油机配电间坡屋顶结构计算书

**CALCULATION DOCUMENT**

工程编号： X21037

工程名称： 广州大和章雷达更新工程

项目名称： 结构工程

设计阶段： 施工图

设计专业： 结构

计算内容： 油机配电间坡屋顶

专业负责人： 黄锦炫

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日 期： 2021年11月

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| 3D3S | 民航新时代机场设计研究院有限公司 |

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# 1 设计依据

《钢结构设计标准》 (GB50017-2017)

《建筑结构荷载规范》 (GB50009-2012)

《建筑抗震设计规范》 (GB50011-2010)(2016年版)

《建筑地基基础设计规范》 (GB50007-2011)

《钢管混凝土结构技术规范》 (GB50936-2014)

《钢管混凝土结构设计规程》 (CECS 28:2012)

《矩形钢管混凝土结构技术规程》 (CECS159-2004)

《钢结构焊接规范》 (GB50661-2011)

《钢结构高强度螺栓连接技术规程》 (JGJ82-2011)

# 2 计算简图



计算简图 (圆表示支座，数字为节点号)

# 3 荷载与组合

结构重要性系数： 1.00

## 3.1 荷载工况

荷载工况汇总表

| 工况号 | 荷载类型 | 荷载说明 |
| --- | --- | --- |
| 0 | 恒 |  |
| 1 | 活 |  |
| 2 | 风 | 左吸 |
| 3 | 风 | 左压 |
| 4 | 风 | 前吸 |
| 5 | 风 | 前压 |

(1)杆件导荷载列表(力：kN；分布力：kN/m；弯矩：kN.m；分布弯矩：kN.m/m)

| 序号 | 荷载类型 | 工况 | 导荷方式 | 体型系数 | 面荷载值  (基本风压) |
| --- | --- | --- | --- | --- | --- |
| 1 | 恒 | 0 | 单向杆件 | -- | 0.50 |
| 3 | 活 | 1 | 单向杆件 | -- | 0.50 |
| 4 | 风 | 2 | 单向杆件 | -0.60 | 0.50 |
| 6 | 风 | 2 | 单向杆件 | -0.50 | 0.50 |
| 7 | 风 | 2 | 单向杆件 | -0.70 | 0.50 |
| 8 | 风 | 3 | 单向杆件 | 0.60 | 0.50 |
| 9 | 风 | 3 | 单向杆件 | 0.50 | 0.50 |
| 10 | 风 | 3 | 单向杆件 | 0.70 | 0.50 |
| 11 | 风 | 4 | 单向杆件 | -0.60 | 0.50 |
| 12 | 风 | 4 | 单向杆件 | -0.50 | 0.50 |
| 13 | 风 | 4 | 单向杆件 | -0.70 | 0.50 |
| 14 | 风 | 5 | 单向杆件 | 0.60 | 0.50 |
| 15 | 风 | 5 | 单向杆件 | 0.50 | 0.50 |
| 16 | 风 | 5 | 单向杆件 | 0.70 | 0.50 |

## 3.2 节点荷载

## 3.3 单元荷载

1) 工况号: 0

\*输入的面荷载:

| 序号 | 荷载类型 | 导荷方式 | 体型系数 | 面荷载值  (基本风压)  kN/m2 |
| --- | --- | --- | --- | --- |
| 1 | 恒载 | 单向杆件 | -- | 0.50 |

*面荷载分布图:*



面荷载序号 1 分布图（红线表示荷载分配到的单元）

2) 工况号: 1

\*输入的面荷载:

| 序号 | 荷载类型 | 导荷方式 | 体型系数 | 面荷载值  (基本风压)  kN/m2 |
| --- | --- | --- | --- | --- |
| 1 | 活载 | 单向杆件 | -- | 0.50 |

*面荷载分布图:*



面荷载序号 1 分布图（红线表示荷载分配到的单元）

3) 工况号: 2

\*输入的面荷载:

| 序号 | 荷载类型 | 导荷方式 | 体型系数 | 面荷载值  (基本风压)  kN/m2 |
| --- | --- | --- | --- | --- |
| 1 | 风载 | 单向杆件 | -0.60 | 0.50 |
| 2 | 风载 | 单向杆件 | -0.50 | 0.50 |
| 3 | 风载 | 单向杆件 | -0.70 | 0.50 |

*面荷载分布图:*



面荷载序号 1 分布图（红线表示荷载分配到的单元）



面荷载序号 2 分布图（红线表示荷载分配到的单元）



面荷载序号 3 分布图（红线表示荷载分配到的单元）

4) 工况号: 3

\*输入的面荷载:

| 序号 | 荷载类型 | 导荷方式 | 体型系数 | 面荷载值  (基本风压)  kN/m2 |
| --- | --- | --- | --- | --- |
| 1 | 风载 | 单向杆件 | 0.60 | 0.50 |
| 2 | 风载 | 单向杆件 | 0.50 | 0.50 |
| 3 | 风载 | 单向杆件 | 0.70 | 0.50 |

*面荷载分布图:*



面荷载序号 1 分布图（红线表示荷载分配到的单元）



面荷载序号 2 分布图（红线表示荷载分配到的单元）



面荷载序号 3 分布图（红线表示荷载分配到的单元）

5) 工况号: 4

\*输入的面荷载:

| 序号 | 荷载类型 | 导荷方式 | 体型系数 | 面荷载值  (基本风压)  kN/m2 |
| --- | --- | --- | --- | --- |
| 1 | 风载 | 单向杆件 | -0.60 | 0.50 |
| 2 | 风载 | 单向杆件 | -0.50 | 0.50 |
| 3 | 风载 | 单向杆件 | -0.70 | 0.50 |

*面荷载分布图:*



面荷载序号 1 分布图（红线表示荷载分配到的单元）



面荷载序号 2 分布图（红线表示荷载分配到的单元）



面荷载序号 3 分布图（红线表示荷载分配到的单元）

6) 工况号: 5

\*输入的面荷载:

| 序号 | 荷载类型 | 导荷方式 | 体型系数 | 面荷载值  (基本风压)  kN/m2 |
| --- | --- | --- | --- | --- |
| 1 | 风载 | 单向杆件 | 0.60 | 0.50 |
| 2 | 风载 | 单向杆件 | 0.50 | 0.50 |
| 3 | 风载 | 单向杆件 | 0.70 | 0.50 |

*面荷载分布图:*



面荷载序号 1 分布图（红线表示荷载分配到的单元）



面荷载序号 2 分布图（红线表示荷载分配到的单元）



面荷载序号 3 分布图（红线表示荷载分配到的单元）

## 3.4 面荷载

## 3.5其它荷载

(1). 风总信息

基本风压：0.50(kN/m2)

地面粗糙度：B

风压高度变化修正系数η：2.00

风荷载计算用阻尼比：0.01

风荷载参数

高度(m) μz（修正前） η μz βz

5.43 1.00 2.00 2.00 1.70

(2). 地震作用

规范： 《建筑抗震设计规范》（GB50011-2010）（2016年版）

地震烈度： 7度(0.10g)

水平地震影响系数最大值： 0.080

计算振型数： 20

建筑结构阻尼比： 0.020

特征周期值： 0.35

地震影响： 多遇地震

场地类别： Ⅱ类

地震分组： 第一组

周期折减系数： 1.00

地震力计算方法： 振型分解法

| 振型号 | 周期（秒） | 各振型质量参与系数 | | |
| --- | --- | --- | --- | --- |
| 1 | 0.1200 | 0.00% | 0.00% | 0.00% |
| 2 | 0.1172 | 4.09% | 0.00% | 0.00% |
| 3 | 0.1089 | 0.00% | 0.00% | 0.00% |
| 4 | 0.1086 | 0.00% | 72.89% | 0.00% |
| 5 | 0.0960 | 0.00% | 6.91% | 0.00% |
| 6 | 0.0875 | 18.07% | 0.00% | 0.00% |
| 7 | 0.0834 | 0.00% | 0.00% | 0.00% |
| 8 | 0.0709 | 0.00% | 0.00% | 0.79% |
| 9 | 0.0692 | 0.00% | 0.00% | 1.12% |
| 10 | 0.0594 | 0.00% | 0.00% | 0.00% |
| 11 | 0.0519 | 0.00% | 0.00% | 2.99% |
| 12 | 0.0517 | 0.00% | 18.72% | 0.00% |
| 13 | 0.0495 | 74.95% | 0.00% | 0.00% |
| 14 | 0.0467 | 0.00% | 0.00% | 2.55% |
| 15 | 0.0435 | 0.00% | 0.00% | 0.27% |
| 16 | 0.0317 | 0.00% | 0.00% | 1.76% |
| 17 | 0.0217 | 0.00% | 0.00% | 1.67% |
| 18 | 0.0118 | 0.00% | 0.00% | 60.51% |
| 19 | 0.0058 | 0.00% | 0.00% | 0.86% |
| 20 | 0.0017 | 0.00% | 0.00% | 6.00% |

