桩承台计算\_序号11

# 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：1100mm

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 | -1500 | -1500 |
| 2 | -1500 | 1500 |
| 3 | 0 | 0 |
| 4 | 1500 | -1500 |
| 5 | 1500 | 1500 |

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

= 16.0× 24.0

= 384.0 kN

∑ = 9000000.0 ∑ = 9000000.0

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=8854.0kN =-79.5kN.m =-5.9kN.m =-8.7kN =144.6kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1500.0 | -1500.0 | 1758.53 | 1835.33 | 满足 |
| 2 | -1500.0 | 1500.0 | 1785.04 | 1861.84 | 满足 |
| 3 | 0.0 | 0.0 | 1770.80 | 1847.60 | 满足 |
| 4 | 1500.0 | -1500.0 | 1756.56 | 1833.36 | 满足 |
| 5 | 1500.0 | 1500.0 | 1783.07 | 1859.87 | 满足 |

桩总反力= 9238.0 kN; 桩均反力= 1847.6 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=8879.1kN =-61.7kN.m =-23.6kN.m =-17.6kN =135.3kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1500.0 | -1500.0 | 1769.48 | 1846.28 | 满足 |
| 2 | -1500.0 | 1500.0 | 1790.04 | 1866.84 | 满足 |
| 3 | 0.0 | 0.0 | 1775.82 | 1852.62 | 满足 |
| 4 | 1500.0 | -1500.0 | 1761.60 | 1838.40 | 满足 |
| 5 | 1500.0 | 1500.0 | 1782.17 | 1858.97 | 满足 |

桩总反力= 9263.1 kN; 桩均反力= 1852.6 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=11529.6kN =-16.8kN.m =-8.7kN.m =-15.1kN =122.3kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1500.0 | -1500.0 | 2304.58 | 2381.38 | 满足 |
| 2 | -1500.0 | 1500.0 | 2310.16 | 2386.96 | 满足 |
| 3 | 0.0 | 0.0 | 2305.92 | 2382.72 | 满足 |
| 4 | 1500.0 | -1500.0 | 2301.68 | 2378.48 | 满足 |
| 5 | 1500.0 | 1500.0 | 2307.26 | 2384.06 | 满足 |

桩总反力= 11913.6 kN; 桩均反力= 2382.7 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=11514.5kN =-27.5kN.m =2.0kN.m =-9.8kN =127.9kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1500.0 | -1500.0 | 2298.00 | 2374.80 | 满足 |
| 2 | -1500.0 | 1500.0 | 2307.16 | 2383.96 | 满足 |
| 3 | 0.0 | 0.0 | 2302.91 | 2379.71 | 满足 |
| 4 | 1500.0 | -1500.0 | 2298.66 | 2375.46 | 满足 |
| 5 | 1500.0 | 1500.0 | 2307.81 | 2384.61 | 满足 |

桩总反力= 11898.5 kN; 桩均反力= 2379.7 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=9899.6kN =-182.5kN.m =-0.1kN.m =-6.7kN =206.4kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1500.0 | -1500.0 | 1949.52 | 2026.32 | 满足 |
| 2 | -1500.0 | 1500.0 | 2010.36 | 2087.16 | 满足 |
| 3 | 0.0 | 0.0 | 1979.92 | 2056.72 | 满足 |
| 4 | 1500.0 | -1500.0 | 1949.49 | 2026.29 | 满足 |
| 5 | 1500.0 | 1500.0 | 2010.33 | 2087.13 | 满足 |

桩总反力= 10283.6 kN; 桩均反力= 2056.7 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=10525.0kN =103.1kN.m =-14.7kN.m =-17.8kN =51.8kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1500.0 | -1500.0 | 2124.63 | 2201.43 | 满足 |
| 2 | -1500.0 | 1500.0 | 2090.27 | 2167.07 | 满足 |
| 3 | 0.0 | 0.0 | 2104.99 | 2181.79 | 满足 |
| 4 | 1500.0 | -1500.0 | 2119.72 | 2196.52 | 满足 |
| 5 | 1500.0 | 1500.0 | 2085.36 | 2162.16 | 满足 |

桩总反力= 10909.0 kN; 桩均反力= 2181.8 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=10336.8kN =-51.0kN.m =138.2kN.m =59.6kN =136.1kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1500.0 | -1500.0 | 2035.81 | 2112.61 | 满足 |
| 2 | -1500.0 | 1500.0 | 2052.82 | 2129.62 | 满足 |
| 3 | 0.0 | 0.0 | 2067.35 | 2144.15 | 满足 |
| 4 | 1500.0 | -1500.0 | 2081.88 | 2158.68 | 满足 |
| 5 | 1500.0 | 1500.0 | 2098.89 | 2175.69 | 满足 |

