桩承台计算\_序号109

# 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

| 【3】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=8157.5kN =-72.4kN.m =-30.9kN.m =-4.6kN =50.5kN

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 | 1622.07 | 1687.78 | 满足 |
| 2 | -1100.0 | 1100.0 | 1654.97 | 1720.68 | 满足 |
| 3 | 0.0 | 0.0 | 1631.50 | 1697.21 | 满足 |
| 4 | 1100.0 | -1100.0 | 1608.02 | 1673.73 | 满足 |
| 5 | 1100.0 | 1100.0 | 1640.92 | 1706.63 | 满足 |

桩总反力= 8486.0 kN; 桩均反力= 1697.2 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=8081.0kN =-133.7kN.m =8.6kN.m =5.8kN =66.7kN

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 | 1583.87 | 1649.58 | 满足 |
| 2 | -1100.0 | 1100.0 | 1644.66 | 1710.37 | 满足 |
| 3 | 0.0 | 0.0 | 1616.21 | 1681.92 | 满足 |
| 4 | 1100.0 | -1100.0 | 1587.76 | 1653.47 | 满足 |
| 5 | 1100.0 | 1100.0 | 1648.55 | 1714.27 | 满足 |

桩总反力= 8409.6 kN; 桩均反力= 1681.9 kN

当前荷载组合

| 【14】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=10610.0kN =-93.9kN.m =30.6kN.m =11.4kN =64.9kN

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 | 2093.71 | 2159.42 | 满足 |
| 2 | -1100.0 | 1100.0 | 2136.37 | 2202.08 | 满足 |
| 3 | 0.0 | 0.0 | 2122.01 | 2187.72 | 满足 |
| 4 | 1100.0 | -1100.0 | 2107.64 | 2173.36 | 满足 |
| 5 | 1100.0 | 1100.0 | 2150.30 | 2216.02 | 满足 |

桩总反力= 10938.6 kN; 桩均反力= 2187.7 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=10655.9kN =-57.0kN.m =7.0kN.m =5.2kN =55.2kN

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 | 2116.64 | 2182.35 | 满足 |
| 2 | -1100.0 | 1100.0 | 2142.56 | 2208.27 | 满足 |
| 3 | 0.0 | 0.0 | 2131.18 | 2196.89 | 满足 |
| 4 | 1100.0 | -1100.0 | 2119.80 | 2185.51 | 满足 |
| 5 | 1100.0 | 1100.0 | 2145.72 | 2211.44 | 满足 |

桩总反力= 10984.5 kN; 桩均反力= 2196.9 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=9502.1kN =-102.1kN.m =201.4kN.m =55.1kN =64.2kN

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 | 1831.45 | 1897.16 | 满足 |
| 2 | -1100.0 | 1100.0 | 1877.85 | 1943.56 | 满足 |
| 3 | 0.0 | 0.0 | 1900.42 | 1966.13 | 满足 |
| 4 | 1100.0 | -1100.0 | 1922.98 | 1988.70 | 满足 |
| 5 | 1100.0 | 1100.0 | 1969.38 | 2035.09 | 满足 |

桩总反力= 9830.6 kN; 桩均反力= 1966.1 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=9274.5kN =-65.0kN.m =-186.6kN.m =-44.6kN =51.6kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1100.0 | -1100.0 | 1882.52 | 1948.23 | 满足 |
| 2 | -1100.0 | 1100.0 | 1912.09 | 1977.80 | 满足 |
| 3 | 0.0 | 0.0 | 1854.90 | 1920.61 | 满足 |
| 4 | 1100.0 | -1100.0 | 1797.71 | 1863.42 | 满足 |
| 5 | 1100.0 | 1100.0 | 1827.27 | 1892.98 | 满足 |

桩总反力= 9603.0 kN; 桩均反力= 1920.6 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=9083.4kN =-277.4kN.m =17.9kN.m =9.0kN =109.2kN

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 | 1749.57 | 1815.28 | 满足 |
| 2 | -1100.0 | 1100.0 | 1875.65 | 1941.36 | 满足 |
| 3 | 0.0 | 0.0 | 1816.69 | 1882.40 | 满足 |
| 4 | 1100.0 | -1100.0 | 1757.73 | 1823.44 | 满足 |
| 5 | 1100.0 | 1100.0 | 1883.81 | 1949.52 | 满足 |

桩总反力= 9412.0 kN; 桩均反力= 1882.4 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=9693.1kN =110.2kN.m =-3.2kN.m =1.5kN =6.7kN

