结构计算书

**2023年7月**

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一. 设计依据

《建筑结构荷载规范》(GB 50009-2012);

《建筑抗震设计规范》(GB 50011-2010);

《钢结构设计规范》(GB 50017-2017);

二. 计算软件信息

本工程计算软件为PKPM钢结构设计软件(21版V4.3-2018年9月30日)。

计算日期为 2023年 7月12日18时33分37秒。

三. 结构计算简图



图1-1 结构简图

四. 结构计算信息

结构类型: 单层钢结构厂房

设计规范: 按《钢结构设计规范》计算

结构重要性系数: 1.00

节点总数: 12

柱数: 11

梁数: 0

支座约束数: 7

标准截面总数: 2

活荷载计算信息: 考虑活荷载不利布置

风荷载计算信息: 不计算风荷载

钢材: Q235

梁柱自重计算信息: 柱梁自重都计算

恒载作用下柱的轴向变形: 考虑

梁柱自重计算增大系数: 1.20

梁刚度增大系数: 1.00

钢结构净截面面积与毛截面面积比: 0.85

钢柱计算长度系数计算方法: 无侧移

钢结构阶形柱的计算长度折减系数: 0.800

程序自动确定允许的长细比

钢梁(恒+活)容许挠跨比: l /180

钢梁(活)容许挠跨比: l /180

柱顶容许水平位移/柱高: l /500

地震影响系数取值依据: 10抗规(2010版)

特征周期(s):0.35

水平地震影响系数最大值αmax:0.08

地震作用计算: 计算水平地震作用

计算振型数：3

地震烈度：7.00

场地土类别：Ⅱ类

附加重量节点数：0

设计地震分组：第一组

周期折减系数:0.80

地震力计算方法：振型分解法

结构阻尼比：0.050

按GB50011-2010 地震效应增大系数:1.050

防火设计计算信息：不考虑防火设计

五. 结构基本信息

**节点坐标**

| 节点号 | X | Y | 节点号 | X | Y |
| --- | --- | --- | --- | --- | --- |
|  1 | 0.00 | 3.00 | 2 | 6.00 | 3.00 |
|  3 | 12.00 | 3.00 | 4 | 18.00 | 3.00 |
|  5 | 24.00 | 3.00 | 6 | 31.00 | 3.00 |
|  7 | 0.00 | 0.00 | 8 | 6.00 | 0.00 |
|  9 | 12.00 | 0.00 | 10 | 18.00 | 0.00 |
|  11 | 24.00 | 0.00 | 12 | 31.00 | 0.00 |

**柱关联号**

| 柱号 | 节点Ι | 节点Π | 柱号 | 节点Ι | 节点Π |
| --- | --- | --- | --- | --- | --- |
|  1 |  7 |  1 |  2 |  8 |  2 |
|  3 |  9 |  3 |  4 |  10 |  4 |
|  5 |  11 |  5 |  6 |  12 |  6 |
|  7 |  1 |  2 |  8 |  2 |  3 |
|  9 |  3 |  4 |  10 |  4 |  5 |
|  11 |  5 |  6 |  |  |  |

**梁关联号**

| 梁号 | 节点Ι | 节点Π | 梁号 | 节点Ι | 节点Π |
| --- | --- | --- | --- | --- | --- |

**柱节点偏心 (m)**

| 节点号 | 柱偏心值 | 节点号 | 柱偏心值 | 节点号 | 柱偏心值 |
| --- | --- | --- | --- | --- | --- |
|  1 | 0.000 |  2 | 0.000 |  3 | 0.000 |
|  4 | 0.000 |  5 | 0.000 |  6 | 0.000 |
|  7 | 0.000 |  8 | 0.000 |  9 | 0.000 |
|  10 | 0.000 |  11 | 0.000 |  12 | 0.000 |

**标准截面信息**

| 截面号 | 截面信息 |
| --- | --- |
|  1 | 国标宽、窄翼缘H型钢：HN300X150 |
|  2 | 空心圆管截面:  D\*T=200\*10 |

**柱布置截面号,约束信息,截面布置角度**

| 柱号 | 标准截面号 | 约束信息 | 截面布置角度 |
| --- | --- | --- | --- |
|  1 |  1 | I端铰接 | 90 |
|  2 |  1 | I端铰接 | 90 |
|  3 |  1 | I端铰接 | 90 |
|  4 |  1 | I端铰接 | 90 |
|  5 |  1 | I端铰接 | 90 |
|  6 |  1 | I端铰接 | 90 |
|  7 |  2 | 两端铰接 | 0 |
|  8 |  2 | 两端铰接 | 0 |
|  9 |  2 | 两端铰接 | 0 |
|  10 |  2 | 两端铰接 | 0 |
|  11 |  2 | 两端铰接 | 0 |

**梁布置截面号,约束信息**

| 梁号 | 标准截面号 | 约束信息 |
| --- | --- | --- |

**截面特性**

| 截面号 | Xc (mm) | Yc (mm) | Ix (cm4) | Iy (cm4) | A (cm2) |
| --- | --- | --- | --- | --- | --- |
|  1 | 75.0 | 150.0 | 7210.0 | 508.0 | 46.8 |
|  2 | 100.0 | 100.0 | 2701.0 | 2701.0 | 59.7 |

**截面特性**

| 截面号 | ix (cm) | iy (cm) | W1x (cm3) | W2x (cm3) | W1y (cm3) | W2y (cm3) |
| --- | --- | --- | --- | --- | --- | --- |
|  1 | 12.4 | 3.3 | 481.0 | 481.0 | 67.7 | 67.7 |
|  2 | 6.7 | 6.7 | 270.1 | 270.1 | 270.1 | 270.1 |

六. 荷载与效应组合

## 1. 各工况荷载表

**节点荷载**

| 工况 | 节点号 | 弯矩 | 垂直力 | 水平力 |
| --- | --- | --- | --- | --- |
| -- | -- | -- | -- | -- |

**柱荷载**

| 工况 | 柱号 | 荷载类型 | 荷载值 | 荷载参数1 | 荷载参数2 |
| --- | --- | --- | --- | --- | --- |
| -- | -- | -- | -- | -- | -- |

**梁荷载**

| 工况 | 连续数 | 荷载个数 | 荷载类型 | 荷载值1 | 荷载参数1 | 荷载值2 | 荷载参数2 |
| --- | --- | --- | --- | --- | --- | --- | --- |
| -- | -- | -- | -- | -- | -- | -- | -- |

## 2. 荷载效应组合表

**(1)柱内力的组合值**

| 柱内力的组合 |
| --- |

**(2)梁内力的组合值**

| 梁内力组合 |
| --- |

七. 地震计算信息

## 1. 左地震

**地震力计算质量集中信息**

| 质量集中节点号 | 质量重量(KN) |
| --- | --- |
| 1 | 2.348 |
| 2 | 4.035 |
| 3 | 4.035 |
| 4 | 4.035 |
| 5 | 4.316 |
| 6 | 2.629 |

水平地震标准值作用底层剪力： 0.786

底层最小地震剪力(抗震规范5.2.5条): 0.342

各质点地震力调整系数: 1.000

地震力调整后剪重比： 0.037

**周期(已乘折减系数)**

| 振型号 | 周期(s) |
| --- | --- |
| 1 | 0.024 |
| 2 | 0.008 |
| 3 | 0.005 |

## 2. 右地震

**地震力计算质量集中信息**

| 质量集中节点号 | 质量重量(KN) |
| --- | --- |
| 1 | 2.348 |
| 2 | 4.035 |
| 3 | 4.035 |
| 4 | 4.035 |
| 5 | 4.316 |
| 6 | 2.629 |