(3). 温度作用

无温度作用。

## 3.6荷载组合

(1) 1.30 恒载 + 1.50 活载工况1

(2) 1.30 恒载 + 1.50 风载工况2

(3) 1.30 恒载 + 1.50 风载工况3

(4) 1.30 恒载 + 1.50 风载工况4

(5) 1.30 恒载 + 1.50 风载工况5

(6) 1.30 恒载 + 1.50 活载工况1 + 1.50 x 0.60 风载工况2

(7) 1.30 恒载 + 1.50 活载工况1 + 1.50 x 0.60 风载工况3

(8) 1.30 恒载 + 1.50 活载工况1 + 1.50 x 0.60 风载工况4

(9) 1.30 恒载 + 1.50 活载工况1 + 1.50 x 0.60 风载工况5

(10) 1.30 恒载 + 1.50 x 0.70 活载工况1 + 1.50 风载工况2

(11) 1.30 恒载 + 1.50 x 0.70 活载工况1 + 1.50 风载工况3

(12) 1.30 恒载 + 1.50 x 0.70 活载工况1 + 1.50 风载工况4

(13) 1.30 恒载 + 1.50 x 0.70 活载工况1 + 1.50 风载工况5

(14) 1.30 恒载 + 1.50 x 0.70 活载工况1 + 1.50 x 0.60 风载工况2

(15) 1.30 恒载 + 1.50 x 0.70 活载工况1 + 1.50 x 0.60 风载工况3

(16) 1.30 恒载 + 1.50 x 0.70 活载工况1 + 1.50 x 0.60 风载工况4

(17) 1.30 恒载 + 1.50 x 0.70 活载工况1 + 1.50 x 0.60 风载工况5

(18) 1.20 恒载 + 1.20 x 0.50 活载工况1 + 1.30 水平地震

(19) 1.00 恒载 + 1.50 风载工况2

(20) 1.00 恒载 + 1.50 风载工况3

(21) 1.00 恒载 + 1.50 风载工况4

(22) 1.00 恒载 + 1.50 风载工况5

(23) 1.00 恒载 + 1.00 x 0.50 活载工况1 + 1.30 水平地震

# 4 内力位移计算结果

## 4.1 内力

### 4.1.1 最不利内力

各效应组合下最大支座反力设计值(单位：kN、kN.m)