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 | 1964.40 | 2030.11 | 满足 |
| 2 | -1100.0 | 1100.0 | 1914.29 | 1980.00 | 满足 |
| 3 | 0.0 | 0.0 | 1938.62 | 2004.33 | 满足 |
| 4 | 1100.0 | -1100.0 | 1962.96 | 2028.67 | 满足 |
| 5 | 1100.0 | 1100.0 | 1912.85 | 1978.56 | 满足 |

桩总反力= 10021.7 kN; 桩均反力= 2004.3 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=13411.2kN =-118.3kN.m =10.4kN.m =7.4kN =82.1kN

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 | 2652.99 | 2741.70 |
| 2 | -1100.0 | 1100.0 | 2706.75 | 2795.47 |
| 3 | 0.0 | 0.0 | 2682.24 | 2770.95 |
| 4 | 1100.0 | -1100.0 | 2657.72 | 2746.43 |
| 5 | 1100.0 | 1100.0 | 2711.48 | 2800.19 |

桩总反力= 13854.7 kN; 桩均反力= 2770.9 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 > = 2652.99(×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 > = 2657.72(×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 > = 2711.48(×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 > = 2706.75(×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 > =10728.95 × 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

> = 5359.75 (\* 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

> = 5369.20 (\* 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

> = 5310.71 (\* 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

> = 5418.24 (\* 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 > =10728.95 × 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

> = 5359.75 (\* 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

> = 5369.20 (\* 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

> = 5310.71 (\* 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

> = 5418.24 (\* 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：

= 3751.82\*1.00= 3751.82 X = -400. H = 1200.

= /(0.9\*\*)/YS = 3751.82/(0.9\*1200.0\*360.0)/3.7= 2608.0 /m

= 3758.44\*1.00= 3758.44 X = 400. H = 1200.

= /(0.9\*\*)/YS = 3758.44/(0.9\*1200.0\*360.0)/3.7= 2612.6 /m

= 3758.44\*1.00= 3758.44 X = 400. H = 1200.

= /(0.9\*\*)/YS = 3758.44/(0.9\*1200.0\*360.0)/3.7= 2612.6 /m

Y方向配筋计算：

= 3717.50\*1.00= 3717.50 Y = -400. H = 1200.

= /(0.9\*\*)/XS = 3717.50/(0.9\*1200.0\*360.0)/3.7= 2584.2 /m

= 3792.77\*1.00= 3792.77 Y = 400. H = 1200.

= /(0.9\*\*)/XS = 3792.77/(0.9\*1200.0\*360.0)/3.7= 2636.5 /m

= 3792.77\*1.00= 3792.77 Y = 400. H = 1200.

= /(0.9\*\*)/XS = 3792.77/(0.9\*1200.0\*360.0)/3.7= 2636.5 /m

计算的钢筋面积：

= 2613./m = 2637./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 | 2182.35 (19) | 1649.58 (4) | 2030.11 (45) | 1815.28 (44) |
| 2 | 2208.27 (19) | 1710.37 (4) | 1980.00 (45) | 1941.36 (44) |
| 3 | 2196.89 (19) | 1681.92 (4) | 2004.33 (45) | 1882.40 (44) |
| 4 | 2185.51 (19) | 1653.47 (4) | 2028.67 (45) | 1823.44 (44) |
| 5 | 2216.02 (14) | 1706.63 (3) | 2035.09 (42) | 1892.98 (43) |

桩平均反力最大值2196.89 (非震)(Load 19)

桩平均反力最小值1681.92 (非震)(Load 4)

桩平均反力最大值2004.33 (震)(Load 45)

桩平均反力最小值1882.40 (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2652.99 kN ：650 mm (Load:55)

桩 2: 抗力2860.80 kN 冲切力2657.72 kN ：650 mm (Load:55)

桩 3: 抗力2860.80 kN 冲切力2711.48 kN ：650 mm (Load:55)

桩 4: 抗力2860.80 kN 冲切力2706.75 kN ：650 mm (Load:55)

柱冲切计算：

抗力11722.69 kN 冲切力10728.95 kN ：1200 mm Load：55

抗剪计算：

1左边： 抗力5869.85kN 剪力5359.75kN ：1200mm (Load:55)

2右边： 抗力5869.85kN 剪力5369.20kN ：1200mm (Load:55)

3上边： 抗力5869.85kN 剪力5310.71kN ：1200mm (Load:55)

4下边： 抗力5869.85kN 剪力5418.24kN ：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3758.44 kN.m 计算钢筋面积2613 /m Load： 55

Y方向：弯矩3792.77 kN.m 计算钢筋面积2637 /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