桩承台计算\_序号91

# 一、设计资料

1、承台信息

承台底标高：-4.50m

承台上段高：550mm

承台下段高：700mm

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 | -1100 | -1100 |
| 2 | -1100 | 1100 |
| 3 | 0 | 0 |
| 4 | 1100 | -1100 |
| 5 | 1100 | 1100 |

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 | 800 | 800 | 0 | 0 | 0 |
| 外接柱 | 800 | 800 | 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

= 13.7× 24.0

= 328.6 kN

∑ = 4840000.0 ∑ = 4840000.0

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=8156.6kN =-67.9kN.m =29.4kN.m =3.7kN =46.7kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1100.0 | -1100.0 | 1609.23 | 1674.94 | 满足 |
| 2 | -1100.0 | 1100.0 | 1640.07 | 1705.78 | 满足 |
| 3 | 0.0 | 0.0 | 1631.33 | 1697.04 | 满足 |
| 4 | 1100.0 | -1100.0 | 1622.59 | 1688.30 | 满足 |
| 5 | 1100.0 | 1100.0 | 1653.43 | 1719.15 | 满足 |

桩总反力= 8485.2 kN; 桩均反力= 1697.0 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=8073.2kN =-128.3kN.m =-9.0kN.m =-6.5kN =62.5kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1100.0 | -1100.0 | 1587.53 | 1653.24 | 满足 |
| 2 | -1100.0 | 1100.0 | 1645.87 | 1711.58 | 满足 |
| 3 | 0.0 | 0.0 | 1614.65 | 1680.36 | 满足 |
| 4 | 1100.0 | -1100.0 | 1583.42 | 1649.14 | 满足 |
| 5 | 1100.0 | 1100.0 | 1641.76 | 1707.47 | 满足 |

桩总反力= 8401.8 kN; 桩均反力= 1680.4 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=10591.5kN =-87.5kN.m =-32.7kN.m =-12.6kN =60.2kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1100.0 | -1100.0 | 2105.82 | 2171.54 | 满足 |
| 2 | -1100.0 | 1100.0 | 2145.60 | 2211.31 | 满足 |
| 3 | 0.0 | 0.0 | 2118.29 | 2184.00 | 满足 |
| 4 | 1100.0 | -1100.0 | 2090.98 | 2156.69 | 满足 |
| 5 | 1100.0 | 1100.0 | 2130.76 | 2196.47 | 满足 |

桩总反力= 10920.0 kN; 桩均反力= 2184.0 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=10641.5kN =-51.2kN.m =-9.6kN.m =-6.4kN =50.7kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1100.0 | -1100.0 | 2118.84 | 2184.55 | 满足 |
| 2 | -1100.0 | 1100.0 | 2142.12 | 2207.83 | 满足 |
| 3 | 0.0 | 0.0 | 2128.30 | 2194.01 | 满足 |
| 4 | 1100.0 | -1100.0 | 2114.48 | 2180.19 | 满足 |
| 5 | 1100.0 | 1100.0 | 2137.76 | 2203.48 | 满足 |

桩总反力= 10970.1 kN; 桩均反力= 2194.0 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=9269.0kN =-93.5kN.m =185.4kN.m =43.9kN =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 | -1100.0 | -1100.0 | 1790.41 | 1856.12 | 满足 |
| 2 | -1100.0 | 1100.0 | 1832.92 | 1898.63 | 满足 |
| 3 | 0.0 | 0.0 | 1853.80 | 1919.51 | 满足 |
| 4 | 1100.0 | -1100.0 | 1874.67 | 1940.39 | 满足 |
| 5 | 1100.0 | 1100.0 | 1917.18 | 1982.89 | 满足 |

桩总反力= 9597.5 kN; 桩均反力= 1919.5 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=9487.3kN =-62.4kN.m =-203.7kN.m =-56.6kN =58.9kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1100.0 | -1100.0 | 1929.58 | 1995.29 | 满足 |
| 2 | -1100.0 | 1100.0 | 1957.96 | 2023.67 | 满足 |
| 3 | 0.0 | 0.0 | 1897.47 | 1963.18 | 满足 |
| 4 | 1100.0 | -1100.0 | 1836.98 | 1902.69 | 满足 |
| 5 | 1100.0 | 1100.0 | 1865.36 | 1931.07 | 满足 |

桩总反力= 9815.9 kN; 桩均反力= 1963.2 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=9058.1kN =-273.4kN.m =-19.6kN.m =-10.1kN =105.0kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1100.0 | -1100.0 | 1753.93 | 1819.64 | 满足 |
| 2 | -1100.0 | 1100.0 | 1878.19 | 1943.90 | 满足 |
| 3 | 0.0 | 0.0 | 1811.62 | 1877.33 | 满足 |
| 4 | 1100.0 | -1100.0 | 1745.04 | 1810.75 | 满足 |
| 5 | 1100.0 | 1100.0 | 1869.30 | 1935.01 | 满足 |

