桩承台计算\_序号15

# 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

| 【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=6016.5kN =-23.2kN.m =29.9kN.m =95.0kN =2.2kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1000.0 | -1000.0 | 1490.85 | 1544.85 | 满足 |
| 2 | -1000.0 | 1000.0 | 1502.44 | 1556.44 | 满足 |
| 3 | 1000.0 | -1000.0 | 1505.82 | 1559.82 | 满足 |
| 4 | 1000.0 | 1000.0 | 1517.40 | 1571.40 | 满足 |

桩总反力= 6232.5 kN; 桩均反力= 1558.1 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=6012.6kN =-12.0kN.m =41.8kN.m =103.0kN =-5.3kN

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 | 1489.70 | 1543.70 | 满足 |
| 2 | -1000.0 | 1000.0 | 1495.72 | 1549.72 | 满足 |
| 3 | 1000.0 | -1000.0 | 1510.60 | 1564.60 | 满足 |
| 4 | 1000.0 | 1000.0 | 1516.62 | 1570.62 | 满足 |

桩总反力= 6228.6 kN; 桩均反力= 1557.2 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=7630.6kN =20.3kN.m =32.9kN.m =105.3kN =-28.5kN

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 | 1904.50 | 1958.50 | 满足 |
| 2 | -1000.0 | 1000.0 | 1894.36 | 1948.36 | 满足 |
| 3 | 1000.0 | -1000.0 | 1920.94 | 1974.94 | 满足 |
| 4 | 1000.0 | 1000.0 | 1910.80 | 1964.80 | 满足 |

桩总反力= 7846.6 kN; 桩均反力= 1961.6 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=7632.9kN =13.6kN.m =25.8kN.m =100.6kN =-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 | 1905.19 | 1959.19 | 满足 |
| 2 | -1000.0 | 1000.0 | 1898.39 | 1952.39 | 满足 |
| 3 | 1000.0 | -1000.0 | 1918.07 | 1972.07 | 满足 |
| 4 | 1000.0 | 1000.0 | 1911.26 | 1965.26 | 满足 |

桩总反力= 7848.9 kN; 桩均反力= 1962.2 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=6500.5kN =9.4kN.m =131.3kN.m =169.0kN =-13.0kN

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 | 1594.68 | 1648.68 | 满足 |
| 2 | -1000.0 | 1000.0 | 1589.96 | 1643.96 | 满足 |
| 3 | 1000.0 | -1000.0 | 1660.31 | 1714.31 | 满足 |
| 4 | 1000.0 | 1000.0 | 1655.59 | 1709.59 | 满足 |

桩总反力= 6716.5 kN; 桩均反力= 1679.1 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=7193.4kN =-1.4kN.m =-68.5kN.m =31.3kN =-20.9kN

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 | 1815.14 | 1869.14 | 满足 |
| 2 | -1000.0 | 1000.0 | 1815.82 | 1869.82 | 满足 |
| 3 | 1000.0 | -1000.0 | 1780.90 | 1834.90 | 满足 |
| 4 | 1000.0 | 1000.0 | 1781.58 | 1835.58 | 满足 |

桩总反力= 7409.4 kN; 桩均反力= 1852.4 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=6495.8kN =-89.6kN.m =26.4kN.m =96.6kN =49.1kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1000.0 | -1000.0 | 1594.95 | 1648.95 | 满足 |
| 2 | -1000.0 | 1000.0 | 1639.73 | 1693.73 | 满足 |
| 3 | 1000.0 | -1000.0 | 1608.16 | 1662.16 | 满足 |
| 4 | 1000.0 | 1000.0 | 1652.94 | 1706.94 | 满足 |

桩总反力= 6711.8 kN; 桩均反力= 1677.9 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=7198.2kN =97.6kN.m =36.4kN.m =103.7kN =-82.9kN

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 | 1814.87 | 1868.87 | 满足 |
| 2 | -1000.0 | 1000.0 | 1766.05 | 1820.05 | 满足 |
| 3 | 1000.0 | -1000.0 | 1833.05 | 1887.05 | 满足 |
| 4 | 1000.0 | 1000.0 | 1784.23 | 1838.23 | 满足 |

桩总反力= 7414.2 kN; 桩均反力= 1853.6 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=6498.0kN =7.5kN.m =129.8kN.m =168.0kN =-11.6kN

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 | 1593.91 | 1647.91 | 满足 |
| 2 | -1000.0 | 1000.0 | 1590.18 | 1644.18 | 满足 |
| 3 | 1000.0 | -1000.0 | 1658.80 | 1712.80 | 满足 |
| 4 | 1000.0 | 1000.0 | 1655.07 | 1709.07 | 满足 |

桩总反力= 6714.0 kN; 桩均反力= 1678.5 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=7196.0kN =0.6kN.m =-67.0kN.m =32.3kN =-22.2kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1000.0 | -1000.0 | 1815.91 | 1869.91 | 满足 |
| 2 | -1000.0 | 1000.0 | 1815.59 | 1869.59 | 满足 |
| 3 | 1000.0 | -1000.0 | 1782.42 | 1836.42 | 满足 |
| 4 | 1000.0 | 1000.0 | 1782.11 | 1836.11 | 满足 |

