桩承台计算\_序号5

# 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：900mm

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 | -1000 | -1000 |
| 2 | -1000 | 1000 |
| 3 | 1000 | -1000 |
| 4 | 1000 | 1000 |

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 | 700 | 700 | 0 | 0 | 0 |
| 外接柱 | 700 | 700 | 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

= 9.0× 24.0

= 216.0 kN

∑ = 4000000.0 ∑ = 4000000.0

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=6204.9kN =1.3kN.m =-27.0kN.m =-30.7kN =-9.9kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1000.0 | -1000.0 | 1558.31 | 1612.31 | 满足 |
| 2 | -1000.0 | 1000.0 | 1557.65 | 1611.65 | 满足 |
| 3 | 1000.0 | -1000.0 | 1544.78 | 1598.78 | 满足 |
| 4 | 1000.0 | 1000.0 | 1544.13 | 1598.13 | 满足 |

桩总反力= 6420.9 kN; 桩均反力= 1605.2 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=6217.0kN =-25.6kN.m =-8.0kN.m =-17.7kN =9.3kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1000.0 | -1000.0 | 1549.87 | 1603.87 | 满足 |
| 2 | -1000.0 | 1000.0 | 1562.66 | 1616.66 | 满足 |
| 3 | 1000.0 | -1000.0 | 1545.85 | 1599.85 | 满足 |
| 4 | 1000.0 | 1000.0 | 1558.65 | 1612.65 | 满足 |

桩总反力= 6433.0 kN; 桩均反力= 1608.3 kN

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=6230.3kN =29.6kN.m =-8.9kN.m =-20.0kN =-29.4kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1000.0 | -1000.0 | 1567.21 | 1621.21 | 满足 |
| 2 | -1000.0 | 1000.0 | 1552.39 | 1606.39 | 满足 |
| 3 | 1000.0 | -1000.0 | 1562.75 | 1616.75 | 满足 |
| 4 | 1000.0 | 1000.0 | 1547.93 | 1601.93 | 满足 |

桩总反力= 6446.3 kN; 桩均反力= 1611.6 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=6207.6kN =-15.0kN.m =-19.9kN.m =-25.7kN =1.6kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1000.0 | -1000.0 | 1553.15 | 1607.15 | 满足 |
| 2 | -1000.0 | 1000.0 | 1560.63 | 1614.63 | 满足 |
| 3 | 1000.0 | -1000.0 | 1543.17 | 1597.17 | 满足 |
| 4 | 1000.0 | 1000.0 | 1550.66 | 1604.66 | 满足 |

桩总反力= 6423.6 kN; 桩均反力= 1605.9 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=7929.0kN =2.6kN.m =1.5kN.m =-14.0kN =-12.5kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1000.0 | -1000.0 | 1982.52 | 2036.52 | 满足 |
| 2 | -1000.0 | 1000.0 | 1981.22 | 2035.22 | 满足 |
| 3 | 1000.0 | -1000.0 | 1983.27 | 2037.27 | 满足 |
| 4 | 1000.0 | 1000.0 | 1981.96 | 2035.96 | 满足 |

桩总反力= 8145.0 kN; 桩均反力= 2036.2 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=7913.7kN =-14.4kN.m =-9.4kN.m =-20.4kN =-0.7kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1000.0 | -1000.0 | 1977.18 | 2031.18 | 满足 |
| 2 | -1000.0 | 1000.0 | 1984.38 | 2038.38 | 满足 |
| 3 | 1000.0 | -1000.0 | 1972.49 | 2026.49 | 满足 |
| 4 | 1000.0 | 1000.0 | 1979.69 | 2033.69 | 满足 |

桩总反力= 8129.7 kN; 桩均反力= 2032.4 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=7921.7kN =18.8kN.m =-9.9kN.m =-21.8kN =-24.0kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1000.0 | -1000.0 | 1987.59 | 2041.59 | 满足 |
| 2 | -1000.0 | 1000.0 | 1978.21 | 2032.21 | 满足 |
| 3 | 1000.0 | -1000.0 | 1982.63 | 2036.63 | 满足 |
| 4 | 1000.0 | 1000.0 | 1973.25 | 2027.25 | 满足 |

桩总反力= 8137.7 kN; 桩均反力= 2034.4 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=7927.3kN =12.4kN.m =-2.8kN.m =-17.1kN =-19.4kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1000.0 | -1000.0 | 1985.62 | 2039.62 | 满足 |
| 2 | -1000.0 | 1000.0 | 1979.43 | 2033.43 | 满足 |
| 3 | 1000.0 | -1000.0 | 1984.24 | 2038.24 | 满足 |
| 4 | 1000.0 | 1000.0 | 1978.05 | 2032.05 | 满足 |