桩总反力= 10720.8 kN; 桩均反力= 2144.2 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=10087.8kN =-28.4kN.m =-153.0kN.m =-84.1kN =122.1kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1500.0 | -1500.0 | 2038.34 | 2115.14 | 满足 |
| 2 | -1500.0 | 1500.0 | 2047.80 | 2124.60 | 满足 |
| 3 | 0.0 | 0.0 | 2017.57 | 2094.37 | 满足 |
| 4 | 1500.0 | -1500.0 | 1987.33 | 2064.13 | 满足 |
| 5 | 1500.0 | 1500.0 | 1996.79 | 2073.59 | 满足 |

桩总反力= 10471.8 kN; 桩均反力= 2094.4 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=14552.6kN =-55.0kN.m =-10.6kN.m =-17.7kN =178.1kN

承台及覆土重:

= 384.0×1.35= 518.4

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) |
| --- | --- | --- | --- | --- |
| 1 | -1500.0 | -1500.0 | 2903.12 | 3006.80 |
| 2 | -1500.0 | 1500.0 | 2921.46 | 3025.14 |
| 3 | 0.0 | 0.0 | 2910.53 | 3014.21 |
| 4 | 1500.0 | -1500.0 | 2899.59 | 3003.27 |
| 5 | 1500.0 | 1500.0 | 2917.94 | 3021.62 |

桩总反力= 15071.0 kN; 桩均反力= 3014.2 kN

台阶1 H = 1100.00 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

= 850. =0.52 = 700.

= 850. =0.52 = 700.

= 1050. =0.7831 = 0.783 =0.98 = 1.433

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

= 3043.99 kN > = 2903.12(×1.00) kN

角桩No.=2

= 850. =0.52 = 700.

= 850. =0.52 = 700.

= 1050. =0.7831 = 0.783 =0.98 = 1.433

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

= 3043.99 kN > = 2899.59(×1.00) kN

角桩No.=3

= 850. =0.52 = 700.

= 850. =0.52 = 700.

= 1050. =0.7831 = 0.783 =0.98 = 1.433

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

= 3043.99 kN > = 2917.94(×1.00) kN

角桩No.=4

= 850. =0.52 = 700.

= 850. =0.52 = 700.

= 1050. =0.7831 = 0.783 =0.98 = 1.433

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

= 3043.99 kN > = 2921.46(×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=1650.mm

X正方向:= 850. =0.515

X负方向:= 850. =0.515

Y正方向:= 850. =0.515

Y负方向:= 850. =0.515

= 900. = 900. = 1.17 = 1.17 = 1.43 =0.925

=2[( + ) + ( + )]

=17981.18 kN > =11642.11 × 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

=1650. =1302. =0.515

= [1.75/(+1.0)]

=0.834\*[1.75/(0.515+1.0)]\*3436.\*1650.\*1.4329\*1.e-3

= 7830.3 kN

> = 5824.58 (\* 1.00) kN

2、右侧抗剪计算

=1650. = 850. =0.515

= [1.75/(+1.0)]

=0.834\*[1.75/(0.515+1.0)]\*3436.\*1650.\*1.4329\*1.e-3

= 7830.3 kN

> = 5817.53 (\* 1.00) kN

3、下侧抗剪计算

=1650. = 850. =0.515

= [1.75/(+1.0)]

=0.834\*[1.75/(0.515+1.0)]\*3436.\*1650.\*1.4329\*1.e-3

= 7830.3 kN

> = 5802.71 (\* 1.00) kN

4、上侧抗剪计算

=1650. = 850. =0.515

= [1.75/(+1.0)]

=0.834\*[1.75/(0.515+1.0)]\*3436.\*1650.\*1.4329\*1.e-3

= 7830.3 kN

> = 5839.40 (\* 1.00) kN

台阶2 H = 1700.00 mm

b、柱冲切计算：

截面净高=1650.mm

X正方向:= 900. =0.545

X负方向:= 900. =0.545

Y正方向:= 900. =0.545

Y负方向:= 900. =0.545

= 800. = 800. = 1.13 = 1.13 = 1.43 =0.925

=2[( + ) + ( + )]

=16757.37 kN > =11642.11 × 1.00 kN

c、承台抗剪计算

1、左侧抗剪计算

=1650. =1303. =0.545

= [1.75/(+1.0)]

