桩承台计算\_序号6

# 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

| 【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=8929.1kN =73.2kN.m =-9.9kN.m =-21.5kN =-137.9kN

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 | 1799.66 | 1876.46 | 满足 |
| 2 | -1500.0 | 1500.0 | 1775.26 | 1852.06 | 满足 |
| 3 | 0.0 | 0.0 | 1785.81 | 1862.61 | 满足 |
| 4 | 1500.0 | -1500.0 | 1796.37 | 1873.17 | 满足 |
| 5 | 1500.0 | 1500.0 | 1771.97 | 1848.77 | 满足 |

桩总反力= 9313.1 kN; 桩均反力= 1862.6 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=8949.6kN =57.1kN.m =8.3kN.m =-12.5kN =-129.7kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1500.0 | -1500.0 | 1798.06 | 1874.86 | 满足 |
| 2 | -1500.0 | 1500.0 | 1779.03 | 1855.83 | 满足 |
| 3 | 0.0 | 0.0 | 1789.92 | 1866.72 | 满足 |
| 4 | 1500.0 | -1500.0 | 1800.81 | 1877.61 | 满足 |
| 5 | 1500.0 | 1500.0 | 1781.78 | 1858.58 | 满足 |

桩总反力= 9333.6 kN; 桩均反力= 1866.7 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=11635.4kN =6.9kN.m =-10.6kN.m =-22.1kN =-111.2kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1500.0 | -1500.0 | 2329.98 | 2406.78 | 满足 |
| 2 | -1500.0 | 1500.0 | 2327.69 | 2404.49 | 满足 |
| 3 | 0.0 | 0.0 | 2327.07 | 2403.87 | 满足 |
| 4 | 1500.0 | -1500.0 | 2326.46 | 2403.26 | 满足 |
| 5 | 1500.0 | 1500.0 | 2324.17 | 2400.97 | 满足 |

桩总反力= 12019.4 kN; 桩均反力= 2403.9 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=11623.1kN =16.5kN.m =-21.4kN.m =-27.5kN =-116.1kN

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 | 2330.94 | 2407.74 | 满足 |
| 2 | -1500.0 | 1500.0 | 2325.43 | 2402.23 | 满足 |
| 3 | 0.0 | 0.0 | 2324.61 | 2401.41 | 满足 |
| 4 | 1500.0 | -1500.0 | 2323.80 | 2400.60 | 满足 |
| 5 | 1500.0 | 1500.0 | 2318.28 | 2395.08 | 满足 |

桩总反力= 12007.1 kN; 桩均反力= 2401.4 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=10592.0kN =-113.0kN.m =-2.7kN.m =-17.5kN =-41.9kN

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 | 2100.00 | 2176.80 | 满足 |
| 2 | -1500.0 | 1500.0 | 2137.67 | 2214.47 | 满足 |
| 3 | 0.0 | 0.0 | 2118.39 | 2195.19 | 满足 |
| 4 | 1500.0 | -1500.0 | 2099.12 | 2175.92 | 满足 |
| 5 | 1500.0 | 1500.0 | 2136.78 | 2213.58 | 满足 |

桩总反力= 10976.0 kN; 桩均反力= 2195.2 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=10009.4kN =176.2kN.m =-17.7kN.m =-25.8kN =-198.4kN

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 | 2034.19 | 2110.99 | 满足 |
| 2 | -1500.0 | 1500.0 | 1975.46 | 2052.26 | 满足 |
| 3 | 0.0 | 0.0 | 2001.88 | 2078.68 | 满足 |
| 4 | 1500.0 | -1500.0 | 2028.30 | 2105.10 | 满足 |
| 5 | 1500.0 | 1500.0 | 1969.58 | 2046.38 | 满足 |

桩总反力= 10393.4 kN; 桩均反力= 2078.7 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=10195.6kN =47.2kN.m =138.6kN.m =53.4kN =-129.3kN

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 | 2023.88 | 2100.68 | 满足 |
| 2 | -1500.0 | 1500.0 | 2008.15 | 2084.95 | 满足 |
| 3 | 0.0 | 0.0 | 2039.12 | 2115.92 | 满足 |
| 4 | 1500.0 | -1500.0 | 2070.09 | 2146.89 | 满足 |
| 5 | 1500.0 | 1500.0 | 2054.35 | 2131.15 | 满足 |

