桩承台计算\_序号10

# 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=8959.0kN =72.6kN.m =-5.7kN.m =-7.1kN =-135.4kN

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 | 1804.85 | 1881.65 | 满足 |
| 2 | -1500.0 | 1500.0 | 1780.67 | 1857.47 | 满足 |
| 3 | 0.0 | 0.0 | 1791.80 | 1868.60 | 满足 |
| 4 | 1500.0 | -1500.0 | 1802.94 | 1879.74 | 满足 |
| 5 | 1500.0 | 1500.0 | 1778.76 | 1855.56 | 满足 |

桩总反力= 9343.0 kN; 桩均反力= 1868.6 kN

当前荷载组合

| 【13】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=8977.4kN =56.6kN.m =-23.8kN.m =-16.1kN =-127.2kN

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 | 1808.89 | 1885.69 | 满足 |
| 2 | -1500.0 | 1500.0 | 1790.01 | 1866.81 | 满足 |
| 3 | 0.0 | 0.0 | 1795.48 | 1872.28 | 满足 |
| 4 | 1500.0 | -1500.0 | 1800.96 | 1877.76 | 满足 |
| 5 | 1500.0 | 1500.0 | 1782.08 | 1858.88 | 满足 |

桩总反力= 9361.4 kN; 桩均反力= 1872.3 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=11669.1kN =6.2kN.m =-7.7kN.m =-12.2kN =-108.2kN

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 | 2336.16 | 2412.96 | 满足 |
| 2 | -1500.0 | 1500.0 | 2334.08 | 2410.88 | 满足 |
| 3 | 0.0 | 0.0 | 2333.83 | 2410.63 | 满足 |
| 4 | 1500.0 | -1500.0 | 2333.58 | 2410.38 | 满足 |
| 5 | 1500.0 | 1500.0 | 2331.50 | 2408.30 | 满足 |

桩总反力= 12053.1 kN; 桩均反力= 2410.6 kN

当前荷载组合

| 【34】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=11658.1kN =15.8kN.m =3.1kN.m =-6.8kN =-113.1kN

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 | 2333.74 | 2410.54 | 满足 |
| 2 | -1500.0 | 1500.0 | 2328.47 | 2405.27 | 满足 |
| 3 | 0.0 | 0.0 | 2331.62 | 2408.42 | 满足 |
| 4 | 1500.0 | -1500.0 | 2334.77 | 2411.57 | 满足 |
| 5 | 1500.0 | 1500.0 | 2329.50 | 2406.30 | 满足 |

桩总反力= 12042.1 kN; 桩均反力= 2408.4 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=10623.1kN =-111.8kN.m =-14.3kN.m =-14.6kN =-40.3kN

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 | 2108.36 | 2185.16 | 满足 |
| 2 | -1500.0 | 1500.0 | 2145.63 | 2222.43 | 满足 |
| 3 | 0.0 | 0.0 | 2124.62 | 2201.42 | 满足 |
| 4 | 1500.0 | -1500.0 | 2103.60 | 2180.40 | 满足 |
| 5 | 1500.0 | 1500.0 | 2140.87 | 2217.67 | 满足 |

桩总反力= 11007.1 kN; 桩均反力= 2201.4 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=10042.6kN =173.7kN.m =0.7kN.m =-5.0kN =-194.6kN

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 | 2037.35 | 2114.15 | 满足 |
| 2 | -1500.0 | 1500.0 | 1979.44 | 2056.24 | 满足 |
| 3 | 0.0 | 0.0 | 2008.52 | 2085.32 | 满足 |
| 4 | 1500.0 | -1500.0 | 2037.60 | 2114.40 | 满足 |
| 5 | 1500.0 | 1500.0 | 1979.68 | 2056.48 | 满足 |

桩总反力= 10426.6 kN; 桩均反力= 2085.3 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=10455.2kN =13.6kN.m =141.7kN.m =64.2kN =-107.3kN

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 | 2069.69 | 2146.49 | 满足 |
| 2 | -1500.0 | 1500.0 | 2065.16 | 2141.96 | 满足 |
| 3 | 0.0 | 0.0 | 2091.04 | 2167.84 | 满足 |
| 4 | 1500.0 | -1500.0 | 2116.92 | 2193.72 | 满足 |
| 5 | 1500.0 | 1500.0 | 2112.39 | 2189.19 | 满足 |

桩总反力= 10839.2 kN; 桩均反力= 2167.8 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=10210.5kN =48.3kN.m =-155.2kN.m =-83.8kN =-127.6kN