水平地震标准值作用底层剪力： 0.786

底层最小地震剪力(抗震规范5.2.5条): 0.342

各质点地震力调整系数: 1.000

地震力调整后剪重比： 0.037

**周期(已乘折减系数)**

| 振型号 | 周期(s) |
| --- | --- |
| 1 | 0.024 |
| 2 | 0.008 |
| 3 | 0.005 |

八. 内力计算结果

## 1. 单工况内力

**柱内力**

| 工况 | 单元 | I端N(kN) | I端V(kN) | I端M(kN.m) | II端N(kN) | II端V(kN) | II端M(kN.m) |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 恒荷载 | 1 | 3.0 | -0.0 | 0.0 | -1.7 | 0.0 | -0.0 |
| 2 | 4.7 | -0.0 | 0.0 | -3.4 | 0.0 | -0.0 |
| 3 | 4.7 | 0.0 | 0.0 | -3.4 | -0.0 | 0.0 |
| 4 | 4.7 | -0.0 | 0.0 | -3.4 | 0.0 | -0.0 |
| 5 | 5.0 | 0.0 | 0.0 | -3.7 | -0.0 | 0.0 |
| 6 | 3.3 | 0.0 | 0.0 | -2.0 | -0.0 | 0.0 |
| 7 | 0.0 | 1.7 | 0.0 | -0.0 | 1.7 | 0.0 |
| 8 | 0.0 | 1.7 | -0.0 | -0.0 | 1.7 | -0.0 |
| 9 | 0.0 | 1.7 | -0.0 | -0.0 | 1.7 | -0.0 |
| 10 | 0.0 | 1.7 | 0.0 | -0.0 | 1.7 | 0.0 |
| 11 | 0.0 | 2.0 | -0.0 | -0.0 | 2.0 | -0.0 |
| 左地震 | 1 | -0.0 | 0.0 | -0.0 | 0.0 | -0.0 | 0.0 |
| 2 | 0.0 | 0.0 | -0.0 | -0.0 | -0.0 | 0.0 |
| 3 | 0.0 | 0.0 | -0.0 | -0.0 | -0.0 | 0.0 |
| 4 | 0.0 | 0.0 | -0.0 | -0.0 | -0.0 | 0.0 |
| 5 | 0.0 | 0.0 | -0.0 | -0.0 | -0.0 | 0.0 |
| 6 | 0.0 | 0.0 | -0.0 | -0.0 | -0.0 | 0.0 |
| 7 | 0.1 | -0.0 | -0.0 | -0.1 | 0.0 | -0.0 |
| 8 | 0.4 | -0.0 | -0.0 | -0.4 | 0.0 | -0.0 |
| 9 | 0.6 | -0.0 | -0.0 | -0.6 | 0.0 | -0.0 |
| 10 | 0.7 | -0.0 | -0.0 | -0.7 | 0.0 | -0.0 |
| 11 | 0.8 | -0.0 | -0.0 | -0.8 | 0.0 | -0.0 |
| 右地震 | 1 | 0.0 | -0.0 | -0.0 | -0.0 | 0.0 | -0.0 |
| 2 | -0.0 | -0.0 | -0.0 | 0.0 | 0.0 | -0.0 |
| 3 | -0.0 | -0.0 | -0.0 | 0.0 | 0.0 | -0.0 |
| 4 | -0.0 | -0.0 | -0.0 | 0.0 | 0.0 | -0.0 |
| 5 | -0.0 | -0.0 | -0.0 | 0.0 | 0.0 | -0.0 |
| 6 | -0.0 | -0.0 | -0.0 | 0.0 | 0.0 | -0.0 |
| 7 | -0.1 | 0.0 | 0.0 | 0.1 | -0.0 | 0.0 |
| 8 | -0.4 | 0.0 | 0.0 | 0.4 | -0.0 | 0.0 |
| 9 | -0.6 | 0.0 | 0.0 | 0.6 | -0.0 | 0.0 |
| 10 | -0.7 | 0.0 | 0.0 | 0.7 | -0.0 | 0.0 |
| 11 | -0.8 | 0.0 | 0.0 | 0.8 | -0.0 | 0.0 |

**梁内力**

| 工况号 | 单元号 | I端N(kN) | I端V(kN) | I端M(kN.m) | II端N(kN) | II端V(kN) | II端M(kN.m) |
| --- | --- | --- | --- | --- | --- | --- | --- |

九. 节点位移

**恒荷载工况下节点位移（mm）**

| 节点号 | X向位移 | Y向位移 |
| --- | --- | --- |
| 1 | 0.00 | 0.01 |
| 2 | 0.00 | 0.01 |
| 3 | 0.00 | 0.01 |
| 4 | 0.00 | 0.01 |
| 5 | 0.00 | 0.01 |
| 6 | 0.00 | 0.01 |

**活荷载工况下节点位移（mm）**

| 节点号 | X向位移 | Y向位移 |
| --- | --- | --- |
| 1 | 0.00 | -0.00 |
| 2 | 0.00 | -0.00 |
| 3 | 0.00 | -0.00 |
| 4 | 0.00 | -0.00 |
| 5 | 0.00 | -0.00 |
| 6 | 0.00 | -0.00 |

**节点侧向（水平向）位移(mm)**

| 工况 | 节点 | δx | 节点 | δx |
| --- | --- | --- | --- | --- |
| 左地震 |  1 | 0.01 |  2 | 0.01 |
|  3 | 0.01 |  4 | 0.01 |
|  5 | 0.00 |  6 | 0.00 |
|  7 | 0.00 |  8 | 0.00 |
|  9 | 0.00 | 10 | 0.00 |
| 11 | 0.00 | 12 | 0.00 |
| 13 | 0.00 |  |  |
| 右地震 |  1 | -0.01 |  2 | -0.01 |
|  3 | -0.01 |  4 | -0.01 |
|  5 | -0.00 |  6 | -0.00 |
|  7 | 0.00 |  8 | 0.00 |
|  9 | 0.00 | 10 | 0.00 |
| 11 | 0.00 | 12 | 0.00 |
| 13 | 0.00 |  |  |

