桩承台计算\_序号12

# 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

| 【2】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=6139.0kN =-5.3kN.m =15.4kN.m =11.1kN =9.7kN

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 | 1529.57 | 1583.57 | 满足 |
| 2 | -1000.0 | 1000.0 | 1532.22 | 1586.22 | 满足 |
| 3 | 1000.0 | -1000.0 | 1537.28 | 1591.28 | 满足 |
| 4 | 1000.0 | 1000.0 | 1539.93 | 1593.93 | 满足 |

桩总反力= 6355.0 kN; 桩均反力= 1588.8 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=6168.1kN =-31.5kN.m =-1.0kN.m =2.8kN =27.3kN

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 | 1534.41 | 1588.41 | 满足 |
| 2 | -1000.0 | 1000.0 | 1550.16 | 1604.16 | 满足 |
| 3 | 1000.0 | -1000.0 | 1533.90 | 1587.90 | 满足 |
| 4 | 1000.0 | 1000.0 | 1549.65 | 1603.65 | 满足 |

桩总反力= 6384.1 kN; 桩均反力= 1596.0 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=6147.2kN =23.5kN.m =-2.6kN.m =-1.3kN =-11.2kN

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 | 1543.33 | 1597.33 | 满足 |
| 2 | -1000.0 | 1000.0 | 1531.56 | 1585.56 | 满足 |
| 3 | 1000.0 | -1000.0 | 1542.03 | 1596.03 | 满足 |
| 4 | 1000.0 | 1000.0 | 1530.27 | 1584.27 | 满足 |

桩总反力= 6363.2 kN; 桩均反力= 1590.8 kN

当前荷载组合

| 【11】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=6139.3kN =11.7kN.m =8.6kN.m =6.0kN =-2.5kN

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 | 1535.59 | 1589.59 | 满足 |
| 2 | -1000.0 | 1000.0 | 1529.72 | 1583.72 | 满足 |
| 3 | 1000.0 | -1000.0 | 1539.91 | 1593.91 | 满足 |
| 4 | 1000.0 | 1000.0 | 1534.04 | 1588.04 | 满足 |

桩总反力= 6355.3 kN; 桩均反力= 1588.8 kN

当前荷载组合

| 【15】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=7807.5kN =-5.5kN.m =-12.6kN.m =-5.6kN =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 | -1000.0 | -1000.0 | 1953.65 | 2007.65 | 满足 |
| 2 | -1000.0 | 1000.0 | 1956.42 | 2010.42 | 满足 |
| 3 | 1000.0 | -1000.0 | 1947.33 | 2001.33 | 满足 |
| 4 | 1000.0 | 1000.0 | 1950.10 | 2004.10 | 满足 |

桩总反力= 8023.5 kN; 桩均反力= 2005.9 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=7802.6kN =-22.8kN.m =-1.8kN.m =1.8kN =24.7kN

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 | 1945.40 | 1999.40 | 满足 |
| 2 | -1000.0 | 1000.0 | 1956.81 | 2010.81 | 满足 |
| 3 | 1000.0 | -1000.0 | 1944.48 | 1998.48 | 满足 |
| 4 | 1000.0 | 1000.0 | 1955.90 | 2009.90 | 满足 |

桩总反力= 8018.6 kN; 桩均反力= 2004.6 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=7790.0kN =10.2kN.m =-2.8kN.m =-0.7kN =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 | 1950.75 | 2004.75 | 满足 |
| 2 | -1000.0 | 1000.0 | 1945.65 | 1999.65 | 满足 |
| 3 | 1000.0 | -1000.0 | 1949.36 | 2003.36 | 满足 |
| 4 | 1000.0 | 1000.0 | 1944.27 | 1998.27 | 满足 |

桩总反力= 8006.0 kN; 桩均反力= 2001.5 kN

当前荷载组合

| 【30】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=7807.4kN =-15.7kN.m =-8.6kN.m =-2.6kN =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 | 1950.05 | 2004.05 | 满足 |
| 2 | -1000.0 | 1000.0 | 1957.92 | 2011.92 | 满足 |
| 3 | 1000.0 | -1000.0 | 1945.76 | 1999.76 | 满足 |
| 4 | 1000.0 | 1000.0 | 1953.63 | 2007.63 | 满足 |

桩总反力= 8023.4 kN; 桩均反力= 2005.8 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=6874.7kN =-15.2kN.m =91.3kN.m =59.6kN =20.0kN

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 | 1692.05 | 1746.05 | 满足 |
| 2 | -1000.0 | 1000.0 | 1699.64 | 1753.64 | 满足 |
| 3 | 1000.0 | -1000.0 | 1737.71 | 1791.71 | 满足 |
| 4 | 1000.0 | 1000.0 | 1745.29 | 1799.29 | 满足 |

桩总反力= 7090.7 kN; 桩均反力= 1772.7 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=7079.3kN =4.9kN.m =-95.4kN.m =-58.2kN =1.1kN

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 | 1794.90 | 1848.90 | 满足 |
| 2 | -1000.0 | 1000.0 | 1792.46 | 1846.46 | 满足 |
| 3 | 1000.0 | -1000.0 | 1747.18 | 1801.18 | 满足 |
| 4 | 1000.0 | 1000.0 | 1744.75 | 1798.75 | 满足 |

