桩承台计算\_序号108

# 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：700mm

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 | -1100 | -1100 |
| 2 | -1100 | 1100 |
| 3 | 0 | 0 |
| 4 | 1100 | -1100 |
| 5 | 1100 | 1100 |

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

= 13.7× 24.0

= 328.6 kN

∑ = 4840000.0 ∑ = 4840000.0

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=8238.9kN =76.0kN.m =-28.4kN.m =-2.5kN =-53.3kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1100.0 | -1100.0 | 1671.50 | 1737.21 | 满足 |
| 2 | -1100.0 | 1100.0 | 1636.97 | 1702.69 | 满足 |
| 3 | 0.0 | 0.0 | 1647.79 | 1713.50 | 满足 |
| 4 | 1100.0 | -1100.0 | 1658.60 | 1724.32 | 满足 |
| 5 | 1100.0 | 1100.0 | 1624.08 | 1689.79 | 满足 |

桩总反力= 8567.5 kN; 桩均反力= 1713.5 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=8176.6kN =133.3kN.m =10.2kN.m =7.6kN =-67.9kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1100.0 | -1100.0 | 1663.28 | 1728.99 | 满足 |
| 2 | -1100.0 | 1100.0 | 1602.70 | 1668.41 | 满足 |
| 3 | 0.0 | 0.0 | 1635.31 | 1701.03 | 满足 |
| 4 | 1100.0 | -1100.0 | 1667.93 | 1733.64 | 满足 |
| 5 | 1100.0 | 1100.0 | 1607.35 | 1673.07 | 满足 |

桩总反力= 8505.1 kN; 桩均反力= 1701.0 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=8231.0kN =108.5kN.m =34.7kN.m =13.8kN =-61.4kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1100.0 | -1100.0 | 1662.97 | 1728.68 | 满足 |
| 2 | -1100.0 | 1100.0 | 1613.64 | 1679.35 | 满足 |
| 3 | 0.0 | 0.0 | 1646.19 | 1711.91 | 满足 |
| 4 | 1100.0 | -1100.0 | 1678.75 | 1744.46 | 满足 |
| 5 | 1100.0 | 1100.0 | 1629.42 | 1695.13 | 满足 |

桩总反力= 8559.5 kN; 桩均反力= 1711.9 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=10747.0kN =93.6kN.m =35.4kN.m =14.7kN =-66.3kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1100.0 | -1100.0 | 2162.64 | 2228.35 | 满足 |
| 2 | -1100.0 | 1100.0 | 2120.08 | 2185.79 | 满足 |
| 3 | 0.0 | 0.0 | 2149.40 | 2215.11 | 满足 |
| 4 | 1100.0 | -1100.0 | 2178.72 | 2244.43 | 满足 |
| 5 | 1100.0 | 1100.0 | 2136.16 | 2201.87 | 满足 |

桩总反力= 11075.6 kN; 桩均反力= 2215.1 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=10784.4kN =59.2kN.m =12.2kN.m =8.6kN =-57.5kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1100.0 | -1100.0 | 2167.57 | 2233.28 | 满足 |
| 2 | -1100.0 | 1100.0 | 2140.64 | 2206.36 | 满足 |
| 3 | 0.0 | 0.0 | 2156.88 | 2222.60 | 满足 |
| 4 | 1100.0 | -1100.0 | 2173.12 | 2238.83 | 满足 |
| 5 | 1100.0 | 1100.0 | 2146.19 | 2211.91 | 满足 |

桩总反力= 11113.0 kN; 桩均反力= 2222.6 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=10751.8kN =74.1kN.m =-2.5kN.m =5.0kN =-61.4kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1100.0 | -1100.0 | 2167.75 | 2233.47 | 满足 |
| 2 | -1100.0 | 1100.0 | 2134.08 | 2199.79 | 满足 |
| 3 | 0.0 | 0.0 | 2150.36 | 2216.07 | 满足 |
| 4 | 1100.0 | -1100.0 | 2166.63 | 2232.34 | 满足 |
| 5 | 1100.0 | 1100.0 | 2132.96 | 2198.67 | 满足 |