十. 构件设计结果

**1、 钢 柱 1 设计结果**

 截面类型=39; 布置角度=0; 计算长度：Lx=10.20, Ly=3.00; 长细比：λx=82.2,λy=91.2

 构件长度=3.00; 计算长度系数: Ux=3.40 Uy=1.00

 抗震等级: 三级

 截面参数:HN300X150 国标 H 型钢

 轴压截面分类:X轴:a类, Y轴:b类

 构件钢号：Q235

 宽厚比等级:S3

 验算规范: 门规GB51022-2015

|  |  |  |
| --- | --- | --- |
| \ | I端 | II端 |
| 组合 | M | N | V | M | N | V |
| 1 | 0.00 | 12.70 | -5.93 | -17.78 | -10.91 | 5.93 |
| 2 | 0.00 | 23.56 | -12.67 | -38.00 | -21.77 | 12.67 |
| 3 | 0.00 | 26.66 | -12.67 | -38.00 | -24.87 | 12.67 |
| 4 | 0.00 | 12.70 | -5.93 | -17.78 | -10.91 | 5.93 |
| 5 | 0.00 | 11.29 | -5.27 | -15.81 | -9.70 | 5.27 |
| 6 | 0.00 | 26.80 | -14.90 | -44.69 | -25.21 | 14.90 |
| 7 | 0.00 | 31.23 | -14.90 | -44.69 | -29.64 | 14.90 |
| 8 | 0.00 | 11.29 | -5.27 | -15.81 | -9.70 | 5.27 |
| 9 | 0.00 | 9.41 | -4.39 | -13.17 | -8.08 | 4.39 |
| 10 | 0.00 | 24.92 | -14.02 | -42.05 | -23.60 | 14.02 |
| 11 | 0.00 | 29.35 | -14.02 | -42.05 | -28.03 | 14.02 |
| 12 | 0.00 | 9.41 | -4.39 | -13.17 | -8.08 | 4.39 |
| 13 | 0.00 | -4.90 | 5.08 | 10.66 | 6.49 | -2.02 |
| 14 | 0.00 | 0.18 | -1.47 | 1.92 | 1.41 | -2.75 |
| 15 | 0.00 | 0.07 | 3.70 | 2.79 | 1.51 | 1.84 |
| 16 | 0.00 | 5.18 | -2.91 | -6.02 | -3.59 | 1.11 |
| 17 | 0.00 | -6.78 | 5.96 | 13.29 | 8.11 | -2.90 |
| 18 | 0.00 | -1.70 | -0.60 | 4.55 | 3.02 | -3.63 |
| 19 | 0.00 | -1.81 | 4.58 | 5.43 | 3.13 | 0.96 |
| 20 | 0.00 | 3.30 | -2.03 | -3.39 | -1.97 | 0.23 |
| 21 | 0.00 | 1.57 | 0.94 | 0.07 | 0.01 | 0.90 |
| 22 | 0.00 | 4.62 | -2.99 | -5.17 | -3.04 | 0.46 |
| 23 | 0.00 | 4.56 | 0.11 | -4.65 | -2.97 | 3.21 |
| 24 | 0.00 | 7.62 | -3.85 | -9.94 | -6.04 | 2.77 |
| 25 | 0.00 | 17.09 | -8.68 | -28.81 | -15.50 | 10.52 |
| 26 | 0.00 | 20.13 | -12.62 | -34.05 | -18.55 | 10.08 |
| 27 | 0.00 | 20.07 | -9.51 | -33.53 | -18.48 | 12.84 |
| 28 | 0.00 | 23.13 | -13.48 | -38.82 | -21.55 | 12.40 |
| 29 | 0.00 | 21.52 | -8.68 | -28.81 | -19.93 | 10.52 |
| 30 | 0.00 | 24.57 | -12.62 | -34.05 | -22.98 | 10.08 |
| 31 | 0.00 | 24.50 | -9.51 | -33.53 | -22.92 | 12.84 |
| 32 | 0.00 | 27.57 | -13.48 | -38.82 | -25.98 | 12.40 |
| 33 | 0.00 | 1.57 | 0.94 | 0.07 | 0.01 | 0.90 |
| 34 | 0.00 | 4.62 | -2.99 | -5.17 | -3.04 | 0.46 |
| 35 | 0.00 | 4.56 | 0.11 | -4.65 | -2.97 | 3.21 |
| 36 | 0.00 | 7.62 | -3.85 | -9.94 | -6.04 | 2.77 |
| 37 | 0.00 | -0.31 | 1.82 | 2.71 | 1.63 | 0.02 |
| 38 | 0.00 | 2.74 | -2.11 | -2.54 | -1.42 | -0.42 |
| 39 | 0.00 | 2.68 | 0.99 | -2.01 | -1.36 | 2.33 |
| 40 | 0.00 | 5.74 | -2.97 | -7.30 | -4.42 | 1.89 |
| 41 | 0.00 | 15.20 | -7.81 | -26.18 | -13.88 | 9.65 |
| 42 | 0.00 | 18.25 | -11.74 | -31.42 | -16.93 | 9.21 |
| 43 | 0.00 | 18.19 | -8.64 | -30.90 | -16.87 | 11.96 |
| 44 | 0.00 | 21.25 | -12.60 | -36.18 | -19.93 | 11.52 |
| 45 | 0.00 | 19.64 | -7.81 | -26.18 | -18.31 | 9.65 |
| 46 | 0.00 | 22.69 | -11.74 | -31.42 | -21.36 | 9.21 |
| 47 | 0.00 | 22.62 | -8.64 | -30.90 | -21.30 | 11.96 |
| 48 | 0.00 | 25.68 | -12.60 | -36.18 | -24.36 | 11.52 |
| 49 | 0.00 | -0.31 | 1.82 | 2.71 | 1.63 | 0.02 |
| 50 | 0.00 | 2.74 | -2.11 | -2.54 | -1.42 | -0.42 |
| 51 | 0.00 | 2.68 | 0.99 | -2.01 | -1.36 | 2.33 |
| 52 | 0.00 | 5.74 | -2.97 | -7.30 | -4.42 | 1.89 |
| 53 | 0.00 | -4.90 | 5.08 | 10.66 | 6.49 | -2.02 |
| 54 | 0.00 | 0.18 | -1.47 | 1.92 | 1.41 | -2.75 |
| 55 | 0.00 | 0.07 | 3.70 | 2.79 | 1.51 | 1.84 |
| 56 | 0.00 | 5.18 | -2.91 | -6.02 | -3.59 | 1.11 |
| 57 | 0.00 | 5.96 | -1.65 | -9.56 | -4.37 | 4.72 |
| 58 | 0.00 | 11.04 | -8.21 | -18.30 | -9.45 | 3.99 |
| 59 | 0.00 | 10.93 | -3.04 | -17.43 | -9.34 | 8.58 |
| 60 | 0.00 | 16.04 | -9.65 | -26.24 | -14.45 | 7.85 |
| 61 | 0.00 | 9.06 | -1.65 | -9.56 | -7.47 | 4.72 |
| 62 | 0.00 | 14.14 | -8.21 | -18.30 | -12.55 | 3.99 |
| 63 | 0.00 | 14.03 | -3.04 | -17.43 | -12.45 | 8.58 |
| 64 | 0.00 | 19.14 | -9.65 | -26.24 | -17.55 | 7.85 |
| 65 | 0.00 | -4.90 | 5.08 | 10.66 | 6.49 | -2.02 |
| 66 | 0.00 | 0.18 | -1.47 | 1.92 | 1.41 | -2.75 |
| 67 | 0.00 | 0.07 | 3.70 | 2.79 | 1.51 | 1.84 |
| 68 | 0.00 | 5.18 | -2.91 | -6.02 | -3.59 | 1.11 |
| 69 | 0.00 | -6.78 | 5.96 | 13.29 | 8.11 | -2.90 |
| 70 | 0.00 | -1.70 | -0.60 | 4.55 | 3.02 | -3.63 |
| 71 | 0.00 | -1.81 | 4.58 | 5.43 | 3.13 | 0.96 |
| 72 | 0.00 | 3.30 | -2.03 | -3.39 | -1.97 | 0.23 |
| 73 | 0.00 | 4.07 | -0.78 | -6.93 | -2.75 | 3.84 |
| 74 | 0.00 | 9.16 | -7.34 | -15.67 | -7.83 | 3.11 |
| 75 | 0.00 | 9.05 | -2.16 | -14.79 | -7.73 | 7.70 |
| 76 | 0.00 | 14.15 | -8.77 | -23.61 | -12.83 | 6.97 |
| 77 | 0.00 | 7.18 | -0.78 | -6.93 | -5.86 | 3.84 |
| 78 | 0.00 | 12.26 | -7.34 | -15.67 | -10.94 | 3.11 |
| 79 | 0.00 | 12.15 | -2.16 | -14.79 | -10.83 | 7.70 |
| 80 | 0.00 | 17.26 | -8.77 | -23.61 | -15.94 | 6.97 |
| 81 | 0.00 | -6.78 | 5.96 | 13.29 | 8.11 | -2.90 |
| 82 | 0.00 | -1.70 | -0.60 | 4.55 | 3.02 | -3.63 |
| 83 | 0.00 | -1.81 | 4.58 | 5.43 | 3.13 | 0.96 |
| 84 | 0.00 | 3.30 | -2.03 | -3.39 | -1.97 | 0.23 |
| 85 | 0.00 | 10.78 | -4.31 | -12.94 | -9.19 | 4.31 |
| 86 | 0.00 | 11.80 | -6.22 | -18.67 | -10.21 | 6.22 |
| 87 | 0.00 | 17.43 | -8.44 | -25.32 | -15.84 | 8.44 |
| 88 | 0.00 | 18.44 | -10.35 | -31.05 | -16.86 | 10.35 |
| 89 | 0.00 | 19.33 | -8.44 | -25.32 | -17.74 | 8.44 |
| 90 | 0.00 | 20.34 | -10.35 | -31.05 | -18.76 | 10.35 |
| 91 | 0.00 | 10.78 | -4.31 | -12.94 | -9.19 | 4.31 |
| 92 | 0.00 | 11.80 | -6.22 | -18.67 | -10.21 | 6.22 |
| 93 | 0.00 | 8.90 | -3.44 | -10.31 | -7.57 | 3.44 |
| 94 | 0.00 | 9.92 | -5.35 | -16.04 | -8.59 | 5.35 |
| 95 | 0.00 | 14.44 | -6.87 | -20.62 | -13.11 | 6.87 |
| 96 | 0.00 | 15.46 | -8.78 | -26.35 | -14.13 | 8.78 |
| 97 | 0.00 | 16.02 | -6.87 | -20.62 | -14.70 | 6.87 |
| 98 | 0.00 | 17.04 | -8.78 | -26.35 | -15.72 | 8.78 |
| 99 | 0.00 | 8.90 | -3.44 | -10.31 | -7.57 | 3.44 |
| 100 | 0.00 | 9.92 | -5.35 | -16.04 | -8.59 | 5.35 |