桩总反力= 9386.6 kN; 桩均反力= 1877.3 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=9698.2kN =117.4kN.m =1.2kN.m =-2.6kN =2.1kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1100.0 | -1100.0 | 1966.07 | 2031.78 | 满足 |
| 2 | -1100.0 | 1100.0 | 1912.68 | 1978.40 | 满足 |
| 3 | 0.0 | 0.0 | 1939.65 | 2005.36 | 满足 |
| 4 | 1100.0 | -1100.0 | 1966.61 | 2032.33 | 满足 |
| 5 | 1100.0 | 1100.0 | 1913.23 | 1978.94 | 满足 |

桩总反力= 10026.8 kN; 桩均反力= 2005.4 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=9278.3kN =-89.4kN.m =182.4kN.m =43.2kN =47.2kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1100.0 | -1100.0 | 1793.89 | 1859.60 | 满足 |
| 2 | -1100.0 | 1100.0 | 1834.52 | 1900.23 | 满足 |
| 3 | 0.0 | 0.0 | 1855.66 | 1921.37 | 满足 |
| 4 | 1100.0 | -1100.0 | 1876.80 | 1942.51 | 满足 |
| 5 | 1100.0 | 1100.0 | 1917.43 | 1983.14 | 满足 |

桩总反力= 9606.9 kN; 桩均反力= 1921.4 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=9478.0kN =-66.6kN.m =-200.8kN.m =-55.9kN =59.9kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1100.0 | -1100.0 | 1926.10 | 1991.81 | 满足 |
| 2 | -1100.0 | 1100.0 | 1956.35 | 2022.07 | 满足 |
| 3 | 0.0 | 0.0 | 1895.60 | 1961.31 | 满足 |
| 4 | 1100.0 | -1100.0 | 1834.85 | 1900.56 | 满足 |
| 5 | 1100.0 | 1100.0 | 1865.10 | 1930.81 | 满足 |

桩总反力= 9806.6 kN; 桩均反力= 1961.3 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=13393.1kN =-110.6kN.m =-12.9kN.m =-8.9kN =76.1kN

承台及覆土重:

= 328.6×1.35= 443.6

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) |
| --- | --- | --- | --- | --- |
| 1 | -1100.0 | -1100.0 | 2656.43 | 2745.14 |
| 2 | -1100.0 | 1100.0 | 2706.68 | 2795.39 |
| 3 | 0.0 | 0.0 | 2678.62 | 2767.33 |
| 4 | 1100.0 | -1100.0 | 2650.57 | 2739.28 |
| 5 | 1100.0 | 1100.0 | 2700.82 | 2789.53 |

桩总反力= 13836.7 kN; 桩均反力= 2767.3 kN

台阶1 H = 700.00 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

= 450. =0.38 = 950.

= 450. =0.38 = 950.

= 650. =0.9739 = 0.974 =1.00 = 1.433

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

= 2860.80 kN > = 2656.43(×1.00) kN

角桩No.=2

= 450. =0.38 = 950.

= 450. =0.38 = 950.

= 650. =0.9739 = 0.974 =1.00 = 1.433

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

= 2860.80 kN > = 2650.57(×1.00) kN

角桩No.=3

= 450. =0.38 = 950.

= 450. =0.38 = 950.

= 650. =0.9739 = 0.974 =1.00 = 1.433

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

= 2860.80 kN > = 2700.82(×1.00) kN

角桩No.=4

= 450. =0.38 = 950.

= 450. =0.38 = 950.

= 650. =0.9739 = 0.974 =1.00 = 1.433

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

= 2860.80 kN > = 2706.68(×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=1200.mm

X正方向:= 450. =0.375

X负方向:= 450. =0.375

Y正方向:= 450. =0.375

Y负方向:= 450. =0.375

= 900. = 900. = 1.46 = 1.46 = 1.43 =0.962

=2[( + ) + ( + )]

=13055.71 kN > =10714.49 × 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

=1200. = 902. =0.375

= [1.75/(+1.0)]

=0.904\*[1.75/(0.375+1.0)]\*3058.\*1200.\*1.4329\*1.e-3

= 6047.7 kN

> = 5363.11 (\* 1.00) kN

2、右侧抗剪计算

=1200. = 450. =0.375

= [1.75/(+1.0)]

=0.904\*[1.75/(0.375+1.0)]\*3058.\*1200.\*1.4329\*1.e-3

= 6047.7 kN

> = 5351.39 (\* 1.00) kN

3、下侧抗剪计算

=1200. = 450. =0.375

= [1.75/(+1.0)]

=0.904\*[1.75/(0.375+1.0)]\*3058.\*1200.\*1.4329\*1.e-3

= 6047.7 kN

> = 5307.00 (\* 1.00) kN

4、上侧抗剪计算

=1200. = 450. =0.375

= [1.75/(+1.0)]