桩总反力= 10579.6 kN; 桩均反力= 2115.9 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=10405.8kN =16.0kN.m =-158.9kN.m =-96.7kN =-111.0kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1500.0 | -1500.0 | 2110.30 | 2187.10 | 满足 |
| 2 | -1500.0 | 1500.0 | 2104.98 | 2181.78 | 满足 |
| 3 | 0.0 | 0.0 | 2081.15 | 2157.95 | 满足 |
| 4 | 1500.0 | -1500.0 | 2057.33 | 2134.13 | 满足 |
| 5 | 1500.0 | 1500.0 | 2052.00 | 2128.80 | 满足 |

桩总反力= 10789.8 kN; 桩均反力= 2158.0 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=14686.3kN =43.0kN.m =-14.1kN.m =-29.7kN =-164.7kN

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 | 2946.78 | 3050.46 |
| 2 | -1500.0 | 1500.0 | 2932.43 | 3036.11 |
| 3 | 0.0 | 0.0 | 2937.26 | 3040.94 |
| 4 | 1500.0 | -1500.0 | 2942.09 | 3045.77 |
| 5 | 1500.0 | 1500.0 | 2927.74 | 3031.42 |

桩总反力= 15204.7 kN; 桩均反力= 3040.9 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 > = 2946.78(×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 > = 2942.09(×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 > = 2927.74(×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 > = 2932.43(×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 > =11749.04 × 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

> = 5879.21 (\* 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

> = 5869.83 (\* 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

> = 5888.87 (\* 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

> = 5860.17 (\* 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 > =11749.04 × 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

> = 5879.21 (\* 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

> = 5869.83 (\* 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

> = 5888.87 (\* 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

> = 5860.17 (\* 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：

= 6467.13\*1.00= 6467.13 X = -400. H = 1650.

= /(0.9\*\*)/YS = 6467.13/(0.9\*1650.0\*360.0)/4.0= 3024.3 /m

= 6456.82\*1.00= 6456.82 X = 400. H = 1650.

= /(0.9\*\*)/YS = 6456.82/(0.9\*1650.0\*360.0)/4.0= 3019.5 /m

= 6467.13\*1.00= 6467.13 X = -400. H = 1650.

= /(0.9\*\*)/YS = 6467.13/(0.9\*1650.0\*360.0)/4.0= 3024.3 /m

Y方向配筋计算：

= 6477.76\*1.00= 6477.76 Y = -400. H = 1650.

= /(0.9\*\*)/XS = 6477.76/(0.9\*1650.0\*360.0)/4.0= 3029.3 /m

= 6446.19\*1.00= 6446.19 Y = 400. H = 1650.

= /(0.9\*\*)/XS = 6446.19/(0.9\*1650.0\*360.0)/4.0= 3014.5 /m

= 6477.76\*1.00= 6477.76 Y = -400. H = 1650.

= /(0.9\*\*)/XS = 6477.76/(0.9\*1650.0\*360.0)/4.0= 3029.3 /m

计算的钢筋面积：

= 3024./m = 3029./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 | 2407.74 (30) | 1874.86 (11) | 2187.10 (49) | 2100.68 (48) |
| 2 | 2404.49 (18) | 1852.06 (5) | 2214.47 (44) | 2052.26 (45) |
| 3 | 2403.87 (18) | 1862.61 (5) | 2195.19 (44) | 2078.68 (45) |
| 4 | 2403.26 (18) | 1873.17 (5) | 2175.92 (44) | 2105.10 (45) |
| 5 | 2400.97 (18) | 1848.77 (5) | 2213.58 (44) | 2046.38 (45) |

桩平均反力最大值2403.87 (非震)(Load 18)

桩平均反力最小值1862.61 (非震)(Load 5)

桩平均反力最大值2195.19 (震)(Load 44)

桩平均反力最小值2078.68 (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3043.99 kN 冲切力2946.78 kN ：1050 mm (Load:55)

桩 2: 抗力3043.99 kN 冲切力2942.09 kN ：1050 mm (Load:55)

桩 3: 抗力3043.99 kN 冲切力2927.74 kN ：1050 mm (Load:55)

桩 4: 抗力3043.99 kN 冲切力2932.43 kN ：1050 mm (Load:55)

柱冲切计算：

抗力16757.37 kN 冲切力11749.04 kN ：1650 mm Load：55

抗剪计算：

1左边： 抗力7676.79kN 剪力5879.21kN ：1650mm (Load:55)

2右边： 抗力7676.79kN 剪力5869.83kN ：1650mm (Load:55)

3上边： 抗力7676.79kN 剪力5888.87kN ：1650mm (Load:55)

4下边： 抗力7676.79kN 剪力5860.17kN ：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6467.13 kN.m 计算钢筋面积3024 /m Load： 55

Y方向：弯矩6477.76 kN.m 计算钢筋面积3029 /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