| 节点号 | 控制 | 组合号 | 组合  序号 | N1 | N2 | N3 | M1 | M2 | M3 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | N1最大 | 18 | 2 | 0.6 | 0.0 | 5.2 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 23 | 4 | -0.4 | 1.8 | 0.3 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 13 | 1 | -0.6 | -0.0 | 9.6 | 0.0 | 0.0 | 0.0 |
| 1 | 合力最大 | 13 | 1 | -0.6 | -0.0 | 9.6 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 22 | 1 | -0.8 | -0.0 | 7.0 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | 0.4 | -1.8 | 7.3 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 21 | 1 | 0.0 | 1.1 | -1.3 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 18 | 2 | 0.0 | -0.0 | 4.0 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 23 | 4 | -0.0 | 0.0 | 3.4 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | -0.0 | -0.0 | 12.2 | 0.0 | 0.0 | 0.0 |
| 3 | 合力最大 | 11 | 1 | -0.0 | -0.0 | 12.2 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 11 | 1 | -0.0 | -0.0 | 12.2 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | 0.0 | -0.0 | 3.9 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 19 | 1 | 0.0 | -0.0 | -4.8 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 18 | 2 | 1.2 | -0.0 | 4.1 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 23 | 4 | -0.7 | 0.0 | 4.2 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | -0.1 | -0.0 | 13.6 | 0.0 | 0.0 | 0.0 |
| 5 | 合力最大 | 11 | 1 | -0.1 | -0.0 | 13.6 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 23 | 1 | -1.2 | -0.0 | 4.0 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | 0.7 | -0.0 | 3.9 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 19 | 1 | 1.1 | -0.0 | -5.4 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 23 | 2 | 0.5 | -0.0 | 4.6 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 23 | 4 | -0.0 | 0.0 | 4.1 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | -0.2 | -0.0 | 10.1 | 0.0 | 0.0 | 0.0 |
| 7 | 合力最大 | 11 | 1 | -0.2 | -0.0 | 10.1 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 18 | 1 | -0.5 | -0.0 | 4.5 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | 0.0 | -0.0 | 4.9 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 19 | 1 | 0.0 | -0.0 | -0.2 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 18 | 2 | 0.6 | -0.0 | 5.2 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | 0.4 | 1.8 | 7.3 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | -0.6 | 0.0 | 9.2 | 0.0 | 0.0 | 0.0 |
| 9 | 合力最大 | 11 | 1 | -0.6 | 0.0 | 9.2 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 22 | 1 | -1.1 | -1.4 | 5.6 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 23 | 3 | -0.4 | -1.8 | 0.3 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 19 | 1 | 0.0 | -0.1 | -0.9 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 21 | 1 | 1.5 | 0.0 | -4.5 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | 0.7 | 0.0 | 3.9 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | -0.1 | -0.0 | 13.6 | 0.0 | 0.0 | 0.0 |
| 11 | 合力最大 | 11 | 1 | -0.1 | -0.0 | 13.6 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 23 | 1 | -1.2 | 0.0 | 4.0 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 23 | 3 | -0.7 | -0.0 | 4.2 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 19 | 1 | 1.1 | 0.0 | -5.4 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 18 | 2 | 0.0 | 0.0 | 4.0 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | 0.0 | 0.0 | 3.9 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | -0.0 | -0.0 | 12.2 | 0.0 | 0.0 | 0.0 |
| 13 | 合力最大 | 11 | 1 | -0.0 | -0.0 | 12.2 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 13 | 1 | -0.0 | -0.0 | 11.2 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 23 | 3 | -0.0 | -0.0 | 3.4 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 19 | 1 | 0.0 | 0.0 | -4.8 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 12 | 1 | 0.0 | 1.3 | -1.6 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | 0.0 | 4.2 | 3.4 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 13 | 1 | -0.0 | -1.1 | 10.2 | 0.0 | 0.0 | 0.0 |
| 15 | 合力最大 | 13 | 1 | -0.0 | -1.1 | 10.2 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 13 | 1 | -0.0 | -1.1 | 10.2 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | 0.0 | -4.2 | 3.4 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 21 | 1 | 0.0 | 1.3 | -3.8 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 18 | 2 | 0.0 | -0.0 | 4.8 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 23 | 4 | -0.0 | 0.0 | 4.2 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | -0.0 | -0.0 | 15.0 | 0.0 | 0.0 | 0.0 |
| 17 | 合力最大 | 11 | 1 | -0.0 | -0.0 | 15.0 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 23 | 1 | -0.0 | -0.0 | 4.0 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | 0.0 | -0.0 | 4.6 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 19 | 1 | 0.0 | -0.0 | -6.0 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 19 | 1 | 0.7 | -0.0 | -7.0 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 23 | 4 | -0.3 | 0.0 | 5.0 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | -0.0 | 0.0 | 17.2 | 0.0 | 0.0 | 0.0 |
| 19 | 合力最大 | 11 | 1 | -0.0 | 0.0 | 17.2 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 23 | 1 | -0.5 | -0.0 | 5.1 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | 0.3 | -0.0 | 5.3 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 19 | 1 | 0.7 | -0.0 | -7.0 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 21 | 1 | 0.9 | 0.0 | -2.4 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 23 | 4 | -0.0 | 0.0 | 4.5 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | -0.0 | -0.0 | 13.2 | 0.0 | 0.0 | 0.0 |
| 21 | 合力最大 | 11 | 1 | -0.0 | -0.0 | 13.2 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 18 | 1 | -0.5 | -0.0 | 5.9 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | 0.0 | -0.0 | 5.4 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 19 | 1 | 0.9 | -0.0 | -3.7 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 21 | 1 | 0.9 | 0.0 | -5.7 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | 0.3 | 0.0 | 5.3 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | -0.0 | -0.0 | 17.2 | 0.0 | 0.0 | 0.0 |
| 23 | 合力最大 | 11 | 1 | -0.0 | -0.0 | 17.2 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 23 | 1 | -0.5 | 0.0 | 5.1 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 23 | 3 | -0.3 | -0.0 | 5.0 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 19 | 1 | 0.7 | 0.0 | -7.0 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 18 | 2 | 0.0 | 0.0 | 4.8 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | 0.0 | 0.0 | 4.6 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | -0.0 | -0.0 | 15.0 | 0.0 | 0.0 | 0.0 |
| 25 | 合力最大 | 11 | 1 | -0.0 | -0.0 | 15.0 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 23 | 1 | -0.0 | 0.0 | 4.0 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 23 | 3 | -0.0 | -0.0 | 4.2 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 19 | 1 | 0.0 | 0.0 | -6.0 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 23 | 2 | 0.0 | -0.0 | 4.0 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 23 | 4 | -0.0 | 0.0 | 4.3 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | -0.0 | 0.0 | 15.0 | 0.0 | 0.0 | 0.0 |
| 27 | 合力最大 | 11 | 1 | -0.0 | 0.0 | 15.0 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 18 | 1 | -0.0 | -0.0 | 4.8 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | -0.0 | -0.0 | 4.6 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 19 | 1 | 0.0 | -0.0 | -6.0 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 23 | 2 | 0.0 | -0.0 | 4.6 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 23 | 4 | -0.0 | 0.0 | 4.8 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | -0.0 | 0.0 | 17.1 | 0.0 | 0.0 | 0.0 |
| 29 | 合力最大 | 11 | 1 | -0.0 | 0.0 | 17.1 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 18 | 1 | -0.0 | -0.0 | 5.5 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | -0.0 | -0.0 | 5.3 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 19 | 1 | 0.0 | -0.0 | -6.8 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 23 | 2 | 0.0 | -0.0 | 4.4 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 23 | 4 | -0.0 | 0.0 | 4.4 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | -0.0 | 0.0 | 12.9 | 0.0 | 0.0 | 0.0 |
| 31 | 合力最大 | 11 | 1 | -0.0 | 0.0 | 12.9 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 18 | 1 | -0.0 | -0.0 | 5.2 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | -0.0 | -0.0 | 5.2 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 19 | 1 | 0.0 | 0.0 | -3.2 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 23 | 2 | 0.0 | 0.0 | 4.6 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | -0.0 | 0.0 | 5.3 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | -0.0 | -0.0 | 17.1 | 0.0 | 0.0 | 0.0 |
| 33 | 合力最大 | 11 | 1 | -0.0 | -0.0 | 17.1 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 18 | 1 | -0.0 | 0.0 | 5.5 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 23 | 3 | -0.0 | -0.0 | 4.8 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 19 | 1 | 0.0 | 0.0 | -6.8 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 18 | 2 | 0.0 | 0.0 | 4.8 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | -0.0 | 0.0 | 4.6 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | -0.0 | -0.0 | 15.0 | 0.0 | 0.0 | 0.0 |
| 35 | 合力最大 | 11 | 1 | -0.0 | -0.0 | 15.0 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 23 | 1 | -0.0 | 0.0 | 4.0 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 23 | 3 | -0.0 | -0.0 | 4.3 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 19 | 1 | 0.0 | 0.0 | -6.0 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 22 | 1 | 0.8 | -0.0 | 7.0 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 23 | 4 | 0.4 | 1.8 | 0.3 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 13 | 1 | 0.6 | -0.0 | 9.6 | 0.0 | 0.0 | 0.0 |
| 47 | 合力最大 | 13 | 1 | 0.6 | -0.0 | 9.6 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 18 | 1 | -0.6 | 0.0 | 5.2 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | -0.4 | -1.8 | 7.3 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 21 | 1 | -0.0 | 1.1 | -3.4 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 23 | 2 | 0.0 | -0.0 | 3.3 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 23 | 4 | 0.0 | 0.0 | 3.4 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | 0.0 | 0.0 | 12.2 | 0.0 | 0.0 | 0.0 |
| 49 | 合力最大 | 11 | 1 | 0.0 | 0.0 | 12.2 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 18 | 1 | -0.0 | -0.0 | 4.0 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | -0.0 | -0.0 | 3.9 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 19 | 1 | -0.0 | -0.0 | -4.8 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 23 | 2 | 1.2 | -0.0 | 4.0 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 23 | 4 | 0.7 | 0.0 | 4.2 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | 0.0 | 0.0 | 13.3 | 0.0 | 0.0 | 0.0 |
| 51 | 合力最大 | 11 | 1 | 0.0 | 0.0 | 13.3 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 18 | 1 | -1.2 | -0.0 | 4.1 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | -0.7 | -0.0 | 3.9 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 19 | 1 | -0.7 | -0.0 | -5.3 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 18 | 2 | 0.5 | -0.0 | 4.5 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 23 | 4 | 0.0 | 0.0 | 4.1 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | 0.0 | 0.0 | 10.1 | 0.0 | 0.0 | 0.0 |
| 53 | 合力最大 | 11 | 1 | 0.0 | 0.0 | 10.1 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 23 | 1 | -0.5 | -0.0 | 4.6 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | -0.0 | -0.0 | 4.9 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 21 | 1 | -0.0 | 0.0 | -2.1 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 22 | 1 | 1.1 | -1.4 | 5.6 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | -0.4 | 1.8 | 7.3 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | 0.0 | -0.0 | 9.4 | 0.0 | 0.0 | 0.0 |
