桩承台计算\_序号92

# 一、设计资料

1、承台信息

承台底标高：-4.50m

承台上段高：550mm

承台下段高：650mm

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 | -750 | -750 |
| 2 | -750 | 750 |
| 3 | 750 | -750 |
| 4 | 750 | 750 |

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

∑ = 2250000.0 ∑ = 2250000.0

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=5976.7kN =-63.5kN.m =-31.5kN.m =-21.9kN =28.1kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -750.0 | -750.0 | 1483.48 | 1537.48 | 满足 |
| 2 | -750.0 | 750.0 | 1525.82 | 1579.82 | 满足 |
| 3 | 750.0 | -750.0 | 1462.50 | 1516.50 | 满足 |
| 4 | 750.0 | 750.0 | 1504.84 | 1558.84 | 满足 |

桩总反力= 6192.7 kN; 桩均反力= 1548.2 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=5967.2kN =17.0kN.m =-31.1kN.m =-21.3kN =2.7kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -750.0 | -750.0 | 1507.83 | 1561.83 | 满足 |
| 2 | -750.0 | 750.0 | 1496.49 | 1550.49 | 满足 |
| 3 | 750.0 | -750.0 | 1487.11 | 1541.11 | 满足 |
| 4 | 750.0 | 750.0 | 1475.77 | 1529.77 | 满足 |

桩总反力= 6183.2 kN; 桩均反力= 1545.8 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=5959.8kN =-48.4kN.m =-46.7kN.m =-26.2kN =23.6kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -750.0 | -750.0 | 1489.36 | 1543.36 | 满足 |
| 2 | -750.0 | 750.0 | 1521.62 | 1575.62 | 满足 |
| 3 | 750.0 | -750.0 | 1458.26 | 1512.26 | 满足 |
| 4 | 750.0 | 750.0 | 1490.52 | 1544.52 | 满足 |

桩总反力= 6175.8 kN; 桩均反力= 1543.9 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=5954.1kN =-0.1kN.m =-46.4kN.m =-25.9kN =8.4kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -750.0 | -750.0 | 1503.97 | 1557.97 | 满足 |
| 2 | -750.0 | 750.0 | 1504.02 | 1558.02 | 满足 |
| 3 | 750.0 | -750.0 | 1473.02 | 1527.02 | 满足 |
| 4 | 750.0 | 750.0 | 1473.07 | 1527.07 | 满足 |

桩总反力= 6170.1 kN; 桩均反力= 1542.5 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=7503.2kN =-52.1kN.m =-32.6kN.m =-22.6kN =26.5kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -750.0 | -750.0 | 1869.26 | 1923.26 | 满足 |
| 2 | -750.0 | 750.0 | 1904.03 | 1958.03 | 满足 |
| 3 | 750.0 | -750.0 | 1847.56 | 1901.56 | 满足 |
| 4 | 750.0 | 750.0 | 1882.33 | 1936.33 | 满足 |

桩总反力= 7719.2 kN; 桩均反力= 1929.8 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=7497.5kN =-3.8kN.m =-32.3kN.m =-22.2kN =11.3kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -750.0 | -750.0 | 1883.87 | 1937.87 | 满足 |
| 2 | -750.0 | 750.0 | 1886.43 | 1940.43 | 满足 |
| 3 | 750.0 | -750.0 | 1862.32 | 1916.32 | 满足 |
| 4 | 750.0 | 750.0 | 1864.88 | 1918.88 | 满足 |

桩总反力= 7713.5 kN; 桩均反力= 1928.4 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=7507.6kN =-12.9kN.m =-23.2kN.m =-19.7kN =13.9kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -750.0 | -750.0 | 1880.34 | 1934.34 | 满足 |
| 2 | -750.0 | 750.0 | 1888.95 | 1942.95 | 满足 |
| 3 | 750.0 | -750.0 | 1864.87 | 1918.87 | 满足 |
| 4 | 750.0 | 750.0 | 1873.48 | 1927.48 | 满足 |

桩总反力= 7723.6 kN; 桩均反力= 1930.9 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=7511.1kN =-41.9kN.m =-23.3kN.m =-19.9kN =23.1kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -750.0 | -750.0 | 1871.58 | 1925.58 | 满足 |
| 2 | -750.0 | 750.0 | 1899.51 | 1953.51 | 满足 |
| 3 | 750.0 | -750.0 | 1856.02 | 1910.02 | 满足 |
| 4 | 750.0 | 750.0 | 1883.95 | 1937.95 | 满足 |

桩总反力= 7727.1 kN; 桩均反力= 1931.8 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=6856.5kN =-14.3kN.m =92.5kN.m =14.3kN =12.2kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -750.0 | -750.0 | 1678.53 | 1732.53 | 满足 |
| 2 | -750.0 | 750.0 | 1688.04 | 1742.04 | 满足 |
| 3 | 750.0 | -750.0 | 1740.21 | 1794.21 | 满足 |
| 4 | 750.0 | 750.0 | 1749.72 | 1803.72 | 满足 |

