桩承台计算\_序号17

# 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

| 【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=5946.3kN =-22.9kN.m =-36.5kN.m =-102.3kN =1.5kN

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 | 1489.98 | 1543.98 | 满足 |
| 2 | -1000.0 | 1000.0 | 1501.41 | 1555.41 | 满足 |
| 3 | 1000.0 | -1000.0 | 1471.74 | 1525.74 | 满足 |
| 4 | 1000.0 | 1000.0 | 1483.17 | 1537.17 | 满足 |

桩总反力= 6162.3 kN; 桩均反力= 1540.6 kN

当前荷载组合

| 【10】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=5952.9kN =-11.6kN.m =-48.4kN.m =-110.2kN =-6.1kN

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 | 1497.41 | 1551.41 | 满足 |
| 2 | -1000.0 | 1000.0 | 1503.23 | 1557.23 | 满足 |
| 3 | 1000.0 | -1000.0 | 1473.21 | 1527.21 | 满足 |
| 4 | 1000.0 | 1000.0 | 1479.03 | 1533.03 | 满足 |

桩总反力= 6168.9 kN; 桩均反力= 1542.2 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=7560.5kN =20.6kN.m =-40.8kN.m =-113.6kN =-29.3kN

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 | 1905.48 | 1959.48 | 满足 |
| 2 | -1000.0 | 1000.0 | 1895.19 | 1949.19 | 满足 |
| 3 | 1000.0 | -1000.0 | 1885.07 | 1939.07 | 满足 |
| 4 | 1000.0 | 1000.0 | 1874.78 | 1928.78 | 满足 |

桩总反力= 7776.5 kN; 桩均反力= 1944.1 kN

当前荷载组合

| 【31】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=7556.6kN =13.8kN.m =-33.7kN.m =-108.8kN =-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 | 1901.02 | 1955.02 | 满足 |
| 2 | -1000.0 | 1000.0 | 1894.10 | 1948.10 | 满足 |
| 3 | 1000.0 | -1000.0 | 1884.19 | 1938.19 | 满足 |
| 4 | 1000.0 | 1000.0 | 1877.27 | 1931.27 | 满足 |

桩总反力= 7772.6 kN; 桩均反力= 1943.1 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=6350.5kN =-88.8kN.m =-43.6kN.m =-111.5kN =48.3kN

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 | 1576.33 | 1630.33 | 满足 |
| 2 | -1000.0 | 1000.0 | 1620.74 | 1674.74 | 满足 |
| 3 | 1000.0 | -1000.0 | 1554.51 | 1608.51 | 满足 |
| 4 | 1000.0 | 1000.0 | 1598.92 | 1652.92 | 满足 |

桩总反力= 6566.5 kN; 桩均反力= 1641.6 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=7212.4kN =97.5kN.m =-33.7kN.m =-104.3kN =-83.6kN

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 | 1835.90 | 1889.90 | 满足 |
| 2 | -1000.0 | 1000.0 | 1787.14 | 1841.14 | 满足 |
| 3 | 1000.0 | -1000.0 | 1819.06 | 1873.06 | 满足 |
| 4 | 1000.0 | 1000.0 | 1770.30 | 1824.30 | 满足 |

桩总反力= 7428.4 kN; 桩均反力= 1857.1 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=7125.0kN =0.1kN.m =59.7kN.m =-40.0kN =-23.5kN

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 | 1766.36 | 1820.36 | 满足 |
| 2 | -1000.0 | 1000.0 | 1766.30 | 1820.30 | 满足 |
| 3 | 1000.0 | -1000.0 | 1796.22 | 1850.22 | 满足 |
| 4 | 1000.0 | 1000.0 | 1796.16 | 1850.16 | 满足 |

桩总反力= 7341.0 kN; 桩均反力= 1835.3 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=6437.9kN =8.6kN.m =-137.0kN.m =-175.8kN =-11.8kN

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 | 1645.87 | 1699.87 | 满足 |
| 2 | -1000.0 | 1000.0 | 1641.58 | 1695.58 | 满足 |
| 3 | 1000.0 | -1000.0 | 1577.35 | 1631.35 | 满足 |
| 4 | 1000.0 | 1000.0 | 1573.07 | 1627.07 | 满足 |