 强度计算控制组合号: 7, M=0.00, N=31.23, M=-44.69, N=-29.64

 强度计算应力比 =0.546

 抗剪强度计算控制组合号: 6, V=-14.90

 抗剪强度计算应力比 =0.065

 平面内稳定计算最大应力对应组合号: 7, M=0.00, N=31.23, M=-44.69, N=-29.64

 平面内稳定计算最大应力 (N/mm\*mm) =107.35

 平面内稳定计算最大应力比 =0.499

 平面外稳定计算最大应力比 =0.394

 门规GB51022-2015腹板容许高厚比 [H0/TW] =250.00

 翼缘容许宽厚比 [B/T] =15.00

 强度计算应力比 =0.546 < 1.0

 抗剪强度计算应力比 =0.065 < 1.0

 平面内稳定计算最大应力 < f=215.00

 平面外稳定计算最大应力比 < 1.0

 腹板高厚比 H0/TW=39.38 < [H0/TW]=250.00

 翼缘宽厚比 B/T =6.53 < [B/T]=15.00

 压杆,平面内长细比 λ=82. ≤ [λ]=180

 压杆,平面外长细比 λ=91. ≤ [λ]=180

 构件重量 (Kg)=110.17

**2、 钢 柱 2 设计结果**

 截面类型=39; 布置角度=0; 计算长度：Lx=10.20, Ly=3.00; 长细比：λx=82.2,λy=91.2

 构件长度=3.00; 计算长度系数: Ux=3.40 Uy=1.00

 抗震等级: 三级

 截面参数:HN300X150 国标 H 型钢

 轴压截面分类:X轴:a类, Y轴:b类

 构件钢号：Q235

 宽厚比等级:S3

 验算规范: 门规GB51022-2015

|  |  |  |
| --- | --- | --- |
| \ | I端 | II端 |
| 组合 | M | N | V | M | N | V |
| 1 | 0.00 | 23.56 | 12.67 | 38.00 | -21.77 | -12.67 |
| 2 | 0.00 | 12.70 | 5.93 | 17.78 | -10.91 | -5.93 |
| 3 | 0.00 | 26.66 | 12.67 | 38.00 | -24.87 | -12.67 |
| 4 | 0.00 | 12.70 | 5.93 | 17.78 | -10.91 | -5.93 |
| 5 | 0.00 | 26.80 | 14.90 | 44.69 | -25.21 | -14.90 |
| 6 | 0.00 | 11.29 | 5.27 | 15.81 | -9.70 | -5.27 |
| 7 | 0.00 | 31.23 | 14.90 | 44.69 | -29.64 | -14.90 |
| 8 | 0.00 | 11.29 | 5.27 | 15.81 | -9.70 | -5.27 |
| 9 | 0.00 | 24.92 | 14.02 | 42.05 | -23.60 | -14.02 |
| 10 | 0.00 | 9.41 | 4.39 | 13.17 | -8.08 | -4.39 |
| 11 | 0.00 | 29.35 | 14.02 | 42.05 | -28.03 | -14.02 |
| 12 | 0.00 | 9.41 | 4.39 | 13.17 | -8.08 | -4.39 |
| 13 | 0.00 | 0.18 | 1.49 | -1.89 | 1.41 | 2.75 |
| 14 | 0.00 | -4.91 | -5.07 | -10.63 | 6.50 | 2.02 |
| 15 | 0.00 | 5.18 | 2.91 | 6.02 | -3.59 | -1.11 |
| 16 | 0.00 | 0.07 | -3.70 | -2.79 | 1.51 | -1.84 |
| 17 | 0.00 | -1.70 | 0.61 | -4.52 | 3.03 | 3.63 |
| 18 | 0.00 | -6.79 | -5.95 | -13.26 | 8.11 | 2.90 |
| 19 | 0.00 | 3.30 | 2.03 | 3.39 | -1.97 | -0.23 |
| 20 | 0.00 | -1.81 | -4.58 | -5.43 | 3.13 | -0.96 |
| 21 | 0.00 | 20.13 | 12.63 | 34.07 | -18.55 | -10.09 |
| 22 | 0.00 | 17.08 | 8.69 | 28.83 | -15.50 | -10.52 |
| 23 | 0.00 | 23.13 | 13.48 | 38.82 | -21.55 | -12.40 |
| 24 | 0.00 | 20.07 | 9.51 | 33.53 | -18.48 | -12.84 |
| 25 | 0.00 | 4.62 | 3.00 | 5.19 | -3.03 | -0.46 |
| 26 | 0.00 | 1.57 | -0.93 | -0.06 | 0.02 | -0.90 |
| 27 | 0.00 | 7.62 | 3.85 | 9.94 | -6.04 | -2.77 |
| 28 | 0.00 | 4.56 | -0.11 | 4.65 | -2.97 | -3.21 |
| 29 | 0.00 | 24.57 | 12.63 | 34.07 | -22.98 | -10.09 |
| 30 | 0.00 | 21.51 | 8.69 | 28.83 | -19.93 | -10.52 |
| 31 | 0.00 | 27.57 | 13.48 | 38.82 | -25.98 | -12.40 |
| 32 | 0.00 | 24.50 | 9.51 | 33.53 | -22.92 | -12.84 |
| 33 | 0.00 | 4.62 | 3.00 | 5.19 | -3.03 | -0.46 |
| 34 | 0.00 | 1.57 | -0.93 | -0.06 | 0.02 | -0.90 |
| 35 | 0.00 | 7.62 | 3.85 | 9.94 | -6.04 | -2.77 |
| 36 | 0.00 | 4.56 | -0.11 | 4.65 | -2.97 | -3.21 |
| 37 | 0.00 | 18.25 | 11.75 | 31.44 | -16.93 | -9.21 |
| 38 | 0.00 | 15.20 | 7.82 | 26.19 | -13.88 | -9.65 |
| 39 | 0.00 | 21.25 | 12.60 | 36.18 | -19.93 | -11.52 |
| 40 | 0.00 | 18.19 | 8.64 | 30.90 | -16.87 | -11.96 |
| 41 | 0.00 | 2.74 | 2.12 | 2.56 | -1.42 | 0.42 |
| 42 | 0.00 | -0.31 | -1.81 | -2.69 | 1.63 | -0.02 |
| 43 | 0.00 | 5.74 | 2.97 | 7.30 | -4.42 | -1.89 |
| 44 | 0.00 | 2.68 | -0.99 | 2.01 | -1.36 | -2.33 |
| 45 | 0.00 | 22.68 | 11.75 | 31.44 | -21.36 | -9.21 |
| 46 | 0.00 | 19.63 | 7.82 | 26.19 | -18.31 | -9.65 |
| 47 | 0.00 | 25.68 | 12.60 | 36.18 | -24.36 | -11.52 |
| 48 | 0.00 | 22.62 | 8.64 | 30.90 | -21.30 | -11.96 |
| 49 | 0.00 | 2.74 | 2.12 | 2.56 | -1.42 | 0.42 |
| 50 | 0.00 | -0.31 | -1.81 | -2.69 | 1.63 | -0.02 |
| 51 | 0.00 | 5.74 | 2.97 | 7.30 | -4.42 | -1.89 |
| 52 | 0.00 | 2.68 | -0.99 | 2.01 | -1.36 | -2.33 |
| 53 | 0.00 | 11.04 | 8.23 | 18.33 | -9.45 | -3.99 |
| 54 | 0.00 | 5.95 | 1.67 | 9.59 | -4.36 | -4.72 |
| 55 | 0.00 | 16.04 | 9.65 | 26.24 | -14.45 | -7.85 |
| 56 | 0.00 | 10.93 | 3.04 | 17.43 | -9.34 | -8.58 |
| 57 | 0.00 | 0.18 | 1.49 | -1.89 | 1.41 | 2.75 |
| 58 | 0.00 | -4.91 | -5.07 | -10.63 | 6.50 | 2.02 |
| 59 | 0.00 | 5.18 | 2.91 | 6.02 | -3.59 | -1.11 |
| 60 | 0.00 | 0.07 | -3.70 | -2.79 | 1.51 | -1.84 |
| 61 | 0.00 | 14.14 | 8.23 | 18.33 | -12.55 | -3.99 |
| 62 | 0.00 | 9.05 | 1.67 | 9.59 | -7.47 | -4.72 |
| 63 | 0.00 | 19.14 | 9.65 | 26.24 | -17.55 | -7.85 |
| 64 | 0.00 | 14.03 | 3.04 | 17.43 | -12.45 | -8.58 |
| 65 | 0.00 | 0.18 | 1.49 | -1.89 | 1.41 | 2.75 |
| 66 | 0.00 | -4.91 | -5.07 | -10.63 | 6.50 | 2.02 |
| 67 | 0.00 | 5.18 | 2.91 | 6.02 | -3.59 | -1.11 |
| 68 | 0.00 | 0.07 | -3.70 | -2.79 | 1.51 | -1.84 |
| 69 | 0.00 | 9.15 | 7.35 | 15.70 | -7.83 | -3.11 |
| 70 | 0.00 | 4.07 | 0.79 | 6.95 | -2.75 | -3.84 |
| 71 | 0.00 | 14.15 | 8.77 | 23.61 | -12.83 | -6.97 |
| 72 | 0.00 | 9.05 | 2.16 | 14.79 | -7.73 | -7.70 |
| 73 | 0.00 | -1.70 | 0.61 | -4.52 | 3.03 | 3.63 |
| 74 | 0.00 | -6.79 | -5.95 | -13.26 | 8.11 | 2.90 |
| 75 | 0.00 | 3.30 | 2.03 | 3.39 | -1.97 | -0.23 |
| 76 | 0.00 | -1.81 | -4.58 | -5.43 | 3.13 | -0.96 |
| 77 | 0.00 | 12.26 | 7.35 | 15.70 | -10.93 | -3.11 |
| 78 | 0.00 | 7.17 | 0.79 | 6.95 | -5.85 | -3.84 |
| 79 | 0.00 | 17.26 | 8.77 | 23.61 | -15.94 | -6.97 |
| 80 | 0.00 | 12.15 | 2.16 | 14.79 | -10.83 | -7.70 |
| 81 | 0.00 | -1.70 | 0.61 | -4.52 | 3.03 | 3.63 |
| 82 | 0.00 | -6.79 | -5.95 | -13.26 | 8.11 | 2.90 |
| 83 | 0.00 | 3.30 | 2.03 | 3.39 | -1.97 | -0.23 |
| 84 | 0.00 | -1.81 | -4.58 | -5.43 | 3.13 | -0.96 |
| 85 | 0.00 | 18.44 | 10.35 | 31.05 | -16.86 | -10.35 |
| 86 | 0.00 | 17.43 | 8.44 | 25.32 | -15.84 | -8.44 |
| 87 | 0.00 | 11.80 | 6.22 | 18.67 | -10.21 | -6.22 |
| 88 | 0.00 | 10.78 | 4.31 | 12.94 | -9.19 | -4.31 |
| 89 | 0.00 | 20.34 | 10.35 | 31.05 | -18.76 | -10.35 |
| 90 | 0.00 | 19.33 | 8.44 | 25.32 | -17.74 | -8.44 |
| 91 | 0.00 | 11.80 | 6.22 | 18.67 | -10.21 | -6.22 |
| 92 | 0.00 | 10.78 | 4.31 | 12.94 | -9.19 | -4.31 |
| 93 | 0.00 | 15.46 | 8.78 | 26.35 | -14.13 | -8.78 |
| 94 | 0.00 | 14.44 | 6.87 | 20.62 | -13.11 | -6.87 |
| 95 | 0.00 | 9.92 | 5.35 | 16.04 | -8.59 | -5.35 |
| 96 | 0.00 | 8.90 | 3.44 | 10.31 | -7.57 | -3.44 |
| 97 | 0.00 | 17.04 | 8.78 | 26.35 | -15.72 | -8.78 |
| 98 | 0.00 | 16.02 | 6.87 | 20.62 | -14.70 | -6.87 |
| 99 | 0.00 | 9.92 | 5.35 | 16.04 | -8.59 | -5.35 |
| 100 | 0.00 | 8.90 | 3.44 | 10.31 | -7.57 | -3.44 |