桩总反力= 7072.5 kN; 桩均反力= 1768.1 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=6615.8kN =-37.0kN.m =-156.2kN.m =-58.4kN =22.1kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -750.0 | -750.0 | 1693.69 | 1747.69 | 满足 |
| 2 | -750.0 | 750.0 | 1718.35 | 1772.35 | 满足 |
| 3 | 750.0 | -750.0 | 1589.54 | 1643.54 | 满足 |
| 4 | 750.0 | 750.0 | 1614.20 | 1668.20 | 满足 |

桩总反力= 6831.8 kN; 桩均反力= 1707.9 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=6768.8kN =-159.1kN.m =-38.1kN.m =-24.1kN =60.0kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -750.0 | -750.0 | 1651.86 | 1705.86 | 满足 |
| 2 | -750.0 | 750.0 | 1757.92 | 1811.92 | 满足 |
| 3 | 750.0 | -750.0 | 1626.46 | 1680.46 | 满足 |
| 4 | 750.0 | 750.0 | 1732.52 | 1786.52 | 满足 |

桩总反力= 6984.8 kN; 桩均反力= 1746.2 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=6703.5kN =107.8kN.m =-25.6kN.m =-20.0kN =-25.7kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -750.0 | -750.0 | 1720.36 | 1774.36 | 满足 |
| 2 | -750.0 | 750.0 | 1648.47 | 1702.47 | 满足 |
| 3 | 750.0 | -750.0 | 1703.29 | 1757.29 | 满足 |
| 4 | 750.0 | 750.0 | 1631.39 | 1685.39 | 满足 |

桩总反力= 6919.5 kN; 桩均反力= 1729.9 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=9560.0kN =-36.0kN.m =-43.4kN.m =-30.0kN =24.2kN

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 | -750.0 | -750.0 | 2392.43 | 2465.33 |
| 2 | -750.0 | 750.0 | 2416.45 | 2489.35 |
| 3 | 750.0 | -750.0 | 2363.52 | 2436.42 |
| 4 | 750.0 | 750.0 | 2387.55 | 2460.45 |

桩总反力= 9851.6 kN; 桩均反力= 2462.9 kN

台阶1 H = 650.00 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

= 150. =0.25 = 950.

= 150. =0.25 = 950.

= 600. =1.2444 = 1.244 =1.00 = 1.433

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

= 3124.98 kN > = 2392.43(×1.00) kN

角桩No.=2

= 150. =0.25 = 950.

= 150. =0.25 = 950.

= 600. =1.2444 = 1.244 =1.00 = 1.433

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

= 3124.98 kN > = 2363.52(×1.00) kN

角桩No.=3

= 150. =0.25 = 950.

= 150. =0.25 = 950.

= 600. =1.2444 = 1.244 =1.00 = 1.433

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

= 3124.98 kN > = 2387.55(×1.00) kN

角桩No.=4

= 150. =0.25 = 950.

= 150. =0.25 = 950.

= 600. =1.2444 = 1.244 =1.00 = 1.433

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

= 3124.98 kN > = 2416.45(×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=1150.mm

X正方向:= 150. =0.250

X负方向:= 150. =0.250

Y正方向:= 150. =0.250

Y负方向:= 150. =0.250

= 800. = 800. = 1.87 = 1.87 = 1.43 =0.967

=2[( + ) + ( + )]

=12250.44 kN > = 9559.95 × 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

=1150. = 552. =0.250

= [1.75/(+1.0)]

=0.913\*[1.75/(0.250+1.0)]\*2474.\*1150.\*1.4329\*1.e-3

= 5212.2 kN

> = 4808.88 (\* 1.00) kN

2、右侧抗剪计算

=1150. = 150. =0.250

= [1.75/(+1.0)]

=0.913\*[1.75/(0.250+1.0)]\*2474.\*1150.\*1.4329\*1.e-3

= 5212.2 kN

> = 4751.07 (\* 1.00) kN

3、下侧抗剪计算

=1150. = 150. =0.250

= [1.75/(+1.0)]

=0.913\*[1.75/(0.250+1.0)]\*2474.\*1150.\*1.4329\*1.e-3

= 5212.2 kN

> = 4755.95 (\* 1.00) kN

4、上侧抗剪计算

=1150. = 150. =0.250

= [1.75/(+1.0)]

=0.913\*[1.75/(0.250+1.0)]\*2474.\*1150.\*1.4329\*1.e-3

= 5212.2 kN

> = 4804.00 (\* 1.00) kN

台阶2 H = 1200.00 mm

b、柱冲切计算：

截面净高=1150.mm

X正方向:= 200. =0.250

X负方向:= 200. =0.250

Y正方向:= 200. =0.250

Y负方向:= 200. =0.250

= 700. = 700. = 1.87 = 1.87 = 1.43 =0.967

=2[( + ) + ( + )]