| 55 | 合力最大 | 11 | 1 | 0.0 | -0.0 | 9.4 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 18 | 1 | -0.6 | -0.0 | 5.2 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 23 | 3 | 0.4 | -1.8 | 0.3 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 21 | 1 | -0.0 | 0.0 | -1.9 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 23 | 2 | 1.2 | 0.0 | 4.0 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | -0.7 | 0.0 | 3.9 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | 0.0 | 0.0 | 13.3 | 0.0 | 0.0 | 0.0 |
| 57 | 合力最大 | 11 | 1 | 0.0 | 0.0 | 13.3 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 21 | 1 | -1.5 | 0.0 | -4.6 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 23 | 3 | 0.7 | -0.0 | 4.2 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 19 | 1 | -0.7 | 0.0 | -5.3 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 13 | 1 | 0.0 | -0.0 | 11.2 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | -0.0 | 0.0 | 3.9 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | 0.0 | 0.0 | 12.2 | 0.0 | 0.0 | 0.0 |
| 59 | 合力最大 | 11 | 1 | 0.0 | 0.0 | 12.2 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 18 | 1 | -0.0 | 0.0 | 4.0 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 23 | 3 | 0.0 | -0.0 | 3.4 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 19 | 1 | -0.0 | 0.0 | -4.8 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 13 | 1 | 0.0 | -1.1 | 10.2 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | -0.0 | 4.2 | 3.4 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 13 | 1 | 0.0 | -1.1 | 10.2 | 0.0 | 0.0 | 0.0 |
| 61 | 合力最大 | 13 | 1 | 0.0 | -1.1 | 10.2 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 12 | 1 | -0.0 | 1.3 | -1.0 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | -0.0 | -4.2 | 3.4 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 21 | 1 | -0.0 | 1.4 | -3.2 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 23 | 2 | 0.0 | -0.0 | 4.0 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 23 | 4 | 0.0 | 0.0 | 4.2 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | -0.0 | 0.0 | 15.0 | 0.0 | 0.0 | 0.0 |
| 63 | 合力最大 | 11 | 1 | -0.0 | 0.0 | 15.0 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 18 | 1 | -0.0 | -0.0 | 4.8 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | -0.0 | -0.0 | 4.6 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 19 | 1 | -0.0 | -0.0 | -6.0 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 23 | 2 | 0.5 | -0.0 | 5.1 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 23 | 4 | 0.3 | 0.0 | 5.0 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | 0.0 | 0.0 | 17.2 | 0.0 | 0.0 | 0.0 |
| 65 | 合力最大 | 11 | 1 | 0.0 | 0.0 | 17.2 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 21 | 1 | -0.5 | 0.0 | -3.9 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | -0.3 | -0.0 | 5.3 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 19 | 1 | -0.5 | -0.0 | -6.9 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 18 | 2 | 0.5 | -0.0 | 5.9 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 23 | 4 | 0.0 | 0.0 | 4.5 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | 0.0 | 0.0 | 13.1 | 0.0 | 0.0 | 0.0 |
| 67 | 合力最大 | 11 | 1 | 0.0 | 0.0 | 13.1 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 21 | 1 | -1.1 | 0.0 | -2.5 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | -0.0 | -0.0 | 5.4 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 19 | 1 | -0.7 | 0.0 | -3.6 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 23 | 2 | 0.5 | 0.0 | 5.1 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | -0.3 | 0.0 | 5.3 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | 0.0 | 0.0 | 17.2 | 0.0 | 0.0 | 0.0 |
| 69 | 合力最大 | 11 | 1 | 0.0 | 0.0 | 17.2 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 21 | 1 | -0.8 | 0.0 | -5.6 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 23 | 3 | 0.3 | -0.0 | 5.0 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 19 | 1 | -0.5 | 0.0 | -6.9 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 23 | 2 | 0.0 | 0.0 | 4.0 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | -0.0 | 0.0 | 4.6 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | -0.0 | 0.0 | 15.0 | 0.0 | 0.0 | 0.0 |
| 71 | 合力最大 | 11 | 1 | -0.0 | 0.0 | 15.0 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 18 | 1 | -0.0 | 0.0 | 4.8 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 23 | 3 | 0.0 | -0.0 | 4.2 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 19 | 1 | -0.0 | 0.0 | -6.0 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 12 | 1 | 0.0 | 0.0 | -0.7 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | 0.0 | 0.0 | 3.4 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | -0.0 | -0.0 | 9.0 | 0.0 | 0.0 | 0.0 |
| 75 | 合力最大 | 11 | 1 | -0.0 | -0.0 | 9.0 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 13 | 1 | -0.0 | -0.0 | 9.0 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 13 | 1 | -0.0 | -0.0 | 9.0 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 19 | 1 | 0.0 | 0.0 | -2.9 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 12 | 1 | 0.0 | 0.0 | -1.7 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | 0.0 | 0.0 | 3.1 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 13 | 1 | -0.0 | -0.0 | 9.6 | 0.0 | 0.0 | 0.0 |
| 77 | 合力最大 | 13 | 1 | -0.0 | -0.0 | 9.6 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 13 | 1 | -0.0 | -0.0 | 9.6 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 13 | 1 | -0.0 | -0.0 | 9.6 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 21 | 1 | 0.0 | 0.0 | -3.8 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 12 | 1 | 0.0 | 0.0 | -1.8 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 23 | 4 | 0.0 | 0.0 | 2.6 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 13 | 1 | -0.0 | -0.0 | 9.7 | 0.0 | 0.0 | 0.0 |
| 79 | 合力最大 | 13 | 1 | -0.0 | -0.0 | 9.7 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 22 | 1 | -0.0 | -0.0 | 7.6 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 13 | 1 | -0.0 | -0.0 | 9.7 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 21 | 1 | 0.0 | 0.0 | -3.8 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 10 | 1 | 0.0 | -0.0 | -0.9 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 23 | 4 | -0.0 | 0.0 | 2.6 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 13 | 1 | -0.0 | -0.0 | 9.6 | 0.0 | 0.0 | 0.0 |
| 81 | 合力最大 | 13 | 1 | -0.0 | -0.0 | 9.6 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 11 | 1 | -0.0 | -0.0 | 8.8 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | 0.0 | -0.0 | 3.1 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 21 | 1 | 0.0 | 0.0 | -3.8 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 18 | 2 | 0.0 | 0.0 | 3.2 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 23 | 4 | -0.0 | 0.0 | 2.7 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | -0.0 | 0.0 | 9.0 | 0.0 | 0.0 | 0.0 |
| 86 | 合力最大 | 11 | 1 | -0.0 | 0.0 | 9.0 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 11 | 1 | -0.0 | 0.0 | 9.0 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | 0.0 | -0.0 | 3.4 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 19 | 1 | 0.0 | -0.0 | -2.9 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 13 | 1 | 0.0 | -0.0 | 9.0 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | -0.0 | 0.0 | 3.4 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 13 | 1 | 0.0 | -0.0 | 9.0 | 0.0 | 0.0 | 0.0 |
| 90 | 合力最大 | 13 | 1 | 0.0 | -0.0 | 9.0 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 12 | 1 | -0.0 | 0.0 | -0.1 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 13 | 1 | 0.0 | -0.0 | 9.0 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 19 | 1 | -0.0 | 0.0 | -2.5 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 13 | 1 | 0.0 | -0.0 | 9.6 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | -0.0 | 0.0 | 3.1 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 13 | 1 | 0.0 | -0.0 | 9.6 | 0.0 | 0.0 | 0.0 |
| 92 | 合力最大 | 13 | 1 | 0.0 | -0.0 | 9.6 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 12 | 1 | -0.0 | 0.0 | -0.0 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 13 | 1 | 0.0 | -0.0 | 9.6 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 19 | 1 | -0.0 | 0.0 | -2.1 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 22 | 1 | 0.0 | -0.0 | 7.6 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 23 | 4 | -0.0 | 0.0 | 2.6 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 13 | 1 | 0.0 | -0.0 | 9.7 | 0.0 | 0.0 | 0.0 |
| 94 | 合力最大 | 13 | 1 | 0.0 | -0.0 | 9.7 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 12 | 1 | -0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 13 | 1 | 0.0 | -0.0 | 9.7 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 19 | 1 | -0.0 | 0.0 | -2.2 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 13 | 1 | 0.0 | -0.0 | 9.6 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 23 | 4 | 0.0 | 0.0 | 2.6 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 13 | 1 | 0.0 | -0.0 | 9.6 | 0.0 | 0.0 | 0.0 |
| 96 | 合力最大 | 13 | 1 | 0.0 | -0.0 | 9.6 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 12 | 1 | -0.0 | 0.0 | -0.0 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | -0.0 | -0.0 | 3.1 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 19 | 1 | -0.0 | -0.0 | -2.1 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 13 | 1 | 0.0 | -0.0 | 8.6 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 23 | 4 | 0.0 | 0.0 | 2.7 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 13 | 1 | 0.0 | -0.0 | 8.6 | 0.0 | 0.0 | 0.0 |
| 101 | 合力最大 | 13 | 1 | 0.0 | -0.0 | 8.6 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 18 | 1 | -0.0 | 0.0 | 3.2 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | -0.0 | -0.0 | 3.4 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 19 | 1 | -0.0 | -0.0 | -2.5 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 12 | 1 | 0.0 | 0.0 | -0.7 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | 0.0 | 0.0 | 3.1 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | -0.0 | -0.0 | 9.6 | 0.0 | 0.0 | 0.0 |
| 103 | 合力最大 | 11 | 1 | -0.0 | -0.0 | 9.6 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 13 | 1 | -0.0 | -0.0 | 8.8 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 13 | 1 | -0.0 | -0.0 | 8.8 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 19 | 1 | 0.0 | 0.0 | -3.7 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 18 | 2 | 0.0 | -0.0 | 3.2 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 23 | 4 | -0.0 | 0.0 | 2.7 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | -0.0 | 0.0 | 9.6 | 0.0 | 0.0 | 0.0 |
| 106 | 合力最大 | 11 | 1 | -0.0 | 0.0 | 9.6 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 11 | 1 | -0.0 | 0.0 | 9.6 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | 0.0 | -0.0 | 3.1 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 19 | 1 | 0.0 | -0.0 | -3.7 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 13 | 1 | 0.0 | -0.0 | 8.8 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | -0.0 | 0.0 | 3.1 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | 0.0 | 0.0 | 9.6 | 0.0 | 0.0 | 0.0 |
| 109 | 合力最大 | 11 | 1 | 0.0 | 0.0 | 9.6 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 18 | 1 | -0.0 | 0.0 | 3.2 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 13 | 1 | 0.0 | -0.0 | 8.8 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 19 | 1 | -0.0 | 0.0 | -3.7 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 23 | 2 | 0.0 | 0.0 | 2.7 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 23 | 4 | 0.0 | 0.0 | 2.7 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | 0.0 | 0.0 | 9.6 | 0.0 | 0.0 | 0.0 |
| 112 | 合力最大 | 11 | 1 | 0.0 | 0.0 | 9.6 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 18 | 1 | -0.0 | -0.0 | 3.2 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | -0.0 | -0.0 | 3.1 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 19 | 1 | -0.0 | -0.0 | -3.7 | 0.0 | 0.0 | 0.0 |