桩总反力= 8143.3 kN; 桩均反力= 2035.8 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=7170.7kN =10.4kN.m =89.5kN.m =45.1kN =-4.8kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1000.0 | -1000.0 | 1772.88 | 1826.88 | 满足 |
| 2 | -1000.0 | 1000.0 | 1767.70 | 1821.70 | 满足 |
| 3 | 1000.0 | -1000.0 | 1817.65 | 1871.65 | 满足 |
| 4 | 1000.0 | 1000.0 | 1812.47 | 1866.47 | 满足 |

桩总反力= 7386.7 kN; 桩均反力= 1846.7 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=6970.7kN =-6.1kN.m =-107.7kN.m =-85.1kN =-17.6kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1000.0 | -1000.0 | 1768.05 | 1822.05 | 满足 |
| 2 | -1000.0 | 1000.0 | 1771.12 | 1825.12 | 满足 |
| 3 | 1000.0 | -1000.0 | 1714.21 | 1768.21 | 满足 |
| 4 | 1000.0 | 1000.0 | 1717.29 | 1771.29 | 满足 |

桩总反力= 7186.7 kN; 桩均反力= 1796.7 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=7034.4kN =-92.8kN.m =-4.1kN.m =-15.8kN =58.0kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1000.0 | -1000.0 | 1736.43 | 1790.43 | 满足 |
| 2 | -1000.0 | 1000.0 | 1782.83 | 1836.83 | 满足 |
| 3 | 1000.0 | -1000.0 | 1734.39 | 1788.39 | 满足 |
| 4 | 1000.0 | 1000.0 | 1780.79 | 1834.79 | 满足 |

桩总反力= 7250.4 kN; 桩均反力= 1812.6 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=7106.9kN =97.0kN.m =-14.1kN.m =-24.2kN =-80.5kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1000.0 | -1000.0 | 1804.50 | 1858.50 | 满足 |
| 2 | -1000.0 | 1000.0 | 1755.99 | 1809.99 | 满足 |
| 3 | 1000.0 | -1000.0 | 1797.47 | 1851.47 | 满足 |
| 4 | 1000.0 | 1000.0 | 1748.96 | 1802.96 | 满足 |

桩总反力= 7322.9 kN; 桩均反力= 1830.7 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=10062.1kN =2.9kN.m =-12.6kN.m =-27.7kN =-15.8kN

承台及覆土重:

= 216.0×1.35= 291.6

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) |
| --- | --- | --- | --- | --- |
| 1 | -1000.0 | -1000.0 | 2519.40 | 2592.30 |
| 2 | -1000.0 | 1000.0 | 2517.95 | 2590.85 |
| 3 | 1000.0 | -1000.0 | 2513.10 | 2586.00 |
| 4 | 1000.0 | 1000.0 | 2511.66 | 2584.56 |

桩总反力= 10353.7 kN; 桩均反力= 2588.4 kN

台阶1 H = 900.00 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

= 400. =0.28 = 700.

= 400. =0.28 = 700.

= 850. =1.1768 = 1.177 =0.99 = 1.433

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

= 3260.77 kN > = 2519.40(×1.00) kN

角桩No.=2

= 400. =0.28 = 700.

= 400. =0.28 = 700.

= 850. =1.1768 = 1.177 =0.99 = 1.433

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

= 3260.77 kN > = 2513.10(×1.00) kN

角桩No.=3

= 400. =0.28 = 700.

= 400. =0.28 = 700.

= 850. =1.1768 = 1.177 =0.99 = 1.433

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

= 3260.77 kN > = 2511.66(×1.00) kN

角桩No.=4

= 400. =0.28 = 700.

= 400. =0.28 = 700.

= 850. =1.1768 = 1.177 =0.99 = 1.433

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

= 3260.77 kN > = 2517.95(×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=1450.mm

X正方向:= 400. =0.276

X负方向:= 400. =0.276

Y正方向:= 400. =0.276

Y负方向:= 400. =0.276

= 800. = 800. = 1.77 = 1.77 = 1.43 =0.942

=2[( + ) + ( + )]

=16577.45 kN > =10062.11 × 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

=1450. = 802. =0.276

= [1.75/(+1.0)]

=0.862\*[1.75/(0.276+1.0)]\*2545.\*1450.\*1.4329\*1.e-3

= 6250.4 kN

> = 5037.35 (\* 1.00) kN

2、右侧抗剪计算

=1450. = 400. =0.276

= [1.75/(+1.0)]

=0.862\*[1.75/(0.276+1.0)]\*2545.\*1450.\*1.4329\*1.e-3

= 6250.4 kN

> = 5024.76 (\* 1.00) kN

3、下侧抗剪计算

=1450. = 400. =0.276

= [1.75/(+1.0)]

=0.862\*[1.75/(0.276+1.0)]\*2545.\*1450.\*1.4329\*1.e-3

= 6250.4 kN

> = 5032.50 (\* 1.00) kN

4、上侧抗剪计算

=1450. = 400. =0.276

= [1.75/(+1.0)]