=11061.08 kN > = 9559.95 × 1.00 kN

c、承台抗剪计算

1、左侧抗剪计算

=1150. = 553. =0.250

= [1.75/(+1.0)]

=0.913\*[1.75/(0.250+1.0)]\*2474.\*1150.\*1.4329\*1.e-3

= 5212.2 kN

> = 4808.88 (\* 1.00) kN

2、右侧抗剪计算

=1150. = 200. =0.250

= [1.75/(+1.0)]

=0.913\*[1.75/(0.250+1.0)]\*2474.\*1150.\*1.4329\*1.e-3

= 5212.2 kN

> = 4751.07 (\* 1.00) kN

3、下侧抗剪计算

=1150. = 200. =0.250

= [1.75/(+1.0)]

=0.913\*[1.75/(0.250+1.0)]\*2474.\*1150.\*1.4329\*1.e-3

= 5212.2 kN

> = 4755.95 (\* 1.00) kN

4、上侧抗剪计算

=1150. = 200. =0.250

= [1.75/(+1.0)]

=0.913\*[1.75/(0.250+1.0)]\*2474.\*1150.\*1.4329\*1.e-3

= 5212.2 kN

> = 4804.00 (\* 1.00) kN

承台阶梯高度：

1阶高： 650mm

2阶高： 550mm

3、承台板抗弯计算

X方向配筋计算：

= 1923.55\*1.00= 1923.55 X = -350. H = 1150.

= /(0.9\*\*)/YS = 1923.55/(0.9\*1150.0\*360.0)/3.0= 1720.8 /m

= 1900.43\*1.00= 1900.43 X = 350. H = 1150.

= /(0.9\*\*)/YS = 1900.43/(0.9\*1150.0\*360.0)/3.0= 1700.2 /m

= 1923.55\*1.00= 1923.55 X = -350. H = 1150.

= /(0.9\*\*)/YS = 1923.55/(0.9\*1150.0\*360.0)/3.0= 1720.8 /m

Y方向配筋计算：

= 1902.38\*1.00= 1902.38 Y = -350. H = 1150.

= /(0.9\*\*)/XS = 1902.38/(0.9\*1150.0\*360.0)/3.0= 1701.9 /m

= 1921.60\*1.00= 1921.60 Y = 350. H = 1150.

= /(0.9\*\*)/XS = 1921.60/(0.9\*1150.0\*360.0)/3.0= 1719.1 /m

= 1921.60\*1.00= 1921.60 Y = 350. H = 1150.

= /(0.9\*\*)/XS = 1921.60/(0.9\*1150.0\*360.0)/3.0= 1719.1 /m

计算的钢筋面积：

= 1721./m = 1719./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 | 1937.87 (19) | 1537.48 (4) | 1774.36 (45) | 1705.86 (44) |
| 2 | 1958.03 (18) | 1550.49 (5) | 1811.92 (44) | 1702.47 (45) |
| 3 | 1918.87 (31) | 1512.26 (10) | 1794.21 (42) | 1643.54 (43) |
| 4 | 1937.95 (34) | 1527.07 (13) | 1803.72 (42) | 1668.20 (43) |

桩平均反力最大值1932.54 (非震)(Load 14)

桩平均反力最小值1541.23 (非震)(Load 3)

桩平均反力最大值1768.13 (震)(Load 42)

桩平均反力最小值1707.94 (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3124.98 kN 冲切力2392.43 kN ：600 mm (Load:55)

桩 2: 抗力3124.98 kN 冲切力2363.52 kN ：600 mm (Load:55)

桩 3: 抗力3124.98 kN 冲切力2387.55 kN ：600 mm (Load:55)

桩 4: 抗力3124.98 kN 冲切力2416.45 kN ：600 mm (Load:55)

柱冲切计算：

抗力11061.08 kN 冲切力9559.95 kN ：1150 mm Load：55

抗剪计算：

1左边： 抗力5212.21kN 剪力4808.88kN ：1150mm (Load:55)

2右边： 抗力5212.21kN 剪力4751.07kN ：1150mm (Load:55)

3上边： 抗力5212.21kN 剪力4755.95kN ：1150mm (Load:55)

4下边： 抗力5212.21kN 剪力4804.00kN ：1150mm (Load:55)

承台高度：

一阶高650 二阶高550

底板配筋计算：

X方向：弯矩1923.55 kN.m 计算钢筋面积1721 /m Load： 55

Y方向：弯矩1921.60 kN.m 计算钢筋面积1719 /m Load： 55

根据最小配筋率计算承台最小配筋：

= 1498. /m

= 1498. /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 16@100

Agy: HRB400 16@100