=0.834\*[1.75/(0.545+1.0)]\*3436.\*1650.\*1.4329\*1.e-3

= 7676.8 kN

> = 5824.58 (\* 1.00) kN

2、右侧抗剪计算

=1650. = 900. =0.545

= [1.75/(+1.0)]

=0.834\*[1.75/(0.545+1.0)]\*3436.\*1650.\*1.4329\*1.e-3

= 7676.8 kN

> = 5817.53 (\* 1.00) kN

3、下侧抗剪计算

=1650. = 900. =0.545

= [1.75/(+1.0)]

=0.834\*[1.75/(0.545+1.0)]\*3436.\*1650.\*1.4329\*1.e-3

= 7676.8 kN

> = 5802.71 (\* 1.00) kN

4、上侧抗剪计算

=1650. = 900. =0.545

= [1.75/(+1.0)]

=0.834\*[1.75/(0.545+1.0)]\*3436.\*1650.\*1.4329\*1.e-3

= 7676.8 kN

> = 5839.40 (\* 1.00) kN

承台阶梯高度：

1阶高： 1100mm

2阶高： 600mm

3、承台板抗弯计算

X方向配筋计算：

= 6407.04\*1.00= 6407.04 X = -400. H = 1650.

= /(0.9\*\*)/YS = 6407.04/(0.9\*1650.0\*360.0)/4.0= 2996.2 /m

= 6399.29\*1.00= 6399.29 X = 400. H = 1650.

= /(0.9\*\*)/YS = 6399.29/(0.9\*1650.0\*360.0)/4.0= 2992.6 /m

= 6407.04\*1.00= 6407.04 X = -400. H = 1650.

= /(0.9\*\*)/YS = 6407.04/(0.9\*1650.0\*360.0)/4.0= 2996.2 /m

Y方向配筋计算：

= 6382.98\*1.00= 6382.98 Y = -400. H = 1650.

= /(0.9\*\*)/XS = 6382.98/(0.9\*1650.0\*360.0)/4.0= 2984.9 /m

= 6423.34\*1.00= 6423.34 Y = 400. H = 1650.

= /(0.9\*\*)/XS = 6423.34/(0.9\*1650.0\*360.0)/4.0= 3003.8 /m

= 6423.34\*1.00= 6423.34 Y = 400. H = 1650.

= /(0.9\*\*)/XS = 6423.34/(0.9\*1650.0\*360.0)/4.0= 3003.8 /m

计算的钢筋面积：

= 2996./m = 3004./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 | 2381.38 (19) | 1835.33 (4) | 2201.43 (45) | 2026.32 (44) |
| 2 | 2386.96 (19) | 1861.84 (4) | 2167.07 (45) | 2087.16 (44) |
| 3 | 2382.72 (19) | 1847.60 (4) | 2181.79 (45) | 2056.72 (44) |
| 4 | 2378.48 (19) | 1833.36 (4) | 2196.52 (45) | 2026.29 (44) |
| 5 | 2384.61 (31) | 1858.97 (10) | 2175.69 (48) | 2073.59 (49) |

桩平均反力最大值2382.72 (非震)(Load 19)

桩平均反力最小值1847.60 (非震)(Load 4)

桩平均反力最大值2181.79 (震)(Load 45)

桩平均反力最小值2056.72 (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3043.99 kN 冲切力2903.12 kN ：1050 mm (Load:55)

桩 2: 抗力3043.99 kN 冲切力2899.59 kN ：1050 mm (Load:55)

桩 3: 抗力3043.99 kN 冲切力2917.94 kN ：1050 mm (Load:55)

桩 4: 抗力3043.99 kN 冲切力2921.46 kN ：1050 mm (Load:55)

柱冲切计算：

抗力16757.37 kN 冲切力11642.11 kN ：1650 mm Load：55

抗剪计算：

1左边： 抗力7676.79kN 剪力5824.58kN ：1650mm (Load:55)

2右边： 抗力7676.79kN 剪力5817.53kN ：1650mm (Load:55)

3上边： 抗力7676.79kN 剪力5802.71kN ：1650mm (Load:55)

4下边： 抗力7676.79kN 剪力5839.40kN ：1650mm (Load:55)

承台高度：

一阶高1100 二阶高600

底板配筋计算：

X方向：弯矩6407.04 kN.m 计算钢筋面积2996 /m Load： 55

Y方向：弯矩6423.34 kN.m 计算钢筋面积3004 /m Load： 55

根据最小配筋率计算承台最小配筋：

= 2201. /m

= 2201. /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