各效应组合下最大支座反力标准值(单位：kN、kN.m)

| 节点号 | 控制 | 组合号 | 组合  序号 | N1 | N2 | N3 | M1 | M2 | M3 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | N1最大 | 18 | 2 | 0.5 | 0.0 | 4.2 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | -0.3 | 1.4 | 1.0 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 13 | 1 | -0.4 | -0.0 | 6.7 | 0.0 | 0.0 | 0.0 |
| 1 | 合力最大 | 13 | 1 | -0.4 | -0.0 | 6.7 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 5 | 1 | -0.5 | -0.0 | 5.6 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | 0.3 | -1.4 | 5.9 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 4 | 1 | 0.0 | 0.7 | -0.0 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 18 | 2 | 0.0 | -0.0 | 3.3 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | -0.0 | 0.0 | 3.4 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | -0.0 | -0.0 | 8.5 | 0.0 | 0.0 | 0.0 |
| 3 | 合力最大 | 11 | 1 | -0.0 | -0.0 | 8.5 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 11 | 1 | -0.0 | -0.0 | 8.5 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | 0.0 | -0.0 | 3.2 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 2 | 1 | 0.0 | -0.0 | -2.4 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 18 | 2 | 0.9 | -0.0 | 3.5 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | -0.5 | 0.0 | 4.1 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | -0.1 | -0.0 | 9.5 | 0.0 | 0.0 | 0.0 |
| 5 | 合力最大 | 11 | 1 | -0.1 | -0.0 | 9.5 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 18 | 1 | -0.9 | -0.0 | 4.0 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | 0.5 | -0.0 | 3.3 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 2 | 1 | 0.7 | -0.0 | -2.7 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 18 | 2 | 0.3 | -0.0 | 4.5 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | -0.0 | 0.0 | 4.1 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | -0.1 | -0.0 | 7.2 | 0.0 | 0.0 | 0.0 |
| 7 | 合力最大 | 11 | 1 | -0.1 | -0.0 | 7.2 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 18 | 1 | -0.3 | -0.0 | 3.8 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | 0.0 | -0.0 | 4.1 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 2 | 1 | 0.0 | -0.0 | 0.9 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 18 | 2 | 0.5 | -0.0 | 4.2 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | 0.3 | 1.4 | 5.9 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | -0.4 | 0.0 | 6.5 | 0.0 | 0.0 | 0.0 |
| 9 | 合力最大 | 11 | 1 | -0.4 | 0.0 | 6.5 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 5 | 1 | -0.7 | -0.9 | 4.6 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | -0.3 | -1.4 | 1.0 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 2 | 1 | 0.0 | -0.1 | 0.3 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 4 | 1 | 1.0 | 0.0 | -2.1 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | 0.5 | 0.0 | 3.3 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | -0.1 | -0.0 | 9.5 | 0.0 | 0.0 | 0.0 |
| 11 | 合力最大 | 11 | 1 | -0.1 | -0.0 | 9.5 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 18 | 1 | -0.9 | 0.0 | 4.0 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | -0.5 | -0.0 | 4.1 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 2 | 1 | 0.7 | 0.0 | -2.7 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 18 | 2 | 0.0 | 0.0 | 3.3 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | 0.0 | 0.0 | 3.2 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | -0.0 | -0.0 | 8.5 | 0.0 | 0.0 | 0.0 |
| 13 | 合力最大 | 11 | 1 | -0.0 | -0.0 | 8.5 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 13 | 1 | -0.0 | -0.0 | 7.8 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | -0.0 | -0.0 | 3.4 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 2 | 1 | 0.0 | 0.0 | -2.4 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 12 | 1 | 0.0 | 0.9 | -0.8 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | 0.0 | 3.2 | 2.8 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 13 | 1 | -0.0 | -0.7 | 7.1 | 0.0 | 0.0 | 0.0 |
| 15 | 合力最大 | 13 | 1 | -0.0 | -0.7 | 7.1 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 13 | 1 | -0.0 | -0.7 | 7.1 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | 0.0 | -3.2 | 2.8 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 4 | 1 | 0.0 | 0.9 | -1.8 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 18 | 2 | 0.0 | -0.0 | 4.0 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | -0.0 | 0.0 | 4.2 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | -0.0 | -0.0 | 10.4 | 0.0 | 0.0 | 0.0 |
| 17 | 合力最大 | 11 | 1 | -0.0 | -0.0 | 10.4 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 18 | 1 | -0.0 | -0.0 | 4.0 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | 0.0 | -0.0 | 3.9 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 2 | 1 | 0.0 | -0.0 | -3.0 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 2 | 1 | 0.5 | -0.0 | -3.5 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | -0.3 | 0.0 | 4.9 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | -0.0 | -0.0 | 11.9 | 0.0 | 0.0 | 0.0 |
| 19 | 合力最大 | 11 | 1 | -0.0 | -0.0 | 11.9 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 18 | 1 | -0.4 | -0.0 | 5.0 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | 0.3 | -0.0 | 4.4 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 2 | 1 | 0.5 | -0.0 | -3.5 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 2 | 1 | 0.6 | 0.0 | -1.4 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | -0.0 | 0.0 | 4.5 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | -0.0 | -0.0 | 9.2 | 0.0 | 0.0 | 0.0 |
| 21 | 合力最大 | 11 | 1 | -0.0 | -0.0 | 9.2 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 18 | 1 | -0.4 | -0.0 | 4.9 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | 0.0 | -0.0 | 4.5 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 2 | 1 | 0.6 | 0.0 | -1.4 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 4 | 1 | 0.6 | 0.0 | -2.7 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | 0.3 | 0.0 | 4.4 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | -0.0 | -0.0 | 11.9 | 0.0 | 0.0 | 0.0 |
| 23 | 合力最大 | 11 | 1 | -0.0 | -0.0 | 11.9 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 18 | 1 | -0.4 | 0.0 | 5.0 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | -0.3 | -0.0 | 4.9 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 2 | 1 | 0.5 | 0.0 | -3.5 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 18 | 2 | 0.0 | 0.0 | 4.0 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | 0.0 | 0.0 | 3.9 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | -0.0 | -0.0 | 10.4 | 0.0 | 0.0 | 0.0 |
| 25 | 合力最大 | 11 | 1 | -0.0 | -0.0 | 10.4 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 18 | 1 | -0.0 | 0.0 | 4.0 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | -0.0 | -0.0 | 4.2 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 2 | 1 | 0.0 | 0.0 | -3.0 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 18 | 2 | 0.0 | -0.0 | 4.0 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | -0.0 | 0.0 | 4.2 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | -0.0 | 0.0 | 10.4 | 0.0 | 0.0 | 0.0 |
| 27 | 合力最大 | 11 | 1 | -0.0 | 0.0 | 10.4 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 18 | 1 | -0.0 | -0.0 | 4.0 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | -0.0 | -0.0 | 3.8 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 2 | 1 | 0.0 | -0.0 | -3.0 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 18 | 2 | 0.0 | -0.0 | 4.6 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | -0.0 | 0.0 | 4.7 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | -0.0 | 0.0 | 11.8 | 0.0 | 0.0 | 0.0 |
| 29 | 合力最大 | 11 | 1 | -0.0 | 0.0 | 11.8 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 18 | 1 | -0.0 | -0.0 | 4.6 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | -0.0 | -0.0 | 4.4 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 2 | 1 | 0.0 | -0.0 | -3.4 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 18 | 2 | 0.0 | -0.0 | 4.4 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | -0.0 | 0.0 | 4.4 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | -0.0 | 0.0 | 9.0 | 0.0 | 0.0 | 0.0 |
| 31 | 合力最大 | 11 | 1 | -0.0 | 0.0 | 9.0 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 18 | 1 | -0.0 | -0.0 | 4.4 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | -0.0 | -0.0 | 4.4 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 2 | 1 | 0.0 | 0.0 | -1.1 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 18 | 2 | 0.0 | 0.0 | 4.6 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | -0.0 | 0.0 | 4.4 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | -0.0 | -0.0 | 11.8 | 0.0 | 0.0 | 0.0 |
| 33 | 合力最大 | 11 | 1 | -0.0 | -0.0 | 11.8 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 18 | 1 | -0.0 | 0.0 | 4.6 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | -0.0 | -0.0 | 4.7 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 2 | 1 | 0.0 | 0.0 | -3.4 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 18 | 2 | 0.0 | 0.0 | 4.0 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | -0.0 | 0.0 | 3.8 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | -0.0 | -0.0 | 10.4 | 0.0 | 0.0 | 0.0 |
| 35 | 合力最大 | 11 | 1 | -0.0 | -0.0 | 10.4 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 18 | 1 | -0.0 | 0.0 | 4.0 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | -0.0 | -0.0 | 4.2 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 2 | 1 | 0.0 | 0.0 | -3.0 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 5 | 1 | 0.5 | -0.0 | 5.6 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | 0.3 | 1.4 | 1.0 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 13 | 1 | 0.4 | -0.0 | 6.7 | 0.0 | 0.0 | 0.0 |
| 47 | 合力最大 | 13 | 1 | 0.4 | -0.0 | 6.7 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 18 | 1 | -0.5 | 0.0 | 4.2 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | -0.3 | -1.4 | 5.9 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 4 | 1 | -0.0 | 0.7 | -1.4 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 18 | 2 | 0.0 | -0.0 | 3.3 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | 0.0 | 0.0 | 3.4 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | 0.0 | 0.0 | 8.5 | 0.0 | 0.0 | 0.0 |
| 49 | 合力最大 | 11 | 1 | 0.0 | 0.0 | 8.5 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 18 | 1 | -0.0 | -0.0 | 3.3 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | -0.0 | -0.0 | 3.2 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 2 | 1 | -0.0 | -0.0 | -2.4 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 18 | 2 | 0.9 | -0.0 | 4.0 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | 0.5 | 0.0 | 4.1 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | 0.0 | 0.0 | 9.2 | 0.0 | 0.0 | 0.0 |
| 51 | 合力最大 | 11 | 1 | 0.0 | 0.0 | 9.2 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 18 | 1 | -0.9 | -0.0 | 3.5 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | -0.5 | -0.0 | 3.3 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 2 | 1 | -0.4 | -0.0 | -2.6 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 18 | 2 | 0.3 | -0.0 | 3.8 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | 0.0 | 0.0 | 4.1 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | 0.0 | 0.0 | 7.1 | 0.0 | 0.0 | 0.0 |
| 53 | 合力最大 | 11 | 1 | 0.0 | 0.0 | 7.1 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 18 | 1 | -0.3 | -0.0 | 4.5 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | -0.0 | -0.0 | 4.1 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 4 | 1 | -0.0 | 0.0 | -0.4 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 5 | 1 | 0.7 | -0.9 | 4.6 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | -0.3 | 1.4 | 5.9 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | 0.0 | 0.0 | 6.6 | 0.0 | 0.0 | 0.0 |
