > = 9884.50 × 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

> = 4924.65 (\* 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

> = 4959.85 (\* 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

> = 4937.92 (\* 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

> = 4946.58 (\* 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 > = 9884.50 × 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

> = 4924.65 (\* 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

> = 4959.85 (\* 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

> = 4937.92 (\* 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

> = 4946.58 (\* 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：

= 3201.02\*1.00= 3201.02 X = -350. H = 1450.

= /(0.9\*\*)/YS = 3201.02/(0.9\*1450.0\*360.0)/3.0= 2271.2 /m

= 3223.90\*1.00= 3223.90 X = 350. H = 1450.

= /(0.9\*\*)/YS = 3223.90/(0.9\*1450.0\*360.0)/3.0= 2287.4 /m

= 3223.90\*1.00= 3223.90 X = 350. H = 1450.

= /(0.9\*\*)/YS = 3223.90/(0.9\*1450.0\*360.0)/3.0= 2287.4 /m

Y方向配筋计算：

= 3209.65\*1.00= 3209.65 Y = -350. H = 1450.

= /(0.9\*\*)/XS = 3209.65/(0.9\*1450.0\*360.0)/3.0= 2277.3 /m

= 3215.28\*1.00= 3215.28 Y = 350. H = 1450.

= /(0.9\*\*)/XS = 3215.28/(0.9\*1450.0\*360.0)/3.0= 2281.3 /m

= 3215.28\*1.00= 3215.28 Y = 350. H = 1450.

= /(0.9\*\*)/XS = 3215.28/(0.9\*1450.0\*360.0)/3.0= 2281.3 /m

计算的钢筋面积：

= 2287./m = 2281./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 | 1995.67 (30) | 1577.52 (11) | 1885.87 (49) | 1699.04 (48) |
| 2 | 2006.69 (18) | 1567.58 (5) | 1932.43 (44) | 1658.65 (45) |
| 3 | 2008.50 (18) | 1590.49 (5) | 1892.19 (44) | 1718.09 (45) |
| 4 | 2020.16 (18) | 1579.47 (5) | 1942.76 (44) | 1673.70 (45) |

桩平均反力最大值2007.59 (非震)(Load 18)

桩平均反力最小值1579.04 (非震)(Load 5)

桩平均反力最大值1912.31 (震)(Load 44)

桩平均反力最小值1688.37 (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2460.16 kN ：850 mm (Load:55)

桩 2: 抗力3260.77 kN 冲切力2477.76 kN ：850 mm (Load:55)

桩 3: 抗力3260.77 kN 冲切力2482.09 kN ：850 mm (Load:55)

桩 4: 抗力3260.77 kN 冲切力2464.49 kN ：850 mm (Load:55)

柱冲切计算：

抗力14813.30 kN 冲切力9884.50 kN ：1450 mm Load：55

抗剪计算：

1左边： 抗力6085.87kN 剪力4924.65kN ：1450mm (Load:55)

2右边： 抗力6085.87kN 剪力4959.85kN ：1450mm (Load:55)

3上边： 抗力6085.87kN 剪力4937.92kN ：1450mm (Load:55)

4下边： 抗力6085.87kN 剪力4946.58kN ：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3223.90 kN.m 计算钢筋面积2287 /m Load： 55

Y方向：弯矩3215.28 kN.m 计算钢筋面积2281 /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