 强度计算控制组合号: 7, M=0.00, N=31.23, M=44.69, N=-29.64

 强度计算应力比 =0.546

 抗剪强度计算控制组合号: 5, V=14.90

 抗剪强度计算应力比 =0.065

 平面内稳定计算最大应力对应组合号: 7, M=0.00, N=31.23, M=44.69, N=-29.64

 平面内稳定计算最大应力 (N/mm\*mm) =107.35

 平面内稳定计算最大应力比 =0.499

 平面外稳定计算最大应力比 =0.394

 门规GB51022-2015腹板容许高厚比 [H0/TW] =250.00

 翼缘容许宽厚比 [B/T] =15.00

 强度计算应力比 =0.546 < 1.0

 抗剪强度计算应力比 =0.065 < 1.0

 平面内稳定计算最大应力 < f=215.00

 平面外稳定计算最大应力比 < 1.0

 腹板高厚比 H0/TW=39.38 < [H0/TW]=250.00

 翼缘宽厚比 B/T =6.53 < [B/T]=15.00

 压杆,平面内长细比 λ=82. ≤ [λ]=180

 压杆,平面外长细比 λ=91. ≤ [λ]=180

 构件重量 (Kg)=110.17

**3、 钢 梁 1 设计结果**

 截面类型=39; 布置角度=0; 计算长度： Lx=12.06, Ly=3.00

 构件长度=6.03; 计算长度系数: Ux=2.00 Uy=0.50

 支撑长度=3.00

 抗震等级: 三级

 截面参数:HN300X150 国标 H 型钢

 轴压截面分类:X轴:a类, Y轴:b类

 构件钢号：Q235

 宽厚比等级:S3

 验算规范: 门规GB51022-2015

|  |  |  |
| --- | --- | --- |
| \ | I端 | II端 |
| 组合 | M | N | V | M | N | V |
| 1 | 38.00 | 14.92 | 21.95 | 24.37 | -12.76 | -0.28 |
| 2 | 17.78 | 6.98 | 10.27 | 11.40 | -5.90 | 0.59 |
| 3 | 30.42 | 12.33 | 21.43 | 19.51 | -9.70 | 4.87 |
| 4 | 25.36 | 9.73 | 12.33 | 16.27 | -8.64 | -1.47 |
| 5 | 44.69 | 17.55 | 25.81 | 28.66 | -15.04 | -0.72 |
| 6 | 15.81 | 6.21 | 9.13 | 10.14 | -5.24 | 0.52 |
| 7 | 33.86 | 13.85 | 25.07 | 21.71 | -10.68 | 6.64 |
| 8 | 26.64 | 10.13 | 12.08 | 17.08 | -9.17 | -2.42 |
| 9 | 42.05 | 16.52 | 24.29 | 26.97 | -14.17 | -0.81 |
| 10 | 13.17 | 5.17 | 7.61 | 8.45 | -4.37 | 0.44 |
| 11 | 31.22 | 12.81 | 23.55 | 20.03 | -9.80 | 6.55 |
| 12 | 24.00 | 9.10 | 10.56 | 15.39 | -8.29 | -2.51 |
| 13 | -10.66 | -2.65 | -6.26 | -3.74 | 3.62 | -1.48 |
| 14 | -1.92 | -2.88 | -1.13 | -3.74 | 3.84 | 0.75 |
| 15 | -2.79 | 1.68 | -1.69 | 0.87 | -0.72 | -1.05 |
| 16 | 6.02 | 1.46 | 3.46 | 0.87 | -0.49 | 1.18 |
| 17 | -13.29 | -3.69 | -7.78 | -5.43 | 4.49 | -1.57 |
| 18 | -4.55 | -3.91 | -2.65 | -5.43 | 4.72 | 0.66 |
| 19 | -5.43 | 0.65 | -3.21 | -0.81 | 0.16 | -1.14 |
| 20 | 3.39 | 0.42 | 1.94 | -0.81 | 0.38 | 1.09 |
| 21 | 28.81 | 12.23 | 16.58 | 20.34 | -9.73 | -1.93 |
| 22 | 34.05 | 12.10 | 19.66 | 20.34 | -9.59 | -0.59 |
| 23 | 33.53 | 14.84 | 19.32 | 23.10 | -12.33 | -1.67 |
| 24 | 38.82 | 14.70 | 22.41 | 23.10 | -12.19 | -0.33 |
| 25 | -0.07 | 0.89 | -0.10 | 1.81 | 0.07 | -0.68 |
| 26 | 5.17 | 0.76 | 2.98 | 1.81 | 0.21 | 0.66 |
| 27 | 4.65 | 3.49 | 2.64 | 4.58 | -2.53 | -0.42 |
| 28 | 9.94 | 3.36 | 5.73 | 4.58 | -2.39 | 0.91 |
| 29 | 17.98 | 8.53 | 15.84 | 13.39 | -5.36 | 5.43 |
| 30 | 23.22 | 8.40 | 18.91 | 13.39 | -5.23 | 6.77 |
| 31 | 22.70 | 11.13 | 18.58 | 16.16 | -7.96 | 5.69 |
| 32 | 27.99 | 11.00 | 21.67 | 16.16 | -7.83 | 7.03 |
| 33 | 10.76 | 4.81 | 2.85 | 8.76 | -3.85 | -3.63 |
| 34 | 16.00 | 4.68 | 5.92 | 8.76 | -3.71 | -2.29 |
| 35 | 15.48 | 7.42 | 5.59 | 11.53 | -6.45 | -3.37 |
| 36 | 20.77 | 7.28 | 8.68 | 11.53 | -6.32 | -2.03 |
| 37 | 26.18 | 11.20 | 15.06 | 18.65 | -8.85 | -2.01 |
| 38 | 31.42 | 11.06 | 18.14 | 18.65 | -8.72 | -0.67 |
| 39 | 30.90 | 13.80 | 17.80 | 21.41 | -11.45 | -1.76 |
| 40 | 36.18 | 13.67 | 20.89 | 21.41 | -11.32 | -0.42 |
| 41 | -2.71 | -0.14 | -1.62 | 0.12 | 0.95 | -0.77 |
| 42 | 2.54 | -0.28 | 1.45 | 0.12 | 1.08 | 0.57 |
| 43 | 2.01 | 2.46 | 1.12 | 2.89 | -1.65 | -0.51 |
| 44 | 7.30 | 2.32 | 4.21 | 2.89 | -1.52 | 0.83 |
| 45 | 15.35 | 7.50 | 14.32 | 11.70 | -4.49 | 5.34 |
| 46 | 20.59 | 7.36 | 17.39 | 11.70 | -4.35 | 6.68 |
| 47 | 20.06 | 10.10 | 17.05 | 14.47 | -7.09 | 5.60 |
| 48 | 25.35 | 9.96 | 20.15 | 14.47 | -6.96 | 6.94 |
| 49 | 8.13 | 3.78 | 1.32 | 7.07 | -2.97 | -3.72 |
| 50 | 13.37 | 3.64 | 4.40 | 7.07 | -2.84 | -2.38 |
| 51 | 12.84 | 6.38 | 4.06 | 9.84 | -5.58 | -3.46 |
| 52 | 18.13 | 6.25 | 7.16 | 9.84 | -5.44 | -2.12 |
| 53 | 9.56 | 5.29 | 5.42 | 9.23 | -3.24 | -2.35 |
| 54 | 18.30 | 5.06 | 10.55 | 9.23 | -3.02 | -0.12 |
| 55 | 17.43 | 9.62 | 9.99 | 13.84 | -7.58 | -1.93 |
| 56 | 26.24 | 9.40 | 15.14 | 13.84 | -7.35 | 0.30 |
| 57 | -10.66 | -2.65 | -6.26 | -3.74 | 3.62 | -1.48 |
| 58 | -1.92 | -2.88 | -1.13 | -3.74 | 3.84 | 0.75 |
| 59 | -2.79 | 1.68 | -1.69 | 0.87 | -0.72 | -1.05 |
| 60 | 6.02 | 1.46 | 3.46 | 0.87 | -0.49 | 1.18 |
| 61 | 1.98 | 2.69 | 4.90 | 4.37 | -0.19 | 2.80 |
| 62 | 10.72 | 2.47 | 10.03 | 4.37 | 0.04 | 5.03 |
| 63 | 9.84 | 7.03 | 9.47 | 8.98 | -4.52 | 3.22 |
| 64 | 18.66 | 6.81 | 14.62 | 8.98 | -4.30 | 5.45 |
| 65 | -3.07 | 0.09 | -4.19 | 1.13 | 0.87 | -3.55 |
| 66 | 5.66 | -0.13 | 0.94 | 1.12 | 1.10 | -1.31 |
| 67 | 4.79 | 4.43 | 0.37 | 5.74 | -3.46 | -3.12 |
| 68 | 13.61 | 4.21 | 5.53 | 5.74 | -3.24 | -0.89 |
| 69 | 6.93 | 4.25 | 3.90 | 7.54 | -2.37 | -2.44 |
| 70 | 15.67 | 4.03 | 9.03 | 7.54 | -2.14 | -0.21 |
| 71 | 14.79 | 8.59 | 8.47 | 12.15 | -6.70 | -2.01 |
| 72 | 23.61 | 8.36 | 13.62 | 12.15 | -6.48 | 0.21 |
| 73 | -13.29 | -3.69 | -7.78 | -5.43 | 4.49 | -1.57 |
| 74 | -4.55 | -3.91 | -2.65 | -5.43 | 4.72 | 0.66 |
| 75 | -5.43 | 0.65 | -3.21 | -0.81 | 0.16 | -1.14 |
| 76 | 3.39 | 0.42 | 1.94 | -0.81 | 0.38 | 1.09 |
| 77 | -0.65 | 1.66 | 3.38 | 2.68 | 0.69 | 2.71 |
| 78 | 8.08 | 1.43 | 8.51 | 2.68 | 0.91 | 4.94 |
| 79 | 7.21 | 6.00 | 7.95 | 7.29 | -3.65 | 3.14 |
| 80 | 16.03 | 5.77 | 13.10 | 7.29 | -3.43 | 5.37 |
| 81 | -5.71 | -0.94 | -5.71 | -0.56 | 1.75 | -3.63 |
| 82 | 3.03 | -1.17 | -0.58 | -0.57 | 1.97 | -1.40 |
| 83 | 2.16 | 3.39 | -1.15 | 4.05 | -2.59 | -3.21 |
| 84 | 10.97 | 3.17 | 4.01 | 4.05 | -2.37 | -0.98 |
| 85 | 25.32 | 10.70 | 15.80 | 18.08 | -9.07 | 0.46 |
| 86 | 31.05 | 11.44 | 16.75 | 18.08 | -9.81 | -0.49 |
| 87 | 12.94 | 5.84 | 8.65 | 10.14 | -4.87 | 1.00 |
| 88 | 18.67 | 6.57 | 9.60 | 10.14 | -5.61 | 0.05 |
| 89 | 20.68 | 9.11 | 15.48 | 15.10 | -7.20 | 3.62 |
| 90 | 26.41 | 9.85 | 16.43 | 15.10 | -7.94 | 2.67 |
| 91 | 17.58 | 7.52 | 9.92 | 13.11 | -6.56 | -0.26 |
| 92 | 23.31 | 8.26 | 10.87 | 13.11 | -7.29 | -1.21 |
| 93 | 20.62 | 8.86 | 13.09 | 15.06 | -7.50 | 0.47 |
| 94 | 26.35 | 9.59 | 14.04 | 15.06 | -8.24 | -0.48 |
| 95 | 10.31 | 4.81 | 7.13 | 8.45 | -4.00 | 0.91 |
| 96 | 16.04 | 5.54 | 8.08 | 8.45 | -4.74 | -0.04 |
| 97 | 16.75 | 7.53 | 12.82 | 12.58 | -5.94 | 3.09 |
| 98 | 22.48 | 8.27 | 13.77 | 12.58 | -6.68 | 2.14 |
| 99 | 14.17 | 6.21 | 8.18 | 10.93 | -5.40 | -0.14 |
| 100 | 19.90 | 6.94 | 9.14 | 10.93 | -6.14 | -1.09 |