| 55 | 合力最大 | 11 | 1 | 0.0 | 0.0 | 6.6 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 18 | 1 | -0.5 | -0.0 | 4.2 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | 0.3 | -1.4 | 1.0 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 4 | 1 | -0.0 | 0.0 | -0.4 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 18 | 2 | 0.9 | 0.0 | 4.0 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | -0.5 | 0.0 | 3.3 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | 0.0 | 0.0 | 9.2 | 0.0 | 0.0 | 0.0 |
| 57 | 合力最大 | 11 | 1 | 0.0 | 0.0 | 9.2 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 4 | 1 | -1.0 | 0.0 | -2.1 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | 0.5 | -0.0 | 4.1 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 2 | 1 | -0.4 | 0.0 | -2.6 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 13 | 1 | 0.0 | -0.0 | 7.8 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | -0.0 | 0.0 | 3.2 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | 0.0 | 0.0 | 8.5 | 0.0 | 0.0 | 0.0 |
| 59 | 合力最大 | 11 | 1 | 0.0 | 0.0 | 8.5 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 18 | 1 | -0.0 | 0.0 | 3.3 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | 0.0 | -0.0 | 3.4 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 2 | 1 | -0.0 | 0.0 | -2.4 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 13 | 1 | 0.0 | -0.7 | 7.1 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | -0.0 | 3.2 | 2.8 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 13 | 1 | 0.0 | -0.7 | 7.1 | 0.0 | 0.0 | 0.0 |
| 61 | 合力最大 | 13 | 1 | 0.0 | -0.7 | 7.1 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 12 | 1 | -0.0 | 0.9 | -0.4 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | -0.0 | -3.2 | 2.8 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 4 | 1 | -0.0 | 0.9 | -1.4 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 18 | 2 | 0.0 | -0.0 | 4.0 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | 0.0 | 0.0 | 4.2 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | -0.0 | 0.0 | 10.4 | 0.0 | 0.0 | 0.0 |
| 63 | 合力最大 | 11 | 1 | -0.0 | 0.0 | 10.4 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 18 | 1 | -0.0 | -0.0 | 4.0 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | -0.0 | -0.0 | 3.9 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 2 | 1 | -0.0 | -0.0 | -3.0 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 18 | 2 | 0.4 | -0.0 | 5.0 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | 0.3 | 0.0 | 4.9 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | 0.0 | 0.0 | 11.9 | 0.0 | 0.0 | 0.0 |
| 65 | 合力最大 | 11 | 1 | 0.0 | 0.0 | 11.9 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 18 | 1 | -0.4 | -0.0 | 4.3 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | -0.3 | -0.0 | 4.4 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 2 | 1 | -0.3 | -0.0 | -3.5 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 18 | 2 | 0.4 | -0.0 | 4.9 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | 0.0 | 0.0 | 4.5 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | 0.0 | 0.0 | 9.1 | 0.0 | 0.0 | 0.0 |
| 67 | 合力最大 | 11 | 1 | 0.0 | 0.0 | 9.1 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 4 | 1 | -0.6 | 0.0 | -0.6 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | -0.0 | -0.0 | 4.5 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 2 | 1 | -0.4 | 0.0 | -1.3 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 18 | 2 | 0.4 | 0.0 | 5.0 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | -0.3 | 0.0 | 4.4 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | 0.0 | 0.0 | 11.9 | 0.0 | 0.0 | 0.0 |
| 69 | 合力最大 | 11 | 1 | 0.0 | 0.0 | 11.9 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 4 | 1 | -0.5 | 0.0 | -2.6 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | 0.3 | -0.0 | 4.9 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 2 | 1 | -0.3 | 0.0 | -3.5 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 18 | 2 | 0.0 | 0.0 | 4.0 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | -0.0 | 0.0 | 3.9 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | -0.0 | 0.0 | 10.4 | 0.0 | 0.0 | 0.0 |
| 71 | 合力最大 | 11 | 1 | -0.0 | 0.0 | 10.4 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 18 | 1 | -0.0 | 0.0 | 4.0 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | 0.0 | -0.0 | 4.2 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 2 | 1 | -0.0 | 0.0 | -3.0 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 12 | 1 | 0.0 | 0.0 | -0.2 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | 0.0 | 0.0 | 2.8 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | -0.0 | -0.0 | 6.3 | 0.0 | 0.0 | 0.0 |
| 75 | 合力最大 | 11 | 1 | -0.0 | -0.0 | 6.3 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 13 | 1 | -0.0 | -0.0 | 6.2 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 13 | 1 | -0.0 | -0.0 | 6.2 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 2 | 1 | 0.0 | 0.0 | -1.2 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 12 | 1 | 0.0 | 0.0 | -0.9 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | 0.0 | 0.0 | 2.6 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 13 | 1 | -0.0 | -0.0 | 6.6 | 0.0 | 0.0 | 0.0 |
| 77 | 合力最大 | 13 | 1 | -0.0 | -0.0 | 6.6 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 13 | 1 | -0.0 | -0.0 | 6.6 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 13 | 1 | -0.0 | -0.0 | 6.6 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 4 | 1 | 0.0 | 0.0 | -1.9 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 12 | 1 | 0.0 | 0.0 | -0.9 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | 0.0 | 0.0 | 2.6 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 13 | 1 | -0.0 | -0.0 | 6.7 | 0.0 | 0.0 | 0.0 |
| 79 | 合力最大 | 13 | 1 | -0.0 | -0.0 | 6.7 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 5 | 1 | -0.0 | -0.0 | 5.7 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | 0.0 | -0.0 | 2.6 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 4 | 1 | 0.0 | 0.0 | -1.9 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 10 | 1 | 0.0 | -0.0 | -0.4 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | -0.0 | 0.0 | 2.6 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 13 | 1 | -0.0 | -0.0 | 6.6 | 0.0 | 0.0 | 0.0 |
| 81 | 合力最大 | 13 | 1 | -0.0 | -0.0 | 6.6 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 11 | 1 | -0.0 | -0.0 | 6.1 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | 0.0 | -0.0 | 2.6 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 4 | 1 | 0.0 | 0.0 | -1.9 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 18 | 2 | 0.0 | 0.0 | 2.7 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | -0.0 | 0.0 | 2.8 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | -0.0 | 0.0 | 6.3 | 0.0 | 0.0 | 0.0 |
| 86 | 合力最大 | 11 | 1 | -0.0 | 0.0 | 6.3 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 11 | 1 | -0.0 | 0.0 | 6.3 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | 0.0 | -0.0 | 2.8 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 2 | 1 | 0.0 | -0.0 | -1.2 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 13 | 1 | 0.0 | -0.0 | 6.2 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | -0.0 | 0.0 | 2.8 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 13 | 1 | 0.0 | -0.0 | 6.2 | 0.0 | 0.0 | 0.0 |
| 90 | 合力最大 | 13 | 1 | 0.0 | -0.0 | 6.2 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 18 | 1 | -0.0 | -0.0 | 2.7 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 13 | 1 | 0.0 | -0.0 | 6.2 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 2 | 1 | -0.0 | 0.0 | -1.0 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 13 | 1 | 0.0 | -0.0 | 6.6 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | -0.0 | 0.0 | 2.6 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 13 | 1 | 0.0 | -0.0 | 6.6 | 0.0 | 0.0 | 0.0 |
| 92 | 合力最大 | 13 | 1 | 0.0 | -0.0 | 6.6 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 12 | 1 | -0.0 | 0.0 | 0.2 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 13 | 1 | 0.0 | -0.0 | 6.6 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 2 | 1 | -0.0 | 0.0 | -0.8 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 5 | 1 | 0.0 | -0.0 | 5.7 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | -0.0 | 0.0 | 2.6 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 13 | 1 | 0.0 | -0.0 | 6.7 | 0.0 | 0.0 | 0.0 |
| 94 | 合力最大 | 13 | 1 | 0.0 | -0.0 | 6.7 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 12 | 1 | -0.0 | 0.0 | 0.3 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | -0.0 | -0.0 | 2.6 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 2 | 1 | -0.0 | 0.0 | -0.8 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 13 | 1 | 0.0 | -0.0 | 6.6 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | 0.0 | 0.0 | 2.6 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 13 | 1 | 0.0 | -0.0 | 6.6 | 0.0 | 0.0 | 0.0 |
| 96 | 合力最大 | 13 | 1 | 0.0 | -0.0 | 6.6 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 18 | 3 | -0.0 | -0.0 | 2.6 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | -0.0 | -0.0 | 2.6 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 2 | 1 | -0.0 | -0.0 | -0.8 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 13 | 1 | 0.0 | -0.0 | 6.0 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | 0.0 | 0.0 | 2.8 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 13 | 1 | 0.0 | -0.0 | 6.0 | 0.0 | 0.0 | 0.0 |
| 101 | 合力最大 | 13 | 1 | 0.0 | -0.0 | 6.0 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 18 | 1 | -0.0 | 0.0 | 2.7 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | -0.0 | -0.0 | 2.8 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 2 | 1 | -0.0 | -0.0 | -1.0 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 18 | 2 | 0.0 | 0.0 | 2.7 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | 0.0 | 0.0 | 2.6 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | -0.0 | -0.0 | 6.7 | 0.0 | 0.0 | 0.0 |
| 103 | 合力最大 | 11 | 1 | -0.0 | -0.0 | 6.7 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 13 | 1 | -0.0 | -0.0 | 6.1 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | -0.0 | -0.0 | 2.7 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 2 | 1 | 0.0 | 0.0 | -1.8 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 18 | 2 | 0.0 | -0.0 | 2.7 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | -0.0 | 0.0 | 2.7 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | -0.0 | -0.0 | 6.7 | 0.0 | 0.0 | 0.0 |
| 106 | 合力最大 | 11 | 1 | -0.0 | -0.0 | 6.7 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 11 | 1 | -0.0 | -0.0 | 6.7 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | 0.0 | -0.0 | 2.6 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 2 | 1 | 0.0 | -0.0 | -1.8 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 13 | 1 | 0.0 | -0.0 | 6.1 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | -0.0 | 0.0 | 2.6 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | 0.0 | 0.0 | 6.7 | 0.0 | 0.0 | 0.0 |
| 109 | 合力最大 | 11 | 1 | 0.0 | 0.0 | 6.7 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 18 | 1 | -0.0 | 0.0 | 2.7 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | 0.0 | -0.0 | 2.7 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 2 | 1 | -0.0 | 0.0 | -1.8 | 0.0 | 0.0 | 0.0 |
|  | N1最大 | 18 | 2 | 0.0 | 0.0 | 2.7 | 0.0 | 0.0 | 0.0 |
|  | N2最大 | 18 | 4 | 0.0 | 0.0 | 2.7 | 0.0 | 0.0 | 0.0 |
|  | N3最大 | 11 | 1 | 0.0 | 0.0 | 6.7 | 0.0 | 0.0 | 0.0 |
| 112 | 合力最大 | 11 | 1 | 0.0 | 0.0 | 6.7 | 0.0 | 0.0 | 0.0 |
|  | N1最小 | 18 | 1 | -0.0 | -0.0 | 2.7 | 0.0 | 0.0 | 0.0 |
|  | N2最小 | 18 | 3 | -0.0 | -0.0 | 2.6 | 0.0 | 0.0 | 0.0 |
|  | N3最小 | 2 | 1 | -0.0 | -0.0 | -1.8 | 0.0 | 0.0 | 0.0 |