桩总反力= 11080.3 kN; 桩均反力= 2216.1 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=9611.8kN =66.4kN.m =208.5kN.m =59.6kN =-53.9kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1100.0 | -1100.0 | 1890.07 | 1955.78 | 满足 |
| 2 | -1100.0 | 1100.0 | 1859.89 | 1925.60 | 满足 |
| 3 | 0.0 | 0.0 | 1922.36 | 1988.08 | 满足 |
| 4 | 1100.0 | -1100.0 | 1984.84 | 2050.55 | 满足 |
| 5 | 1100.0 | 1100.0 | 1954.66 | 2020.37 | 满足 |

桩总反力= 9940.4 kN; 桩均反力= 1988.1 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=9385.3kN =102.5kN.m =-186.0kN.m =-43.5kN =-65.4kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1100.0 | -1100.0 | 1942.63 | 2008.34 | 满足 |
| 2 | -1100.0 | 1100.0 | 1896.06 | 1961.77 | 满足 |
| 3 | 0.0 | 0.0 | 1877.07 | 1942.78 | 满足 |
| 4 | 1100.0 | -1100.0 | 1858.07 | 1923.79 | 满足 |
| 5 | 1100.0 | 1100.0 | 1811.50 | 1877.21 | 满足 |

桩总反力= 9713.9 kN; 桩均反力= 1942.8 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=9780.5kN =-109.4kN.m =1.5kN.m =5.3kN =-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 | -1100.0 | -1100.0 | 1930.91 | 1996.62 | 满足 |
| 2 | -1100.0 | 1100.0 | 1980.62 | 2046.33 | 满足 |
| 3 | 0.0 | 0.0 | 1956.10 | 2021.82 | 满足 |
| 4 | 1100.0 | -1100.0 | 1931.59 | 1997.30 | 满足 |
| 5 | 1100.0 | 1100.0 | 1981.29 | 2047.01 | 满足 |

桩总反力= 10109.1 kN; 桩均反力= 2021.8 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=9216.6kN =278.2kN.m =21.0kN.m =10.9kN =-110.9kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1100.0 | -1100.0 | 1901.79 | 1967.50 | 满足 |
| 2 | -1100.0 | 1100.0 | 1775.33 | 1841.04 | 满足 |
| 3 | 0.0 | 0.0 | 1843.33 | 1909.04 | 满足 |
| 4 | 1100.0 | -1100.0 | 1911.32 | 1977.03 | 满足 |
| 5 | 1100.0 | 1100.0 | 1784.86 | 1850.58 | 满足 |

桩总反力= 9545.2 kN; 桩均反力= 1909.0 kN

当前荷载组合

| 【48】SATWE标准组合:1.00\*恒+0.50\*活+0.20\*风x右+1.00\*地x |
| --- |

承台底面荷载 :（考虑柱底剪力的影响）

N=9602.9kN =70.8kN.m =205.4kN.m =58.9kN =-55.0kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1100.0 | -1100.0 | 1889.99 | 1955.70 | 满足 |
| 2 | -1100.0 | 1100.0 | 1857.81 | 1923.52 | 满足 |
| 3 | 0.0 | 0.0 | 1920.58 | 1986.29 | 满足 |
| 4 | 1100.0 | -1100.0 | 1983.35 | 2049.07 | 满足 |
| 5 | 1100.0 | 1100.0 | 1951.18 | 2016.89 | 满足 |

桩总反力= 9931.5 kN; 桩均反力= 1986.3 kN

当前荷载组合

| 【49】SATWE标准组合:1.00\*恒+0.50\*活-0.20\*风x右-1.00\*地x |
| --- |

承台底面荷载 :（考虑柱底剪力的影响）

N=9394.2kN =98.1kN.m =-182.9kN.m =-42.7kN =-64.3kN

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) | 是否满足 |
| --- | --- | --- | --- | --- | --- |
| 1 | -1100.0 | -1100.0 | 1942.71 | 2008.42 | 满足 |
| 2 | -1100.0 | 1100.0 | 1898.14 | 1963.85 | 满足 |
| 3 | 0.0 | 0.0 | 1878.85 | 1944.56 | 满足 |
| 4 | 1100.0 | -1100.0 | 1859.56 | 1925.27 | 满足 |
| 5 | 1100.0 | 1100.0 | 1814.98 | 1880.70 | 满足 |