=0.862\*[1.75/(0.276+1.0)]\*2545.\*1450.\*1.4329\*1.e-3

= 6250.4 kN

> = 5029.61 (\* 1.00) kN

台阶2 H = 1500.00 mm

b、柱冲切计算：

截面净高=1450.mm

X正方向:= 450. =0.310

X负方向:= 450. =0.310

Y正方向:= 450. =0.310

Y负方向:= 450. =0.310

= 700. = 700. = 1.65 = 1.65 = 1.43 =0.942

=2[( + ) + ( + )]

=14813.30 kN > =10062.11 × 1.00 kN

c、承台抗剪计算

1、左侧抗剪计算

=1450. = 803. =0.310

= [1.75/(+1.0)]

=0.862\*[1.75/(0.310+1.0)]\*2545.\*1450.\*1.4329\*1.e-3

= 6085.9 kN

> = 5037.35 (\* 1.00) kN

2、右侧抗剪计算

=1450. = 450. =0.310

= [1.75/(+1.0)]

=0.862\*[1.75/(0.310+1.0)]\*2545.\*1450.\*1.4329\*1.e-3

= 6085.9 kN

> = 5024.76 (\* 1.00) kN

3、下侧抗剪计算

=1450. = 450. =0.310

= [1.75/(+1.0)]

=0.862\*[1.75/(0.310+1.0)]\*2545.\*1450.\*1.4329\*1.e-3

= 6085.9 kN

> = 5032.50 (\* 1.00) kN

4、上侧抗剪计算

=1450. = 450. =0.310

= [1.75/(+1.0)]

=0.862\*[1.75/(0.310+1.0)]\*2545.\*1450.\*1.4329\*1.e-3

= 6085.9 kN

> = 5029.61 (\* 1.00) kN

承台阶梯高度：

1阶高： 900mm

2阶高： 600mm

3、承台板抗弯计算

X方向配筋计算：

= 3274.28\*1.00= 3274.28 X = -350. H = 1450.

= /(0.9\*\*)/YS = 3274.28/(0.9\*1450.0\*360.0)/3.0= 2323.2 /m

= 3266.09\*1.00= 3266.09 X = 350. H = 1450.

= /(0.9\*\*)/YS = 3266.09/(0.9\*1450.0\*360.0)/3.0= 2317.4 /m

= 3274.28\*1.00= 3274.28 X = -350. H = 1450.

= /(0.9\*\*)/YS = 3274.28/(0.9\*1450.0\*360.0)/3.0= 2323.2 /m

Y方向配筋计算：

= 3271.12\*1.00= 3271.12 Y = -350. H = 1450.

= /(0.9\*\*)/XS = 3271.12/(0.9\*1450.0\*360.0)/3.0= 2320.9 /m

= 3269.25\*1.00= 3269.25 Y = 350. H = 1450.

= /(0.9\*\*)/XS = 3269.25/(0.9\*1450.0\*360.0)/3.0= 2319.6 /m

= 3271.12\*1.00= 3271.12 Y = -350. H = 1450.

= /(0.9\*\*)/XS = 3271.12/(0.9\*1450.0\*360.0)/3.0= 2320.9 /m

计算的钢筋面积：

= 2323./m = 2321./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 | 2041.59 (19) | 1603.87 (4) | 1858.50 (45) | 1790.43 (44) |
| 2 | 2038.38 (18) | 1606.39 (5) | 1836.83 (44) | 1809.99 (45) |
| 3 | 2038.24 (31) | 1597.17 (10) | 1871.65 (42) | 1768.21 (43) |
| 4 | 2035.96 (14) | 1598.13 (3) | 1866.47 (42) | 1771.29 (43) |

桩平均反力最大值2036.24 (非震)(Load 14)

桩平均反力最小值1605.22 (非震)(Load 3)

桩平均反力最大值1846.67 (震)(Load 42)

桩平均反力最小值1796.67 (震)(Load 43)

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3260.77 kN 冲切力2519.40 kN ：850 mm (Load:55)

桩 2: 抗力3260.77 kN 冲切力2513.10 kN ：850 mm (Load:55)

桩 3: 抗力3260.77 kN 冲切力2511.66 kN ：850 mm (Load:55)

桩 4: 抗力3260.77 kN 冲切力2517.95 kN ：850 mm (Load:55)

柱冲切计算：

抗力14813.30 kN 冲切力10062.11 kN ：1450 mm Load：55

抗剪计算：

1左边： 抗力6085.87kN 剪力5037.35kN ：1450mm (Load:55)

2右边： 抗力6085.87kN 剪力5024.76kN ：1450mm (Load:55)

3上边： 抗力6085.87kN 剪力5032.50kN ：1450mm (Load:55)

4下边： 抗力6085.87kN 剪力5029.61kN ：1450mm (Load:55)

承台高度：

一阶高900 二阶高600

底板配筋计算：

X方向：弯矩3274.28 kN.m 计算钢筋面积2323 /m Load： 55

Y方向：弯矩3271.12 kN.m 计算钢筋面积2321 /m Load： 55

根据最小配筋率计算承台最小配筋：

= 1920. /m

= 1920. /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 18@100

Agy: HRB400 18@100