桩承台计算\_序号7

# 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=8836.2kN =-80.1kN.m =-8.9kN.m =-19.2kN =145.8kN

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 | 1755.38 | 1832.18 | 满足 |
| 2 | -1500.0 | 1500.0 | 1782.08 | 1858.88 | 满足 |
| 3 | 0.0 | 0.0 | 1767.25 | 1844.05 | 满足 |
| 4 | 1500.0 | -1500.0 | 1752.41 | 1829.21 | 满足 |
| 5 | 1500.0 | 1500.0 | 1779.12 | 1855.92 | 满足 |

桩总反力= 9220.2 kN; 桩均反力= 1844.0 kN

当前荷载组合

| 【12】SATWE标准组合:1.00\*恒+1.00\*风y右 |
| --- |

承台底面荷载 :（考虑柱底剪力的影响）

N=8865.5kN =-62.3kN.m =8.6kN.m =-10.7kN =136.4kN

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 | 1761.28 | 1838.08 | 满足 |
| 2 | -1500.0 | 1500.0 | 1782.06 | 1858.86 | 满足 |
| 3 | 0.0 | 0.0 | 1773.10 | 1849.90 | 满足 |
| 4 | 1500.0 | -1500.0 | 1764.14 | 1840.94 | 满足 |
| 5 | 1500.0 | 1500.0 | 1784.92 | 1861.72 | 满足 |

桩总反力= 9249.5 kN; 桩均反力= 1849.9 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=11503.4kN =-17.2kN.m =-9.7kN.m =-18.6kN =123.6kN

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 | 2299.43 | 2376.23 | 满足 |
| 2 | -1500.0 | 1500.0 | 2305.17 | 2381.97 | 满足 |
| 3 | 0.0 | 0.0 | 2300.68 | 2377.48 | 满足 |
| 4 | 1500.0 | -1500.0 | 2296.19 | 2372.99 | 满足 |
| 5 | 1500.0 | 1500.0 | 2301.93 | 2378.73 | 满足 |

桩总反力= 11887.4 kN; 桩均反力= 2377.5 kN

当前荷载组合

| 【35】SATWE标准组合:1.00\*恒+1.00\*活-0.60\*风y右 |
| --- |

承台底面荷载 :（考虑柱底剪力的影响）

N=11485.8kN =-27.9kN.m =-20.2kN.m =-23.7kN =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 | 2295.89 | 2372.69 | 满足 |
| 2 | -1500.0 | 1500.0 | 2305.18 | 2381.98 | 满足 |
| 3 | 0.0 | 0.0 | 2297.17 | 2373.97 | 满足 |
| 4 | 1500.0 | -1500.0 | 2289.15 | 2365.95 | 满足 |
| 5 | 1500.0 | 1500.0 | 2298.45 | 2375.25 | 满足 |

桩总反力= 11869.8 kN; 桩均反力= 2374.0 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=9863.1kN =-185.0kN.m =-16.7kN.m =-24.0kN =209.1kN

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 | 1944.56 | 2021.36 | 满足 |
| 2 | -1500.0 | 1500.0 | 2006.21 | 2083.01 | 满足 |
| 3 | 0.0 | 0.0 | 1972.61 | 2049.41 | 满足 |
| 4 | 1500.0 | -1500.0 | 1939.01 | 2015.81 | 满足 |
| 5 | 1500.0 | 1500.0 | 2000.66 | 2077.46 | 满足 |

桩总反力= 10247.1 kN; 桩均反力= 2049.4 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=10519.6kN =104.5kN.m =-1.9kN.m =-13.4kN =51.5kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1500.0 | -1500.0 | 2121.66 | 2198.46 | 满足 |
| 2 | -1500.0 | 1500.0 | 2086.82 | 2163.62 | 满足 |
| 3 | 0.0 | 0.0 | 2103.93 | 2180.73 | 满足 |
| 4 | 1500.0 | -1500.0 | 2121.03 | 2197.83 | 满足 |
| 5 | 1500.0 | 1500.0 | 2086.19 | 2162.99 | 满足 |

桩总反力= 10903.6 kN; 桩均反力= 2180.7 kN

当前荷载组合

| 【46】SATWE标准组合:1.00\*恒+0.50\*活+0.20\*风x左+1.00\*地x |
| --- |

承台底面荷载 :（考虑柱底剪力的影响）

N=10075.6kN =-30.6kN.m =136.2kN.m =52.5kN =124.0kN

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 | 1987.33 | 2064.13 | 满足 |
| 2 | -1500.0 | 1500.0 | 1997.53 | 2074.33 | 满足 |
| 3 | 0.0 | 0.0 | 2015.12 | 2091.92 | 满足 |
| 4 | 1500.0 | -1500.0 | 2032.72 | 2109.52 | 满足 |
| 5 | 1500.0 | 1500.0 | 2042.91 | 2119.71 | 满足 |