### 4.1.2 内力包络及统计





按轴力 N 最大显示构件颜色 (kN)

轴力 N 最大的前 10 个单元的内力 (单位：m,kN,kN.m)

| 序号 | 单元号 | 组合号 | 组合序 | 位置 | 轴力N | 剪力Q2 | 剪力Q3 | 扭矩M | 弯矩M2 | 弯矩M3 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 19 | 19 | 1 | 0.943 | 6.8 | 0.0 | -0.0 | -0.0 | -0.0 | -0.0 |
| 2 | 21 | 19 | 1 | 0.943 | 6.8 | 0.0 | 0.0 | 0.0 | 0.0 | -0.0 |
| 3 | 12 | 19 | 1 | 0.943 | 6.8 | 0.0 | -0.0 | -0.0 | -0.0 | -0.0 |
| 4 | 14 | 19 | 1 | 0.943 | 6.8 | 0.0 | 0.0 | 0.0 | 0.0 | -0.0 |
| 5 | 108 | 19 | 1 | 0.943 | 6.7 | 0.0 | 0.0 | 0.0 | 0.0 | -0.0 |
| 6 | 110 | 19 | 1 | 0.943 | 6.7 | 0.0 | -0.0 | -0.0 | -0.0 | -0.0 |
| 7 | 22 | 19 | 1 | 0.372 | 6.0 | 0.0 | 0.0 | 0.0 | 0.0 | -0.0 |
| 8 | 18 | 19 | 1 | 0.372 | 6.0 | 0.0 | -0.0 | -0.0 | -0.0 | -0.0 |
| 9 | 15 | 19 | 1 | 0.372 | 6.0 | 0.0 | 0.0 | 0.0 | 0.0 | -0.0 |
| 10 | 11 | 19 | 1 | 0.372 | 6.0 | 0.0 | -0.0 | -0.0 | -0.0 | -0.0 |





按轴力 N 最小显示构件颜色 (kN)

轴力 N 最小的前 10 个单元的内力 (单位：m,kN,kN.m)

| 序号 | 单元号 | 组合号 | 组合序 | 位置 | 轴力N | 剪力Q2 | 剪力Q3 | 扭矩M | 弯矩M2 | 弯矩M3 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 12 | 11 | 1 | 0.000 | -17.2 | -0.0 | 0.0 | 0.0 | -0.0 | -0.0 |
| 2 | 14 | 11 | 1 | 0.000 | -17.2 | -0.0 | -0.0 | -0.0 | 0.0 | -0.0 |
| 3 | 110 | 11 | 1 | 0.000 | -17.1 | -0.0 | -0.0 | 0.0 | 0.0 | -0.0 |
| 4 | 108 | 11 | 1 | 0.000 | -17.1 | -0.0 | -0.0 | -0.0 | 0.0 | -0.0 |
| 5 | 19 | 11 | 1 | 0.000 | -17.1 | -0.0 | 0.0 | 0.0 | -0.0 | -0.0 |
| 6 | 21 | 11 | 1 | 0.000 | -17.1 | -0.0 | -0.0 | -0.0 | 0.0 | -0.0 |
| 7 | 22 | 11 | 1 | 0.000 | -15.0 | -0.0 | -0.0 | -0.0 | 0.0 | -0.0 |
| 8 | 18 | 11 | 1 | 0.000 | -15.0 | -0.0 | 0.0 | 0.0 | -0.0 | -0.0 |
| 9 | 111 | 11 | 1 | 0.000 | -15.0 | 0.0 | -0.0 | 0.0 | 0.0 | 0.0 |
| 10 | 107 | 11 | 1 | 0.000 | -15.0 | 0.0 | -0.0 | -0.0 | 0.0 | 0.0 |





按弯矩 M2 最大显示构件颜色 (kN.m)

弯矩 M2 最大的前 10 个单元的内力 (单位：m,kN,kN.m)

| 序号 | 单元号 | 组合号 | 组合序 | 位置 | 轴力N | 剪力Q2 | 剪力Q3 | 扭矩M | 弯矩M2 | 弯矩M3 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 132 | 23 | 3 | 0.000 | 0.4 | 1.5 | -0.2 | -0.0 | 0.2 | 0.8 |
| 2 | 147 | 23 | 4 | 0.000 | 0.3 | 1.5 | -0.2 | 0.0 | 0.2 | 0.8 |
| 3 | 133 | 18 | 3 | 2.669 | -0.6 | -1.3 | 0.1 | -0.0 | 0.2 | 1.0 |
| 4 | 148 | 23 | 4 | 2.669 | -0.1 | -1.1 | 0.1 | 0.0 | 0.2 | 0.8 |
| 5 | 159 | 18 | 4 | 0.000 | 0.4 | 1.8 | -0.2 | -0.0 | 0.2 | 1.0 |
| 6 | 144 | 23 | 3 | 0.000 | 0.3 | 1.5 | -0.2 | 0.0 | 0.2 | 0.8 |
| 7 | 160 | 18 | 4 | 2.669 | -0.6 | -1.3 | 0.1 | -0.0 | 0.2 | 1.0 |
| 8 | 145 | 23 | 3 | 2.669 | -0.1 | -1.1 | 0.1 | 0.0 | 0.2 | 0.8 |
| 9 | 98 | 21 | 1 | 2.601 | 1.2 | 1.8 | 0.4 | -0.0 | 0.2 | -0.7 |
| 10 | 39 | 18 | 1 | 0.000 | 0.5 | 2.0 | -0.2 | -0.0 | 0.2 | 0.8 |





按弯矩 M2 最小显示构件颜色 (kN.m)

弯矩 M2 最小的前 10 个单元的内力 (单位：m,kN,kN.m)

| 序号 | 单元号 | 组合号 | 组合序 | 位置 | 轴力N | 剪力Q2 | 剪力Q3 | 扭矩M | 弯矩M2 | 弯矩M3 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 147 | 18 | 3 | 0.000 | 0.4 | 1.8 | 0.2 | 0.0 | -0.2 | 1.0 |
| 2 | 132 | 18 | 4 | 0.000 | 0.4 | 1.8 | 0.2 | -0.0 | -0.2 | 0.9 |
| 3 | 148 | 18 | 3 | 2.669 | -0.6 | -1.3 | -0.1 | 0.0 | -0.2 | 1.0 |
| 4 | 133 | 23 | 4 | 2.669 | -0.1 | -1.1 | -0.1 | -0.0 | -0.2 | 0.8 |
| 5 | 144 | 18 | 4 | 0.000 | 0.4 | 1.8 | 0.2 | 0.0 | -0.2 | 1.0 |
| 6 | 159 | 23 | 3 | 0.000 | 0.3 | 1.5 | 0.2 | -0.0 | -0.2 | 0.8 |
| 7 | 145 | 18 | 4 | 2.669 | -0.6 | -1.3 | -0.1 | 0.0 | -0.2 | 1.0 |
| 8 | 160 | 23 | 3 | 2.669 | -0.1 | -1.1 | -0.1 | -0.0 | -0.2 | 0.8 |
| 9 | 94 | 21 | 1 | 2.601 | -1.4 | 2.0 | -0.4 | 0.0 | -0.2 | -0.8 |
| 10 | 42 | 18 | 1 | 0.000 | 0.5 | 2.0 | 0.2 | 0.0 | -0.2 | 0.8 |





按弯矩 M3 最大显示构件颜色 (kN.m)

弯矩 M3 最大的前 10 个单元的内力 (单位：m,kN,kN.m)

| 序号 | 单元号 | 组合号 | 组合序 | 位置 | 轴力N | 剪力Q2 | 剪力Q3 | 扭矩M | 弯矩M2 | 弯矩M3 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 34 | 11 | 1 | 0.000 | -1.5 | 8.2 | 0.0 | -0.0 | -0.0 | 2.9 |
| 2 | 41 | 11 | 1 | 0.000 | -1.5 | 8.2 | -0.0 | 0.0 | 0.0 | 2.9 |
| 3 | 33 | 11 | 1 | 2.076 | -6.0 | -8.0 | -0.0 | -0.0 | -0.0 | 2.9 |
| 4 | 40 | 11 | 1 | 2.076 | -6.0 | -8.0 | 0.0 | 0.0 | 0.0 | 2.9 |
| 5 | 88 | 11 | 1 | 0.000 | -1.5 | 8.2 | 0.0 | -0.0 | -0.0 | 2.9 |
| 6 | 85 | 11 | 1 | 0.000 | -1.5 | 8.2 | -0.0 | 0.0 | 0.0 | 2.9 |
| 7 | 87 | 11 | 1 | 2.076 | -6.0 | -8.0 | -0.0 | -0.0 | -0.0 | 2.9 |
| 8 | 84 | 11 | 1 | 2.076 | -6.0 | -8.0 | 0.0 | 0.0 | 0.0 | 2.9 |
| 9 | 31 | 11 | 1 | 0.000 | -1.5 | 8.2 | -0.0 | 0.0 | 0.0 | 2.9 |
| 10 | 28 | 11 | 1 | 0.000 | -1.5 | 8.2 | 0.0 | -0.0 | -0.0 | 2.9 |