**梁的弯矩包络**

| 梁下部受拉 |
| --- |
| 截面 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|  | -13.29 | -6.26 | -6.84 | -17.82 | -24.43 | -25.73 | -28.66 |
| 梁上部受拉 |
| 截面 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|  | 44.69 | 11.49 | 2.60 | 3.11 | 5.45 | 6.22 | 5.43 |

 强度计算应力比 =0.539

 抗剪强度计算应力比 =0.113

 平面外稳定计算最大应力对应组合号: 5, M=44.69, N=17.55, M=28.66, N=-15.04

 平面外稳定计算最大应力比 =0.311

 强度计算应力比 =0.539 < 1.0

 抗剪强度计算应力比 =0.113 < 1.0

 平面外稳定计算最大应力比 =0.311 < 1.0

 腹板高厚比 H0/TW=39.38 < [H0/TW]=250.00 (GB51022-2015)

 翼缘宽厚比 B/T =6.53 < [B/T] =15.00

**(恒+活)梁的挠度 mm**

| 截面 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | 0.00 | 3.46 | 7.56 | 11.41 | 14.39 | 16.14 | 16.59 |

 最大挠度值 =16.59 最大挠度/梁跨度 =1/723.

 斜梁坡度初始值: 1/10.00

 变形后斜梁坡度最小值: 1/10.43

 变形后斜梁坡度改变率 =0.041 < 1/3

 构件重量 (Kg)=221.43

**4、 钢 梁 2 设计结果**

 截面类型=39; 布置角度=0; 计算长度： Lx=12.06, Ly=3.00

 构件长度=6.03; 计算长度系数: Ux=2.00 Uy=0.50

 支撑长度=3.00

 抗震等级: 三级

 截面参数:HN300X150 国标 H 型钢

 轴压截面分类:X轴:a类, Y轴:b类

 构件钢号：Q235

 宽厚比等级:S3

 验算规范: 门规GB51022-2015

|  |  |  |
| --- | --- | --- |
| \ | I端 | II端 |
| 组合 | M | N | V | M | N | V |
| 1 | -11.40 | 5.90 | 0.59 | -17.78 | -6.98 | 10.27 |
| 2 | -24.37 | 12.45 | 2.80 | -38.00 | -14.77 | 20.40 |
| 3 | -19.51 | 9.70 | 4.87 | -30.42 | -12.33 | 21.43 |
| 4 | -16.27 | 8.64 | -1.47 | -25.36 | -9.73 | 12.33 |
| 5 | -10.14 | 5.24 | 0.52 | -15.81 | -6.21 | 9.13 |
| 6 | -28.66 | 14.60 | 3.69 | -44.69 | -17.33 | 23.61 |
| 7 | -21.71 | 10.68 | 6.64 | -33.86 | -13.85 | 25.07 |
| 8 | -17.08 | 9.17 | -2.42 | -26.64 | -10.13 | 12.08 |
| 9 | -8.45 | 4.37 | 0.44 | -13.17 | -5.17 | 7.61 |
| 10 | -26.97 | 13.73 | 3.60 | -42.05 | -16.30 | 22.08 |
| 11 | -20.03 | 9.80 | 6.55 | -31.22 | -12.81 | 23.55 |
| 12 | -15.39 | 8.29 | -2.51 | -24.00 | -9.10 | 10.56 |
| 13 | 3.74 | -3.84 | 0.74 | 1.89 | 2.88 | -1.13 |
| 14 | 3.74 | -3.62 | -1.50 | 10.63 | 2.65 | -6.26 |
| 15 | -0.87 | 0.49 | 1.18 | -6.02 | -1.46 | 3.46 |
| 16 | -0.87 | 0.72 | -1.05 | 2.79 | -1.68 | -1.69 |
| 17 | 5.43 | -4.72 | 0.65 | 4.52 | 3.91 | -2.65 |
| 18 | 5.43 | -4.49 | -1.58 | 13.26 | 3.69 | -7.78 |
| 19 | 0.81 | -0.38 | 1.09 | -3.39 | -0.42 | 1.94 |
| 20 | 0.81 | -0.16 | -1.14 | 5.43 | -0.65 | -3.21 |
| 21 | -1.81 | -0.21 | 0.65 | -5.19 | -0.76 | 2.97 |
| 22 | -1.81 | -0.08 | -0.69 | 0.06 | -0.89 | -0.11 |
| 23 | -4.58 | 2.39 | 0.91 | -9.94 | -3.36 | 5.73 |
| 24 | -4.58 | 2.53 | -0.42 | -4.65 | -3.49 | 2.64 |
| 25 | -20.34 | 9.15 | 3.81 | -34.07 | -11.88 | 17.45 |
| 26 | -20.34 | 9.28 | 2.47 | -28.83 | -12.01 | 14.37 |
| 27 | -23.10 | 11.75 | 4.08 | -38.82 | -14.48 | 20.21 |
| 28 | -23.10 | 11.89 | 2.74 | -33.53 | -14.62 | 17.11 |
| 29 | -13.39 | 5.23 | 6.76 | -23.24 | -8.40 | 18.91 |
| 30 | -13.39 | 5.36 | 5.42 | -18.00 | -8.53 | 15.83 |
| 31 | -16.16 | 7.83 | 7.03 | -27.99 | -11.00 | 21.67 |
| 32 | -16.16 | 7.96 | 5.69 | -22.70 | -11.13 | 18.58 |
| 33 | -8.76 | 3.72 | -2.30 | -16.02 | -4.68 | 5.92 |
| 34 | -8.76 | 3.85 | -3.64 | -10.78 | -4.81 | 2.84 |
| 35 | -11.53 | 6.32 | -2.03 | -20.77 | -7.28 | 8.68 |
| 36 | -11.53 | 6.45 | -3.37 | -15.48 | -7.42 | 5.59 |
| 37 | -0.12 | -1.08 | 0.56 | -2.56 | 0.28 | 1.45 |
| 38 | -0.12 | -0.95 | -0.78 | 2.69 | 0.14 | -1.63 |
| 39 | -2.89 | 1.52 | 0.83 | -7.30 | -2.32 | 4.21 |
| 40 | -2.89 | 1.65 | -0.51 | -2.01 | -2.46 | 1.12 |
| 41 | -18.65 | 8.28 | 3.73 | -31.44 | -10.85 | 15.93 |
| 42 | -18.65 | 8.41 | 2.39 | -26.19 | -10.98 | 12.85 |
| 43 | -21.41 | 10.88 | 3.99 | -36.18 | -13.45 | 18.68 |
| 44 | -21.41 | 11.01 | 2.65 | -30.90 | -13.58 | 15.59 |
| 45 | -11.70 | 4.35 | 6.68 | -20.61 | -7.36 | 17.39 |
| 46 | -11.70 | 4.49 | 5.34 | -15.36 | -7.50 | 14.31 |
| 47 | -14.47 | 6.96 | 6.94 | -25.35 | -9.96 | 20.15 |
| 48 | -14.47 | 7.09 | 5.60 | -20.06 | -10.10 | 17.05 |
| 49 | -7.07 | 2.84 | -2.38 | -13.39 | -3.65 | 4.40 |
| 50 | -7.07 | 2.97 | -3.72 | -8.14 | -3.78 | 1.32 |
| 51 | -9.84 | 5.44 | -2.12 | -18.13 | -6.25 | 7.16 |
| 52 | -9.84 | 5.58 | -3.46 | -12.84 | -6.38 | 4.06 |
| 53 | 3.74 | -3.84 | 0.74 | 1.89 | 2.88 | -1.13 |
| 54 | 3.74 | -3.62 | -1.50 | 10.63 | 2.65 | -6.26 |
| 55 | -0.87 | 0.49 | 1.18 | -6.02 | -1.46 | 3.46 |
| 56 | -0.87 | 0.72 | -1.05 | 2.79 | -1.68 | -1.69 |
| 57 | -9.23 | 2.71 | 2.95 | -18.33 | -4.91 | 9.01 |
| 58 | -9.23 | 2.93 | 0.72 | -9.59 | -5.13 | 3.87 |
| 59 | -13.84 | 7.05 | 3.39 | -26.24 | -9.25 | 13.60 |
| 60 | -13.84 | 7.27 | 1.16 | -17.43 | -9.47 | 8.44 |
| 61 | -4.37 | -0.04 | 5.01 | -10.75 | -2.47 | 10.03 |
| 62 | -4.37 | 0.19 | 2.78 | -2.01 | -2.69 | 4.90 |
| 63 | -8.98 | 4.30 | 5.45 | -18.66 | -6.81 | 14.62 |
| 64 | -8.98 | 4.52 | 3.22 | -9.84 | -7.03 | 9.47 |
| 65 | -1.13 | -1.10 | -1.33 | -5.70 | 0.13 | 0.93 |
| 66 | -1.12 | -0.87 | -3.56 | 3.05 | -0.09 | -4.20 |
| 67 | -5.74 | 3.24 | -0.89 | -13.61 | -4.21 | 5.53 |
| 68 | -5.74 | 3.46 | -3.12 | -4.79 | -4.43 | 0.37 |
| 69 | 5.43 | -4.72 | 0.65 | 4.52 | 3.91 | -2.65 |
| 70 | 5.43 | -4.49 | -1.58 | 13.26 | 3.69 | -7.78 |
| 71 | 0.81 | -0.38 | 1.09 | -3.39 | -0.42 | 1.94 |
| 72 | 0.81 | -0.16 | -1.14 | 5.43 | -0.65 | -3.21 |
| 73 | -7.54 | 1.84 | 2.86 | -15.70 | -3.88 | 7.48 |
| 74 | -7.54 | 2.06 | 0.63 | -6.95 | -4.10 | 2.35 |
| 75 | -12.15 | 6.17 | 3.30 | -23.61 | -8.21 | 12.08 |
| 76 | -12.15 | 6.39 | 1.07 | -14.79 | -8.43 | 6.92 |
| 77 | -2.68 | -0.91 | 4.93 | -8.12 | -1.44 | 8.51 |
| 78 | -2.68 | -0.69 | 2.69 | 0.63 | -1.66 | 3.37 |
| 79 | -7.29 | 3.43 | 5.37 | -16.03 | -5.77 | 13.10 |
| 80 | -7.29 | 3.65 | 3.14 | -7.21 | -6.00 | 7.95 |
| 81 | 0.56 | -1.97 | -1.42 | -3.06 | 1.16 | -0.59 |
| 82 | 0.57 | -1.75 | -3.65 | 5.68 | 0.94 | -5.72 |
| 83 | -4.05 | 2.37 | -0.98 | -10.97 | -3.17 | 4.01 |
| 84 | -4.05 | 2.59 | -3.21 | -2.16 | -3.39 | -1.15 |
| 85 | -10.14 | 5.61 | 0.05 | -18.67 | -6.57 | 9.60 |
| 86 | -10.14 | 4.87 | 1.00 | -12.94 | -5.84 | 8.65 |
| 87 | -18.08 | 9.62 | 1.40 | -31.05 | -11.34 | 15.81 |
| 88 | -18.08 | 8.89 | 2.35 | -25.32 | -10.61 | 14.86 |
| 89 | -15.10 | 7.94 | 2.67 | -26.41 | -9.85 | 16.43 |
| 90 | -15.10 | 7.20 | 3.62 | -20.68 | -9.11 | 15.48 |
| 91 | -13.11 | 7.29 | -1.21 | -23.31 | -8.26 | 10.87 |
| 92 | -13.11 | 6.56 | -0.26 | -17.58 | -7.52 | 9.92 |
| 93 | -8.45 | 4.74 | -0.04 | -16.04 | -5.54 | 8.08 |
| 94 | -8.45 | 4.00 | 0.91 | -10.31 | -4.81 | 7.13 |
| 95 | -15.06 | 8.08 | 1.09 | -26.35 | -9.51 | 13.25 |
| 96 | -15.06 | 7.34 | 2.04 | -20.62 | -8.78 | 12.30 |
| 97 | -12.58 | 6.68 | 2.14 | -22.48 | -8.27 | 13.77 |
| 98 | -12.58 | 5.94 | 3.09 | -16.75 | -7.53 | 12.82 |
| 99 | -10.93 | 6.14 | -1.09 | -19.90 | -6.94 | 9.14 |
| 100 | -10.93 | 5.40 | -0.14 | -14.17 | -6.21 | 8.18 |