桩总反力= 6653.9 kN; 桩均反力= 1663.5 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=9578.9kN =5.7kN.m =-53.5kN.m =-149.2kN =-24.0kN

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 | 2409.52 | 2482.42 |
| 2 | -1000.0 | 1000.0 | 2406.66 | 2479.56 |
| 3 | 1000.0 | -1000.0 | 2382.77 | 2455.67 |
| 4 | 1000.0 | 1000.0 | 2379.91 | 2452.81 |

桩总反力= 9870.5 kN; 桩均反力= 2467.6 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 > = 2409.52(×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 > = 2382.77(×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 > = 2379.91(×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 > = 2406.66(×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 > = 9578.88 × 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

> = 4816.19 (\* 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

> = 4762.69 (\* 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

> = 4792.30 (\* 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

> = 4786.58 (\* 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 > = 9578.88 × 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

> = 4816.19 (\* 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

> = 4762.69 (\* 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

> = 4792.30 (\* 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

> = 4786.58 (\* 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：

= 3130.52\*1.00= 3130.52 X = -350. H = 1450.

= /(0.9\*\*)/YS = 3130.52/(0.9\*1450.0\*360.0)/3.0= 2221.2 /m

= 3095.75\*1.00= 3095.75 X = 350. H = 1450.

= /(0.9\*\*)/YS = 3095.75/(0.9\*1450.0\*360.0)/3.0= 2196.5 /m

= 3130.52\*1.00= 3130.52 X = -350. H = 1450.

= /(0.9\*\*)/YS = 3130.52/(0.9\*1450.0\*360.0)/3.0= 2221.2 /m

Y方向配筋计算：

= 3114.99\*1.00= 3114.99 Y = -350. H = 1450.

= /(0.9\*\*)/XS = 3114.99/(0.9\*1450.0\*360.0)/3.0= 2210.2 /m

= 3111.28\*1.00= 3111.28 Y = 350. H = 1450.

= /(0.9\*\*)/XS = 3111.28/(0.9\*1450.0\*360.0)/3.0= 2207.5 /m

= 3114.99\*1.00= 3114.99 Y = -350. H = 1450.

= /(0.9\*\*)/XS = 3114.99/(0.9\*1450.0\*360.0)/3.0= 2210.2 /m

计算的钢筋面积：

= 2221./m = 2210./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 | 1959.48 (19) | 1543.98 (4) | 1889.90 (45) | 1630.33 (44) |
| 2 | 1949.19 (19) | 1555.41 (4) | 1841.14 (45) | 1674.74 (44) |
| 3 | 1939.07 (19) | 1525.74 (4) | 1873.06 (45) | 1608.51 (44) |
| 4 | 1931.27 (31) | 1533.03 (10) | 1850.16 (48) | 1627.07 (49) |

桩平均反力最大值1944.13 (非震)(Load 19)

桩平均反力最小值1540.57 (非震)(Load 4)

桩平均反力最大值1857.10 (震)(Load 45)

桩平均反力最小值1641.62 (震)(Load 44)

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2409.52 kN ：850 mm (Load:55)

桩 2: 抗力3260.77 kN 冲切力2382.77 kN ：850 mm (Load:55)

桩 3: 抗力3260.77 kN 冲切力2379.91 kN ：850 mm (Load:55)

桩 4: 抗力3260.77 kN 冲切力2406.66 kN ：850 mm (Load:55)

柱冲切计算：

抗力14813.30 kN 冲切力9578.88 kN ：1450 mm Load：55

抗剪计算：

1左边： 抗力6085.87kN 剪力4816.19kN ：1450mm (Load:55)

2右边： 抗力6085.87kN 剪力4762.69kN ：1450mm (Load:55)

3上边： 抗力6085.87kN 剪力4792.30kN ：1450mm (Load:55)

4下边： 抗力6085.87kN 剪力4786.58kN ：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3130.52 kN.m 计算钢筋面积2221 /m Load： 55

Y方向：弯矩3114.99 kN.m 计算钢筋面积2210 /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