桩总反力= 9722.8 kN; 桩均反力= 1944.6 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=13574.4kN =120.3kN.m =15.8kN.m =11.3kN =-84.8kN

承台及覆土重:

= 328.6×1.35= 443.6

桩反力表

| 桩号 | X | Y | 桩净反力Qn(kN) | 桩反力Q(kN) |
| --- | --- | --- | --- | --- |
| 1 | -1100.0 | -1100.0 | 2738.62 | 2827.33 |
| 2 | -1100.0 | 1100.0 | 2683.96 | 2772.67 |
| 3 | 0.0 | 0.0 | 2714.87 | 2803.58 |
| 4 | 1100.0 | -1100.0 | 2745.78 | 2834.49 |
| 5 | 1100.0 | 1100.0 | 2691.12 | 2779.83 |

桩总反力= 14017.9 kN; 桩均反力= 2803.6 kN

台阶1 H = 700.00 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

= 450. =0.38 = 950.

= 450. =0.38 = 950.

= 650. =0.9739 = 0.974 =1.00 = 1.433

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

= 2860.80 kN > = 2738.62(×1.00) kN

角桩No.=2

= 450. =0.38 = 950.

= 450. =0.38 = 950.

= 650. =0.9739 = 0.974 =1.00 = 1.433

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

= 2860.80 kN > = 2745.78(×1.00) kN

角桩No.=3

= 450. =0.38 = 950.

= 450. =0.38 = 950.

= 650. =0.9739 = 0.974 =1.00 = 1.433

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

= 2860.80 kN > = 2691.12(×1.00) kN

角桩No.=4

= 450. =0.38 = 950.

= 450. =0.38 = 950.

= 650. =0.9739 = 0.974 =1.00 = 1.433

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

= 2860.80 kN > = 2683.96(×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=1200.mm

X正方向:= 450. =0.375

X负方向:= 450. =0.375

Y正方向:= 450. =0.375

Y负方向:= 450. =0.375

= 900. = 900. = 1.46 = 1.46 = 1.43 =0.962

=2[( + ) + ( + )]

=13055.71 kN > =10859.48 × 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

=1200. = 902. =0.375

= [1.75/(+1.0)]

=0.904\*[1.75/(0.375+1.0)]\*3058.\*1200.\*1.4329\*1.e-3

= 6047.7 kN

> = 5422.58 (\* 1.00) kN

2、右侧抗剪计算

=1200. = 450. =0.375

= [1.75/(+1.0)]

=0.904\*[1.75/(0.375+1.0)]\*3058.\*1200.\*1.4329\*1.e-3

= 6047.7 kN

> = 5436.90 (\* 1.00) kN

3、下侧抗剪计算

=1200. = 450. =0.375

= [1.75/(+1.0)]

=0.904\*[1.75/(0.375+1.0)]\*3058.\*1200.\*1.4329\*1.e-3

= 6047.7 kN

> = 5484.41 (\* 1.00) kN

4、上侧抗剪计算

=1200. = 450. =0.375

= [1.75/(+1.0)]

=0.904\*[1.75/(0.375+1.0)]\*3058.\*1200.\*1.4329\*1.e-3

= 6047.7 kN

> = 5375.08 (\* 1.00) kN

台阶2 H = 1250.00 mm

b、柱冲切计算：

截面净高=1200.mm

X正方向:= 500. =0.417

X负方向:= 500. =0.417

Y正方向:= 500. =0.417

Y负方向:= 500. =0.417

= 800. = 800. = 1.36 = 1.36 = 1.43 =0.962

=2[( + ) + ( + )]

=11722.69 kN > =10859.48 × 1.00 kN

c、承台抗剪计算

1、左侧抗剪计算

=1200. = 903. =0.417

= [1.75/(+1.0)]

=0.904\*[1.75/(0.417+1.0)]\*3058.\*1200.\*1.4329\*1.e-3

= 5869.8 kN

> = 5422.58 (\* 1.00) kN

2、右侧抗剪计算

=1200. = 500. =0.417

= [1.75/(+1.0)]