桩总反力= 7412.0 kN; 桩均反力= 1853.0 kN

当前荷载组合

| 【52】SATWE标准组合:1.00\*恒+0.50\*活+0.20\*风y右+1.00\*地y |
| --- |

承台底面荷载 :（考虑柱底剪力的影响）

N=6495.0kN =-87.3kN.m =28.8kN.m =98.2kN =47.6kN

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 | 1594.72 | 1648.72 | 满足 |
| 2 | -1000.0 | 1000.0 | 1638.39 | 1692.39 | 满足 |
| 3 | 1000.0 | -1000.0 | 1609.12 | 1663.12 | 满足 |
| 4 | 1000.0 | 1000.0 | 1652.78 | 1706.78 | 满足 |

桩总反力= 6711.0 kN; 桩均反力= 1677.8 kN

当前荷载组合

| 【53】SATWE标准组合:1.00\*恒+0.50\*活-0.20\*风y右-1.00\*地y |
| --- |

承台底面荷载 :（考虑柱底剪力的影响）

N=7199.0kN =95.4kN.m =34.0kN.m =102.1kN =-81.4kN

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 | 1815.10 | 1869.10 | 满足 |
| 2 | -1000.0 | 1000.0 | 1767.39 | 1821.39 | 满足 |
| 3 | 1000.0 | -1000.0 | 1832.10 | 1886.10 | 满足 |
| 4 | 1000.0 | 1000.0 | 1784.39 | 1838.39 | 满足 |

桩总反力= 7415.0 kN; 桩均反力= 1853.7 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=9678.5kN =5.3kN.m =43.3kN.m =138.4kN =-23.0kN

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 | 2410.14 | 2483.04 |
| 2 | -1000.0 | 1000.0 | 2407.47 | 2480.37 |
| 3 | 1000.0 | -1000.0 | 2431.80 | 2504.70 |
| 4 | 1000.0 | 1000.0 | 2429.13 | 2502.03 |

桩总反力= 9970.1 kN; 桩均反力= 2492.5 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 > = 2410.14(×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 > = 2431.80(×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 > = 2429.13(×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 > = 2407.47(×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 > = 9678.55 × 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

> = 4817.61 (\* 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

> = 4860.93 (\* 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

> = 4841.94 (\* 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

> = 4836.60 (\* 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 > = 9678.55 × 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

> = 4817.61 (\* 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

> = 4860.93 (\* 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

> = 4841.94 (\* 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

> = 4836.60 (\* 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：

= 3131.45\*1.00= 3131.45 X = -350. H = 1450.

= /(0.9\*\*)/YS = 3131.45/(0.9\*1450.0\*360.0)/3.0= 2221.8 /m

= 3159.61\*1.00= 3159.61 X = 350. H = 1450.

= /(0.9\*\*)/YS = 3159.61/(0.9\*1450.0\*360.0)/3.0= 2241.8 /m

= 3159.61\*1.00= 3159.61 X = 350. H = 1450.

= /(0.9\*\*)/YS = 3159.61/(0.9\*1450.0\*360.0)/3.0= 2241.8 /m

Y方向配筋计算：

= 3147.26\*1.00= 3147.26 Y = -350. H = 1450.

= /(0.9\*\*)/XS = 3147.26/(0.9\*1450.0\*360.0)/3.0= 2233.1 /m

= 3143.79\*1.00= 3143.79 Y = 350. H = 1450.

= /(0.9\*\*)/XS = 3143.79/(0.9\*1450.0\*360.0)/3.0= 2230.6 /m

= 3147.26\*1.00= 3147.26 Y = -350. H = 1450.

= /(0.9\*\*)/XS = 3147.26/(0.9\*1450.0\*360.0)/3.0= 2233.1 /m

计算的钢筋面积：

= 2242./m = 2233./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 | 1959.19 (35) | 1543.70 (12) | 1869.91 (47) | 1647.91 (46) |
| 2 | 1952.39 (35) | 1549.72 (12) | 1869.82 (43) | 1643.96 (42) |
| 3 | 1974.94 (19) | 1559.82 (4) | 1887.05 (45) | 1662.16 (44) |
| 4 | 1965.26 (35) | 1570.62 (12) | 1838.39 (53) | 1706.78 (52) |

桩平均反力最大值1962.23 (非震)(Load 35)

桩平均反力最小值1557.16 (非震)(Load 12)

桩平均反力最大值1853.74 (震)(Load 53)

桩平均反力最小值1677.75 (震)(Load 52)

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2410.14 kN ：850 mm (Load:55)

桩 2: 抗力3260.77 kN 冲切力2431.80 kN ：850 mm (Load:55)

桩 3: 抗力3260.77 kN 冲切力2429.13 kN ：850 mm (Load:55)

桩 4: 抗力3260.77 kN 冲切力2407.47 kN ：850 mm (Load:55)

柱冲切计算：

抗力14813.30 kN 冲切力9678.55 kN ：1450 mm Load：55

抗剪计算：

1左边： 抗力6085.87kN 剪力4817.61kN ：1450mm (Load:55)

2右边： 抗力6085.87kN 剪力4860.93kN ：1450mm (Load:55)

3上边： 抗力6085.87kN 剪力4841.94kN ：1450mm (Load:55)

4下边： 抗力6085.87kN 剪力4836.60kN ：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3159.61 kN.m 计算钢筋面积2242 /m Load： 55

Y方向：弯矩3147.26 kN.m 计算钢筋面积2233 /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