**梁的弯矩包络**

| 梁下部受拉 |
| --- |
| 截面 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|  | -28.66 | -25.73 | -24.43 | -17.82 | -6.82 | -6.23 | -13.26 |
| 梁上部受拉 |
| 截面 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|  | 5.43 | 6.24 | 5.47 | 3.14 | 2.60 | 11.49 | 44.69 |

 强度计算应力比 =0.539

 抗剪强度计算应力比 =0.109

 平面外稳定计算最大应力对应组合号: 6, M=-28.66, N=14.60, M=-44.69, N=-17.33

 平面外稳定计算最大应力比 =0.311

 强度计算应力比 =0.539 < 1.0

 抗剪强度计算应力比 =0.109 < 1.0

 平面外稳定计算最大应力比 =0.311 < 1.0

 腹板高厚比 H0/TW=39.38 < [H0/TW]=250.00 (GB51022-2015)

 翼缘宽厚比 B/T =6.53 < [B/T] =15.00

**(恒+活)梁的挠度 mm**

| 截面 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | 16.59 | 16.14 | 14.39 | 11.41 | 7.56 | 3.46 | 0.00 |

 最大挠度值 =16.59 最大挠度/梁跨度 =1/723.

 斜梁坡度初始值: 1/10.00

 变形后斜梁坡度最小值: 1/10.43

 变形后斜梁坡度改变率 =0.041 < 1/3

 构件重量 (Kg)=221.43

 风荷载作用下柱顶最大水平（X 向）位移:

 节点( 1), 水平位移 dx=2.026(mm) =H /1481.

 地震荷载作用下柱顶最大水平（X 向）位移:

 节点( 1), 水平位移 dx=1.341(mm) =H /2238.

 梁的(恒+活)最大挠度:

 梁( 1), 挠跨比 =1 /723.

 风载作用下柱顶最大水平位移: H/1481< 柱顶位移容许值: H/60

 地震作用下柱顶最大水平位移: H/2238< 柱顶位移容许值: H/60

 梁的(恒+活)最大挠跨比: 1/723< 梁的容许挠跨比: 1/180

 所有钢柱的总重量 (Kg)=220.

 所有钢梁的总重量 (Kg)=443.

 钢梁与钢柱重量之和 (Kg)=663.

十一. 荷载与计算结果简图

## 1. 结构简图



[图11-1 刚架简图](file:///F%3A%5C%E6%88%91%E7%9A%84%E9%A1%B9%E7%9B%AE%5C%E5%B9%B3%E5%8F%B0%E9%A1%B9%E7%9B%AE%5C%E5%AE%97%E7%BF%B0%5C2023%5C70%E6%9C%88%E7%9A%84%E9%A1%B9%E7%9B%AE%EF%BC%88%E5%88%B0%E6%89%8B500%EF%BC%89%5C%E6%A8%A1%E5%9E%8B%5Cpk-2_%5CCalcTemp%5C%E5%88%9A%E6%9E%B6%E7%AE%80%E5%9B%BE.T)

## 2. 荷载简图



[图11-2 恒载简图](file:///F%3A%5C%E6%88%91%E7%9A%84%E9%A1%B9%E7%9B%AE%5C%E5%B9%B3%E5%8F%B0%E9%A1%B9%E7%9B%AE%5C%E5%AE%97%E7%BF%B0%5C2023%5C70%E6%9C%88%E7%9A%84%E9%A1%B9%E7%9B%AE%EF%BC%88%E5%88%B0%E6%89%8B500%EF%BC%89%5C%E6%A8%A1%E5%9E%8B%5Cpk-2_%5CCalcTemp%5C%E6%81%92%E8%BD%BD%E7%AE%80%E5%9B%BE.T)

## 3. 应力比图



[图11-3 应力比图](file:///F%3A%5C%E6%88%91%E7%9A%84%E9%A1%B9%E7%9B%AE%5C%E5%B9%B3%E5%8F%B0%E9%A1%B9%E7%9B%AE%5C%E5%AE%97%E7%BF%B0%5C2023%5C70%E6%9C%88%E7%9A%84%E9%A1%B9%E7%9B%AE%EF%BC%88%E5%88%B0%E6%89%8B500%EF%BC%89%5C%E6%A8%A1%E5%9E%8B%5Cpk-2_%5CCalcTemp%5C%E5%BA%94%E5%8A%9B%E6%AF%94%E5%9B%BE.T)

## 4. 内力图



[图11-4 恒载弯矩图](file:///F%3A%5C%E6%88%91%E7%9A%84%E9%A1%B9%E7%9B%AE%5C%E5%B9%B3%E5%8F%B0%E9%A1%B9%E7%9B%AE%5C%E5%AE%97%E7%BF%B0%5C2023%5C70%E6%9C%88%E7%9A%84%E9%A1%B9%E7%9B%AE%EF%BC%88%E5%88%B0%E6%89%8B500%EF%BC%89%5C%E6%A8%A1%E5%9E%8B%5Cpk-2_%5CCalcTemp%5C%E6%81%92%E8%BD%BD%E5%BC%AF%E7%9F%A9%E5%9B%BE.T)



[图11-5 恒载剪力图](file:///F%3A%5C%E6%88%91%E7%9A%84%E9%A1%B9%E7%9B%AE%5C%E5%B9%B3%E5%8F%B0%E9%A1%B9%E7%9B%AE%5C%E5%AE%97%E7%BF%B0%5C2023%5C70%E6%9C%88%E7%9A%84%E9%A1%B9%E7%9B%AE%EF%BC%88%E5%88%B0%E6%89%8B500%EF%BC%89%5C%E6%A8%A1%E5%9E%8B%5Cpk-2_%5CCalcTemp%5C%E6%81%92%E8%BD%BD%E5%89%AA%E5%8A%9B%E5%9B%BE.T)