=0.904\*[1.75/(0.417+1.0)]\*3058.\*1200.\*1.4329\*1.e-3

= 5869.8 kN

> = 5436.90 (\* 1.00) kN

3、下侧抗剪计算

=1200. = 500. =0.417

= [1.75/(+1.0)]

=0.904\*[1.75/(0.417+1.0)]\*3058.\*1200.\*1.4329\*1.e-3

= 5869.8 kN

> = 5484.41 (\* 1.00) kN

4、上侧抗剪计算

=1200. = 500. =0.417

= [1.75/(+1.0)]

=0.904\*[1.75/(0.417+1.0)]\*3058.\*1200.\*1.4329\*1.e-3

= 5869.8 kN

> = 5375.08 (\* 1.00) kN

承台阶梯高度：

1阶高： 700mm

2阶高： 550mm

3、承台板抗弯计算

X方向配筋计算：

= 3795.81\*1.00= 3795.81 X = -400. H = 1200.

= /(0.9\*\*)/YS = 3795.81/(0.9\*1200.0\*360.0)/3.7= 2638.6 /m

= 3805.83\*1.00= 3805.83 X = 400. H = 1200.

= /(0.9\*\*)/YS = 3805.83/(0.9\*1200.0\*360.0)/3.7= 2645.6 /m

= 3805.83\*1.00= 3805.83 X = 400. H = 1200.

= /(0.9\*\*)/YS = 3805.83/(0.9\*1200.0\*360.0)/3.7= 2645.6 /m

Y方向配筋计算：

= 3839.08\*1.00= 3839.08 Y = -400. H = 1200.

= /(0.9\*\*)/XS = 3839.08/(0.9\*1200.0\*360.0)/3.7= 2668.7 /m

= 3762.55\*1.00= 3762.55 Y = 400. H = 1200.

= /(0.9\*\*)/XS = 3762.55/(0.9\*1200.0\*360.0)/3.7= 2615.5 /m

= 3839.08\*1.00= 3839.08 Y = -400. H = 1200.

= /(0.9\*\*)/XS = 3839.08/(0.9\*1200.0\*360.0)/3.7= 2668.7 /m

计算的钢筋面积：

= 2646./m = 2669./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 | 2233.47 (30) | 1728.68 (11) | 2008.42 (49) | 1955.70 (48) |
| 2 | 2206.36 (18) | 1668.41 (5) | 2046.33 (44) | 1841.04 (45) |
| 3 | 2222.60 (18) | 1701.03 (5) | 2021.82 (44) | 1909.04 (45) |
| 4 | 2244.43 (14) | 1724.32 (3) | 2050.55 (42) | 1923.79 (43) |
| 5 | 2211.91 (18) | 1673.07 (5) | 2047.01 (44) | 1850.58 (45) |

桩平均反力最大值2222.60 (非震)(Load 18)

桩平均反力最小值1701.03 (非震)(Load 5)

桩平均反力最大值2021.82 (震)(Load 44)

桩平均反力最小值1909.04 (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2860.80 kN 冲切力2738.62 kN ：650 mm (Load:55)

桩 2: 抗力2860.80 kN 冲切力2745.78 kN ：650 mm (Load:55)

桩 3: 抗力2860.80 kN 冲切力2691.12 kN ：650 mm (Load:55)

桩 4: 抗力2860.80 kN 冲切力2683.96 kN ：650 mm (Load:55)

柱冲切计算：

抗力11722.69 kN 冲切力10859.48 kN ：1200 mm Load：55

抗剪计算：

1左边： 抗力5869.85kN 剪力5422.58kN ：1200mm (Load:55)

2右边： 抗力5869.85kN 剪力5436.90kN ：1200mm (Load:55)

3上边： 抗力5869.85kN 剪力5484.41kN ：1200mm (Load:55)

4下边： 抗力5869.85kN 剪力5375.08kN ：1200mm (Load:55)

承台高度：

一阶高700 二阶高550

底板配筋计算：

X方向：弯矩3805.83 kN.m 计算钢筋面积2646 /m Load： 55

Y方向：弯矩3839.08 kN.m 计算钢筋面积2669 /m Load： 55

根据最小配筋率计算承台最小配筋：

= 1563. /m

= 1563. /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