桩总反力= 7295.3 kN; 桩均反力= 1823.8 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=7025.4kN =-98.8kN.m =2.9kN.m =6.5kN =78.8kN

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 | 1730.93 | 1784.93 | 满足 |
| 2 | -1000.0 | 1000.0 | 1780.33 | 1834.33 | 满足 |
| 3 | 1000.0 | -1000.0 | 1732.37 | 1786.37 | 满足 |
| 4 | 1000.0 | 1000.0 | 1781.77 | 1835.77 | 满足 |

桩总反力= 7241.4 kN; 桩均反力= 1810.4 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=6928.6kN =88.5kN.m =-7.0kN.m =-5.2kN =-57.6kN

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 | 1756.01 | 1810.01 | 满足 |
| 2 | -1000.0 | 1000.0 | 1711.76 | 1765.76 | 满足 |
| 3 | 1000.0 | -1000.0 | 1752.52 | 1806.52 | 满足 |
| 4 | 1000.0 | 1000.0 | 1708.27 | 1762.27 | 满足 |

桩总反力= 7144.6 kN; 桩均反力= 1786.1 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=9918.7kN =-7.7kN.m =-2.9kN.m =0.8kN =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 | 2478.49 | 2551.39 |
| 2 | -1000.0 | 1000.0 | 2482.33 | 2555.23 |
| 3 | 1000.0 | -1000.0 | 2477.03 | 2549.93 |
| 4 | 1000.0 | 1000.0 | 2480.86 | 2553.76 |

桩总反力= 10210.3 kN; 桩均反力= 2552.6 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 > = 2478.49(×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 > = 2477.03(×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 > = 2480.86(×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 > = 2482.33(×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 > = 9918.72 × 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

> = 4960.82 (\* 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

> = 4957.90 (\* 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

> = 4955.53 (\* 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

> = 4963.19 (\* 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 > = 9918.72 × 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

> = 4960.82 (\* 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

> = 4957.90 (\* 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

> = 4955.53 (\* 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

> = 4963.19 (\* 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：

= 3224.53\*1.00= 3224.53 X = -350. H = 1450.

= /(0.9\*\*)/YS = 3224.53/(0.9\*1450.0\*360.0)/3.0= 2287.9 /m

= 3222.63\*1.00= 3222.63 X = 350. H = 1450.

= /(0.9\*\*)/YS = 3222.63/(0.9\*1450.0\*360.0)/3.0= 2286.5 /m

= 3224.53\*1.00= 3224.53 X = -350. H = 1450.

= /(0.9\*\*)/YS = 3224.53/(0.9\*1450.0\*360.0)/3.0= 2287.9 /m

Y方向配筋计算：

= 3221.09\*1.00= 3221.09 Y = -350. H = 1450.

= /(0.9\*\*)/XS = 3221.09/(0.9\*1450.0\*360.0)/3.0= 2285.4 /m

= 3226.07\*1.00= 3226.07 Y = 350. H = 1450.

= /(0.9\*\*)/XS = 3226.07/(0.9\*1450.0\*360.0)/3.0= 2289.0 /m

= 3226.07\*1.00= 3226.07 Y = 350. H = 1450.

= /(0.9\*\*)/XS = 3226.07/(0.9\*1450.0\*360.0)/3.0= 2289.0 /m

计算的钢筋面积：

= 2288./m = 2289./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 | 2007.65 (15) | 1583.57 (2) | 1848.90 (43) | 1746.05 (42) |
| 2 | 2011.92 (30) | 1583.72 (11) | 1846.46 (43) | 1753.64 (42) |
| 3 | 2003.36 (19) | 1587.90 (4) | 1806.52 (45) | 1786.37 (44) |
| 4 | 2009.90 (18) | 1584.27 (5) | 1835.77 (44) | 1762.27 (45) |

桩平均反力最大值2005.88 (非震)(Load 15)

桩平均反力最小值1588.75 (非震)(Load 2)

桩平均反力最大值1823.82 (震)(Load 43)

桩平均反力最小值1772.67 (震)(Load 42)

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2478.49 kN ：850 mm (Load:55)

桩 2: 抗力3260.77 kN 冲切力2477.03 kN ：850 mm (Load:55)

桩 3: 抗力3260.77 kN 冲切力2480.86 kN ：850 mm (Load:55)

桩 4: 抗力3260.77 kN 冲切力2482.33 kN ：850 mm (Load:55)

柱冲切计算：

抗力14813.30 kN 冲切力9918.72 kN ：1450 mm Load：55

抗剪计算：

1左边： 抗力6085.87kN 剪力4960.82kN ：1450mm (Load:55)

2右边： 抗力6085.87kN 剪力4957.90kN ：1450mm (Load:55)

3上边： 抗力6085.87kN 剪力4955.53kN ：1450mm (Load:55)

4下边： 抗力6085.87kN 剪力4963.19kN ：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3224.53 kN.m 计算钢筋面积2288 /m Load： 55

Y方向：弯矩3226.07 kN.m 计算钢筋面积2289 /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