[图11-6 恒载轴力图](file:///F%3A%5C%E6%88%91%E7%9A%84%E9%A1%B9%E7%9B%AE%5C%E5%B9%B3%E5%8F%B0%E9%A1%B9%E7%9B%AE%5C%E5%AE%97%E7%BF%B0%5C2023%5C70%E6%9C%88%E7%9A%84%E9%A1%B9%E7%9B%AE%EF%BC%88%E5%88%B0%E6%89%8B500%EF%BC%89%5C%E6%A8%A1%E5%9E%8B%5Cpk-2_%5CCalcTemp%5C%E6%81%92%E8%BD%BD%E8%BD%B4%E5%8A%9B%E5%9B%BE.T)



[图11-7 活载弯矩图](file:///F%3A%5C%E6%88%91%E7%9A%84%E9%A1%B9%E7%9B%AE%5C%E5%B9%B3%E5%8F%B0%E9%A1%B9%E7%9B%AE%5C%E5%AE%97%E7%BF%B0%5C2023%5C70%E6%9C%88%E7%9A%84%E9%A1%B9%E7%9B%AE%EF%BC%88%E5%88%B0%E6%89%8B500%EF%BC%89%5C%E6%A8%A1%E5%9E%8B%5Cpk-2_%5CCalcTemp%5C%E6%B4%BB%E8%BD%BD%E5%BC%AF%E7%9F%A9%E5%9B%BE.T)



[图11-8 活载剪力图](file:///F%3A%5C%E6%88%91%E7%9A%84%E9%A1%B9%E7%9B%AE%5C%E5%B9%B3%E5%8F%B0%E9%A1%B9%E7%9B%AE%5C%E5%AE%97%E7%BF%B0%5C2023%5C70%E6%9C%88%E7%9A%84%E9%A1%B9%E7%9B%AE%EF%BC%88%E5%88%B0%E6%89%8B500%EF%BC%89%5C%E6%A8%A1%E5%9E%8B%5Cpk-2_%5CCalcTemp%5C%E6%B4%BB%E8%BD%BD%E5%89%AA%E5%8A%9B%E5%9B%BE.T)



[图11-9 活载轴力图](file:///F%3A%5C%E6%88%91%E7%9A%84%E9%A1%B9%E7%9B%AE%5C%E5%B9%B3%E5%8F%B0%E9%A1%B9%E7%9B%AE%5C%E5%AE%97%E7%BF%B0%5C2023%5C70%E6%9C%88%E7%9A%84%E9%A1%B9%E7%9B%AE%EF%BC%88%E5%88%B0%E6%89%8B500%EF%BC%89%5C%E6%A8%A1%E5%9E%8B%5Cpk-2_%5CCalcTemp%5C%E6%B4%BB%E8%BD%BD%E8%BD%B4%E5%8A%9B%E5%9B%BE.T)



[图11-10 左地震弯矩图](file:///F%3A%5C%E6%88%91%E7%9A%84%E9%A1%B9%E7%9B%AE%5C%E5%B9%B3%E5%8F%B0%E9%A1%B9%E7%9B%AE%5C%E5%AE%97%E7%BF%B0%5C2023%5C70%E6%9C%88%E7%9A%84%E9%A1%B9%E7%9B%AE%EF%BC%88%E5%88%B0%E6%89%8B500%EF%BC%89%5C%E6%A8%A1%E5%9E%8B%5Cpk-2_%5CCalcTemp%5C%E5%B7%A6%E5%9C%B0%E9%9C%87%E5%BC%AF%E7%9F%A9%E5%9B%BE.T)



[图11-11 右地震弯矩图](file:///F%3A%5C%E6%88%91%E7%9A%84%E9%A1%B9%E7%9B%AE%5C%E5%B9%B3%E5%8F%B0%E9%A1%B9%E7%9B%AE%5C%E5%AE%97%E7%BF%B0%5C2023%5C70%E6%9C%88%E7%9A%84%E9%A1%B9%E7%9B%AE%EF%BC%88%E5%88%B0%E6%89%8B500%EF%BC%89%5C%E6%A8%A1%E5%9E%8B%5Cpk-2_%5CCalcTemp%5C%E5%8F%B3%E5%9C%B0%E9%9C%87%E5%BC%AF%E7%9F%A9%E5%9B%BE.T)



[图11-12 弯矩包络图](file:///F%3A%5C%E6%88%91%E7%9A%84%E9%A1%B9%E7%9B%AE%5C%E5%B9%B3%E5%8F%B0%E9%A1%B9%E7%9B%AE%5C%E5%AE%97%E7%BF%B0%5C2023%5C70%E6%9C%88%E7%9A%84%E9%A1%B9%E7%9B%AE%EF%BC%88%E5%88%B0%E6%89%8B500%EF%BC%89%5C%E6%A8%A1%E5%9E%8B%5Cpk-2_%5CCalcTemp%5C%E5%BC%AF%E7%9F%A9%E5%8C%85%E7%BB%9C%E5%9B%BE.T)



[图11-13 剪力包络图](file:///F%3A%5C%E6%88%91%E7%9A%84%E9%A1%B9%E7%9B%AE%5C%E5%B9%B3%E5%8F%B0%E9%A1%B9%E7%9B%AE%5C%E5%AE%97%E7%BF%B0%5C2023%5C70%E6%9C%88%E7%9A%84%E9%A1%B9%E7%9B%AE%EF%BC%88%E5%88%B0%E6%89%8B500%EF%BC%89%5C%E6%A8%A1%E5%9E%8B%5Cpk-2_%5CCalcTemp%5C%E5%89%AA%E5%8A%9B%E5%8C%85%E7%BB%9C%E5%9B%BE.T)



[图11-14 轴力包络图](file:///F%3A%5C%E6%88%91%E7%9A%84%E9%A1%B9%E7%9B%AE%5C%E5%B9%B3%E5%8F%B0%E9%A1%B9%E7%9B%AE%5C%E5%AE%97%E7%BF%B0%5C2023%5C70%E6%9C%88%E7%9A%84%E9%A1%B9%E7%9B%AE%EF%BC%88%E5%88%B0%E6%89%8B500%EF%BC%89%5C%E6%A8%A1%E5%9E%8B%5Cpk-2_%5CCalcTemp%5C%E8%BD%B4%E5%8A%9B%E5%8C%85%E7%BB%9C%E5%9B%BE.T)

## 5. 位移图



[图11-15 恒载位移图](file:///F%3A%5C%E6%88%91%E7%9A%84%E9%A1%B9%E7%9B%AE%5C%E5%B9%B3%E5%8F%B0%E9%A1%B9%E7%9B%AE%5C%E5%AE%97%E7%BF%B0%5C2023%5C70%E6%9C%88%E7%9A%84%E9%A1%B9%E7%9B%AE%EF%BC%88%E5%88%B0%E6%89%8B500%EF%BC%89%5C%E6%A8%A1%E5%9E%8B%5Cpk-2_%5CCalcTemp%5C%E6%81%92%E8%BD%BD%E4%BD%8D%E7%A7%BB%E5%9B%BE.T)



[图11-16 活载位移图](file:///F%3A%5C%E6%88%91%E7%9A%84%E9%A1%B9%E7%9B%AE%5C%E5%B9%B3%E5%8F%B0%E9%A1%B9%E7%9B%AE%5C%E5%AE%97%E7%BF%B0%5C2023%5C70%E6%9C%88%E7%9A%84%E9%A1%B9%E7%9B%AE%EF%BC%88%E5%88%B0%E6%89%8B500%EF%BC%89%5C%E6%A8%A1%E5%9E%8B%5Cpk-2_%5CCalcTemp%5C%E6%B4%BB%E8%BD%BD%E4%BD%8D%E7%A7%BB%E5%9B%BE.T)



[图11-17 左地震位移图](file:///F%3A%5C%E6%88%91%E7%9A%84%E9%A1%B9%E7%9B%AE%5C%E5%B9%B3%E5%8F%B0%E9%A1%B9%E7%9B%AE%5C%E5%AE%97%E7%BF%B0%5C2023%5C70%E6%9C%88%E7%9A%84%E9%A1%B9%E7%9B%AE%EF%BC%88%E5%88%B0%E6%89%8B500%EF%BC%89%5C%E6%A8%A1%E5%9E%8B%5Cpk-2_%5CCalcTemp%5C%E5%B7%A6%E5%9C%B0%E9%9C%87%E4%BD%8D%E7%A7%BB%E5%9B%BE.T)



[图11-18 右地震位移图](file:///F%3A%5C%E6%88%91%E7%9A%84%E9%A1%B9%E7%9B%AE%5C%E5%B9%B3%E5%8F%B0%E9%A1%B9%E7%9B%AE%5C%E5%AE%97%E7%BF%B0%5C2023%5C70%E6%9C%88%E7%9A%84%E9%A1%B9%E7%9B%AE%EF%BC%88%E5%88%B0%E6%89%8B500%EF%BC%89%5C%E6%A8%A1%E5%9E%8B%5Cpk-2_%5CCalcTemp%5C%E5%8F%B3%E5%9C%B0%E9%9C%87%E4%BD%8D%E7%A7%BB%E5%9B%BE.T)



[图11-19 恒+活位移图](file:///F%3A%5C%E6%88%91%E7%9A%84%E9%A1%B9%E7%9B%AE%5C%E5%B9%B3%E5%8F%B0%E9%A1%B9%E7%9B%AE%5C%E5%AE%97%E7%BF%B0%5C2023%5C70%E6%9C%88%E7%9A%84%E9%A1%B9%E7%9B%AE%EF%BC%88%E5%88%B0%E6%89%8B500%EF%BC%89%5C%E6%A8%A1%E5%9E%8B%5Cpk-2_%5CCalcTemp%5C%E6%81%92%2B%E6%B4%BB%E4%BD%8D%E7%A7%BB%E5%9B%BE.T)