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 | 2076.02 | 2152.82 | 满足 |
| 2 | -1500.0 | 1500.0 | 2059.91 | 2136.71 | 满足 |
| 3 | 0.0 | 0.0 | 2042.09 | 2118.89 | 满足 |
| 4 | 1500.0 | -1500.0 | 2024.28 | 2101.08 | 满足 |
| 5 | 1500.0 | 1500.0 | 2008.16 | 2084.96 | 满足 |

桩总反力= 10594.5 kN; 桩均反力= 2118.9 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=14730.2kN =42.1kN.m =-9.7kN.m =-14.3kN =-160.9kN

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 | 2954.67 | 3058.35 |
| 2 | -1500.0 | 1500.0 | 2940.62 | 3044.30 |
| 3 | 0.0 | 0.0 | 2946.03 | 3049.71 |
| 4 | 1500.0 | -1500.0 | 2951.45 | 3055.13 |
| 5 | 1500.0 | 1500.0 | 2937.40 | 3041.08 |

桩总反力= 15248.6 kN; 桩均反力= 3049.7 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 > = 2954.67(×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 > = 2951.45(×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 > = 2937.40(×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 > = 2940.62(×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 > =11784.13 × 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

> = 5895.28 (\* 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

> = 5888.85 (\* 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

> = 5906.11 (\* 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

> = 5878.01 (\* 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 > =11784.13 × 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

> = 5895.28 (\* 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

> = 5888.85 (\* 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

> = 5906.11 (\* 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

> = 5878.01 (\* 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：

= 6484.81\*1.00= 6484.81 X = -400. H = 1650.

= /(0.9\*\*)/YS = 6484.81/(0.9\*1650.0\*360.0)/4.0= 3032.6 /m

= 6477.73\*1.00= 6477.73 X = 400. H = 1650.

= /(0.9\*\*)/YS = 6477.73/(0.9\*1650.0\*360.0)/4.0= 3029.2 /m

= 6484.81\*1.00= 6484.81 X = -400. H = 1650.

= /(0.9\*\*)/YS = 6484.81/(0.9\*1650.0\*360.0)/4.0= 3032.6 /m

Y方向配筋计算：

= 6496.72\*1.00= 6496.72 Y = -400. H = 1650.

= /(0.9\*\*)/XS = 6496.72/(0.9\*1650.0\*360.0)/4.0= 3038.1 /m

= 6465.82\*1.00= 6465.82 Y = 400. H = 1650.

= /(0.9\*\*)/XS = 6465.82/(0.9\*1650.0\*360.0)/4.0= 3023.7 /m

= 6496.72\*1.00= 6496.72 Y = -400. H = 1650.

= /(0.9\*\*)/XS = 6496.72/(0.9\*1650.0\*360.0)/4.0= 3038.1 /m

计算的钢筋面积：

= 3033./m = 3038./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 | 2412.96 (18) | 1881.65 (5) | 2185.16 (44) | 2114.15 (45) |
| 2 | 2410.88 (18) | 1857.47 (5) | 2222.43 (44) | 2056.24 (45) |
| 3 | 2410.63 (18) | 1868.60 (5) | 2201.42 (44) | 2085.32 (45) |
| 4 | 2411.57 (34) | 1877.76 (13) | 2193.72 (46) | 2101.08 (47) |
| 5 | 2408.30 (18) | 1855.56 (5) | 2217.67 (44) | 2056.48 (45) |

桩平均反力最大值2410.63 (非震)(Load 18)

桩平均反力最小值1868.60 (非震)(Load 5)

桩平均反力最大值2201.42 (震)(Load 44)

桩平均反力最小值2085.32 (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2954.67 kN ：1050 mm (Load:55)

桩 2: 抗力3043.99 kN 冲切力2951.45 kN ：1050 mm (Load:55)

桩 3: 抗力3043.99 kN 冲切力2937.40 kN ：1050 mm (Load:55)

桩 4: 抗力3043.99 kN 冲切力2940.62 kN ：1050 mm (Load:55)

柱冲切计算：

抗力16757.37 kN 冲切力11784.13 kN ：1650 mm Load：55

抗剪计算：

1左边： 抗力7676.79kN 剪力5895.28kN ：1650mm (Load:55)

2右边： 抗力7676.79kN 剪力5888.85kN ：1650mm (Load:55)

3上边： 抗力7676.79kN 剪力5906.11kN ：1650mm (Load:55)

4下边： 抗力7676.79kN 剪力5878.01kN ：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6484.81 kN.m 计算钢筋面积3033 /m Load： 55

Y方向：弯矩6496.72 kN.m 计算钢筋面积3038 /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