=0.904\*[1.75/(0.375+1.0)]\*3058.\*1200.\*1.4329\*1.e-3

= 6047.7 kN

> = 5407.50 (\* 1.00) kN

台阶2 H = 1250.00 mm

b、柱冲切计算：

截面净高=1200.mm

X正方向:= 500. =0.417

X负方向:= 500. =0.417

Y正方向:= 500. =0.417

Y负方向:= 500. =0.417

= 800. = 800. = 1.36 = 1.36 = 1.43 =0.962

=2[( + ) + ( + )]

=11722.69 kN > =10714.49 × 1.00 kN

c、承台抗剪计算

1、左侧抗剪计算

=1200. = 903. =0.417

= [1.75/(+1.0)]

=0.904\*[1.75/(0.417+1.0)]\*3058.\*1200.\*1.4329\*1.e-3

= 5869.8 kN

> = 5363.11 (\* 1.00) kN

2、右侧抗剪计算

=1200. = 500. =0.417

= [1.75/(+1.0)]

=0.904\*[1.75/(0.417+1.0)]\*3058.\*1200.\*1.4329\*1.e-3

= 5869.8 kN

> = 5351.39 (\* 1.00) kN

3、下侧抗剪计算

=1200. = 500. =0.417

= [1.75/(+1.0)]

=0.904\*[1.75/(0.417+1.0)]\*3058.\*1200.\*1.4329\*1.e-3

= 5869.8 kN

> = 5307.00 (\* 1.00) kN

4、上侧抗剪计算

=1200. = 500. =0.417

= [1.75/(+1.0)]

=0.904\*[1.75/(0.417+1.0)]\*3058.\*1200.\*1.4329\*1.e-3

= 5869.8 kN

> = 5407.50 (\* 1.00) kN

承台阶梯高度：

1阶高： 700mm

2阶高： 550mm

3、承台板抗弯计算

X方向配筋计算：

= 3754.17\*1.00= 3754.17 X = -400. H = 1200.

= /(0.9\*\*)/YS = 3754.17/(0.9\*1200.0\*360.0)/3.7= 2609.7 /m

= 3745.97\*1.00= 3745.97 X = 400. H = 1200.

= /(0.9\*\*)/YS = 3745.97/(0.9\*1200.0\*360.0)/3.7= 2604.0 /m

= 3754.17\*1.00= 3754.17 X = -400. H = 1200.

= /(0.9\*\*)/YS = 3754.17/(0.9\*1200.0\*360.0)/3.7= 2609.7 /m

Y方向配筋计算：

= 3714.90\*1.00= 3714.90 Y = -400. H = 1200.

= /(0.9\*\*)/XS = 3714.90/(0.9\*1200.0\*360.0)/3.7= 2582.4 /m

= 3785.25\*1.00= 3785.25 Y = 400. H = 1200.

= /(0.9\*\*)/XS = 3785.25/(0.9\*1200.0\*360.0)/3.7= 2631.3 /m

= 3785.25\*1.00= 3785.25 Y = 400. H = 1200.

= /(0.9\*\*)/XS = 3785.25/(0.9\*1200.0\*360.0)/3.7= 2631.3 /m

计算的钢筋面积：

= 2610./m = 2631./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 | 2184.55 (19) | 1653.24 (4) | 2031.78 (45) | 1819.64 (44) |
| 2 | 2211.31 (15) | 1705.78 (2) | 2023.67 (43) | 1898.63 (42) |
| 3 | 2194.01 (19) | 1680.36 (4) | 2005.36 (45) | 1877.33 (44) |
| 4 | 2180.19 (19) | 1649.14 (4) | 2032.33 (45) | 1810.75 (44) |
| 5 | 2203.48 (19) | 1707.47 (4) | 1983.14 (48) | 1930.81 (49) |

桩平均反力最大值2194.01 (非震)(Load 19)

桩平均反力最小值1680.36 (非震)(Load 4)

桩平均反力最大值2005.36 (震)(Load 45)

桩平均反力最小值1877.33 (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2860.80 kN 冲切力2656.43 kN ：650 mm (Load:55)

桩 2: 抗力2860.80 kN 冲切力2650.57 kN ：650 mm (Load:55)

桩 3: 抗力2860.80 kN 冲切力2700.82 kN ：650 mm (Load:55)

桩 4: 抗力2860.80 kN 冲切力2706.68 kN ：650 mm (Load:55)

柱冲切计算：

抗力11722.69 kN 冲切力10714.49 kN ：1200 mm Load：55

抗剪计算：

1左边： 抗力5869.85kN 剪力5363.11kN ：1200mm (Load:55)

2右边： 抗力5869.85kN 剪力5351.39kN ：1200mm (Load:55)

3上边： 抗力5869.85kN 剪力5307.00kN ：1200mm (Load:55)

4下边： 抗力5869.85kN 剪力5407.50kN ：1200mm (Load:55)

承台高度：

一阶高700 二阶高550

底板配筋计算：

X方向：弯矩3754.17 kN.m 计算钢筋面积2610 /m Load： 55

Y方向：弯矩3785.25 kN.m 计算钢筋面积2631 /m Load： 55

根据最小配筋率计算承台最小配筋：

= 1563. /m

= 1563. /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 20@100

Agy: HRB400 20@100