桩总反力= 10459.6 kN; 桩均反力= 2091.9 kN

当前荷载组合

| 【47】SATWE标准组合:1.00\*恒+0.50\*活-0.20\*风x左-1.00\*地x |
| --- |

承台底面荷载 :（考虑柱底剪力的影响）

N=10307.1kN =-49.8kN.m =-154.7kN.m =-89.8kN =136.7kN

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 | 2078.89 | 2155.69 | 满足 |
| 2 | -1500.0 | 1500.0 | 2095.50 | 2172.30 | 满足 |
| 3 | 0.0 | 0.0 | 2061.41 | 2138.21 | 满足 |
| 4 | 1500.0 | -1500.0 | 2027.33 | 2104.13 | 满足 |
| 5 | 1500.0 | 1500.0 | 2043.94 | 2120.74 | 满足 |

桩总反力= 10691.1 kN; 桩均反力= 2138.2 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=14519.3kN =-55.7kN.m =-12.8kN.m =-25.6kN =179.9kN

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 | 2896.70 | 3000.38 |
| 2 | -1500.0 | 1500.0 | 2915.28 | 3018.96 |
| 3 | 0.0 | 0.0 | 2903.86 | 3007.54 |
| 4 | 1500.0 | -1500.0 | 2892.43 | 2996.11 |
| 5 | 1500.0 | 1500.0 | 2911.01 | 3014.69 |

桩总反力= 15037.7 kN; 桩均反力= 3007.5 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 > = 2896.70(×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 > = 2892.43(×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 > = 2911.01(×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 > = 2915.28(×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 > =11615.42 × 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

> = 5811.99 (\* 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

> = 5803.43 (\* 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

> = 5789.13 (\* 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

> = 5826.29 (\* 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 > =11615.42 × 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

> = 5811.99 (\* 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

> = 5803.43 (\* 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

> = 5789.13 (\* 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

> = 5826.29 (\* 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：

= 6393.19\*1.00= 6393.19 X = -400. H = 1650.

= /(0.9\*\*)/YS = 6393.19/(0.9\*1650.0\*360.0)/4.0= 2989.7 /m

= 6383.78\*1.00= 6383.78 X = 400. H = 1650.

= /(0.9\*\*)/YS = 6383.78/(0.9\*1650.0\*360.0)/4.0= 2985.3 /m

= 6393.19\*1.00= 6393.19 X = -400. H = 1650.

= /(0.9\*\*)/YS = 6393.19/(0.9\*1650.0\*360.0)/4.0= 2989.7 /m

Y方向配筋计算：

= 6368.04\*1.00= 6368.04 Y = -400. H = 1650.

= /(0.9\*\*)/XS = 6368.04/(0.9\*1650.0\*360.0)/4.0= 2977.9 /m

= 6408.92\*1.00= 6408.92 Y = 400. H = 1650.

= /(0.9\*\*)/XS = 6408.92/(0.9\*1650.0\*360.0)/4.0= 2997.1 /m

= 6408.92\*1.00= 6408.92 Y = 400. H = 1650.

= /(0.9\*\*)/XS = 6408.92/(0.9\*1650.0\*360.0)/4.0= 2997.1 /m

计算的钢筋面积：

= 2990./m = 2997./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 | 2376.23 (19) | 1832.18 (4) | 2198.46 (45) | 2021.36 (44) |
| 2 | 2381.98 (35) | 1858.86 (12) | 2172.30 (47) | 2074.33 (46) |
| 3 | 2377.48 (19) | 1844.05 (4) | 2180.73 (45) | 2049.41 (44) |
| 4 | 2372.99 (19) | 1829.21 (4) | 2197.83 (45) | 2015.81 (44) |
| 5 | 2378.73 (19) | 1855.92 (4) | 2162.99 (45) | 2077.46 (44) |

桩平均反力最大值2377.48 (非震)(Load 19)

桩平均反力最小值1844.05 (非震)(Load 4)

桩平均反力最大值2180.73 (震)(Load 45)

桩平均反力最小值2049.41 (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2896.70 kN ：1050 mm (Load:55)

桩 2: 抗力3043.99 kN 冲切力2892.43 kN ：1050 mm (Load:55)

桩 3: 抗力3043.99 kN 冲切力2911.01 kN ：1050 mm (Load:55)

桩 4: 抗力3043.99 kN 冲切力2915.28 kN ：1050 mm (Load:55)

柱冲切计算：

抗力16757.37 kN 冲切力11615.42 kN ：1650 mm Load：55

抗剪计算：

1左边： 抗力7676.79kN 剪力5811.99kN ：1650mm (Load:55)

2右边： 抗力7676.79kN 剪力5803.43kN ：1650mm (Load:55)

3上边： 抗力7676.79kN 剪力5789.13kN ：1650mm (Load:55)

4下边： 抗力7676.79kN 剪力5826.29kN ：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6393.19 kN.m 计算钢筋面积2990 /m Load： 55

Y方向：弯矩6408.92 kN.m 计算钢筋面积2997 /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