按弯矩 M3 最小显示构件颜色 (kN.m)

弯矩 M3 最小的前 10 个单元的内力 (单位：m,kN,kN.m)

| 序号 | 单元号 | 组合号 | 组合序 | 位置 | 轴力N | 剪力Q2 | 剪力Q3 | 扭矩M | 弯矩M2 | 弯矩M3 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 31 | 11 | 1 | 1.065 | -2.4 | 0.1 | -0.0 | 0.0 | 0.0 | -1.6 |
| 2 | 28 | 11 | 1 | 1.065 | -2.4 | 0.1 | 0.0 | -0.0 | -0.0 | -1.6 |
| 3 | 88 | 11 | 1 | 1.065 | -2.4 | 0.1 | 0.0 | -0.0 | -0.0 | -1.6 |
| 4 | 85 | 11 | 1 | 1.065 | -2.4 | 0.1 | -0.0 | 0.0 | 0.0 | -1.6 |
| 5 | 34 | 11 | 1 | 1.065 | -2.4 | 0.1 | 0.0 | -0.0 | -0.0 | -1.6 |
| 6 | 41 | 11 | 1 | 1.065 | -2.4 | 0.1 | -0.0 | 0.0 | 0.0 | -1.6 |
| 7 | 45 | 11 | 1 | 1.065 | -1.9 | 0.0 | 0.0 | -0.0 | -0.0 | -1.3 |
| 8 | 49 | 11 | 1 | 1.065 | -1.9 | 0.0 | -0.0 | 0.0 | 0.0 | -1.3 |
| 9 | 96 | 11 | 1 | 1.065 | -1.9 | 0.0 | 0.0 | -0.0 | -0.0 | -1.3 |
| 10 | 92 | 11 | 1 | 1.065 | -1.9 | 0.0 | -0.0 | 0.0 | 0.0 | -1.3 |

## 4.2 位移

### 4.2.1 组合位移





最大正位移组合 4: Uz(mm)





最大负位移组合 13: Uz(mm)

# 5 设计验算结果

本工程有 1 种材料：

Q235：弹性模量：2.06\*105N/mm2；泊松比：0.30；线膨胀系数：1.20\*10-5；质量密度：7850kg/m3。

## 5.1 设计验算结果图及统计表

根据计算分析模型，进行规范检验，检验结果表明，结构能够满足承载力计算要求，应力比最大值为0.22。下图为模型总体应力比分布图：



杆件应力比分布图





按“强度应力比”显示构件颜色

“强度应力比”最大的前 10 个单元的验算结果（所在组合号／情况号）

| 序号 | 单元号 | 强度 | 绕2轴  整体  稳定 | 绕3轴  整体  稳定 | 沿2轴  抗剪  应力比 | 沿3轴  抗剪  应力比 | 绕2轴  长细比 | 绕3轴  长细比 | 结果 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 132 | 0.182 (13/1) | 0.188 | 0.184 | 0.000 | 0.002 | 42 | 25 | 满足 |
| 2 | 147 | 0.182 (13/1) | 0.188 | 0.184 | 0.000 | 0.002 | 42 | 25 | 满足 |
| 3 | 133 | 0.182 (13/1) | 0.221 | 0.181 | 0.000 | 0.001 | 107 | 64 | 满足 |
| 4 | 148 | 0.182 (13/1) | 0.197 | 0.181 | 0.000 | 0.002 | 107 | 64 | 满足 |
| 5 | 33 | 0.182 (11/1) | 0.185 | 0.184 | 0.000 | 0.000 | 83 | 50 | 满足 |
| 6 | 40 | 0.182 (11/1) | 0.185 | 0.184 | 0.000 | 0.000 | 83 | 50 | 满足 |
| 7 | 27 | 0.181 (11/1) | 0.184 | 0.184 | 0.000 | 0.000 | 83 | 50 | 满足 |
| 8 | 30 | 0.181 (11/1) | 0.184 | 0.184 | 0.000 | 0.000 | 83 | 50 | 满足 |
| 9 | 87 | 0.181 (11/1) | 0.184 | 0.184 | 0.000 | 0.000 | 83 | 50 | 满足 |
| 10 | 84 | 0.181 (11/1) | 0.184 | 0.184 | 0.000 | 0.000 | 83 | 50 | 满足 |

按“强度应力比”统计结果表

| 范围 | >1.00 | 1.00~0.90 | 0.90~0.70 | 0.70~0.50 | 0.50~0.01 |
| --- | --- | --- | --- | --- | --- |
| 单元数 | 0 | 0 | 0 | 0 | 213 |
| 百分比 | 0.0% | 0.0% | 0.0% | 0.0% | 100.0% |





按“绕2轴应力比”显示构件颜色

“绕2轴整体稳定应力比”最大的前 10 个单元的验算结果（所在组合号／情况号）

| 序号 | 单元号 | 强度 | 绕2轴  整体  稳定 | 绕3轴  整体  稳定 | 沿2轴  抗剪  应力比 | 沿3轴  抗剪  应力比 | 绕2轴  长细比 | 绕3轴  长细比 | 结果 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 133 | 0.182 | 0.221 (11/1) | 0.181 | 0.000 | 0.001 | 107 | 64 | 满足 |
| 2 | 145 | 0.177 | 0.221 (11/1) | 0.178 | 0.000 | 0.001 | 107 | 64 | 满足 |
| 3 | 148 | 0.182 | 0.197 (13/1) | 0.181 | 0.000 | 0.002 | 107 | 64 | 满足 |
| 4 | 160 | 0.177 | 0.193 (13/1) | 0.178 | 0.000 | 0.002 | 107 | 64 | 满足 |
| 5 | 132 | 0.182 | 0.188 (13/1) | 0.184 | 0.000 | 0.002 | 42 | 25 | 满足 |
| 6 | 147 | 0.182 | 0.188 (13/1) | 0.184 | 0.000 | 0.002 | 42 | 25 | 满足 |
| 7 | 40 | 0.182 | 0.185 (11/1) | 0.184 | 0.000 | 0.000 | 83 | 50 | 满足 |
| 8 | 33 | 0.182 | 0.185 (11/1) | 0.184 | 0.000 | 0.000 | 83 | 50 | 满足 |
| 9 | 27 | 0.181 | 0.184 (11/1) | 0.184 | 0.000 | 0.000 | 83 | 50 | 满足 |
| 10 | 30 | 0.181 | 0.184 (11/1) | 0.184 | 0.000 | 0.000 | 83 | 50 | 满足 |

按“绕2轴整体稳定应力比”统计结果表

| 范围 | >1.00 | 1.00~0.90 | 0.90~0.70 | 0.70~0.50 | 0.50~0.00 |
| --- | --- | --- | --- | --- | --- |
| 单元数 | 0 | 0 | 0 | 0 | 213 |
| 百分比 | 0.0% | 0.0% | 0.0% | 0.0% | 100.0% |





按“绕3轴应力比”显示构件颜色

“绕3轴整体稳定应力比”最大的前 10 个单元的验算结果（所在组合号／情况号）

| 序号 | 单元号 | 强度 | 绕2轴  整体  稳定 | 绕3轴  整体  稳定 | 沿2轴  抗剪  应力比 | 沿3轴  抗剪  应力比 | 绕2轴  长细比 | 绕3轴  长细比 | 结果 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 33 | 0.182 | 0.185 | 0.184 (11/1) | 0.000 | 0.000 | 83 | 50 | 满足 |
| 2 | 40 | 0.182 | 0.185 | 0.184 (11/1) | 0.000 | 0.000 | 83 | 50 | 满足 |
| 3 | 27 | 0.181 | 0.184 | 0.184 (11/1) | 0.000 | 0.000 | 83 | 50 | 满足 |
| 4 | 30 | 0.181 | 0.184 | 0.184 (11/1) | 0.000 | 0.000 | 83 | 50 | 满足 |
| 5 | 132 | 0.182 | 0.188 | 0.184 (13/1) | 0.000 | 0.002 | 42 | 25 | 满足 |
| 6 | 147 | 0.182 | 0.188 | 0.184 (13/1) | 0.000 | 0.002 | 42 | 25 | 满足 |
| 7 | 87 | 0.181 | 0.184 | 0.184 (11/1) | 0.000 | 0.000 | 83 | 50 | 满足 |
| 8 | 84 | 0.181 | 0.184 | 0.184 (11/1) | 0.000 | 0.000 | 83 | 50 | 满足 |
| 9 | 133 | 0.182 | 0.221 | 0.181 (13/1) | 0.000 | 0.001 | 107 | 64 | 满足 |
| 10 | 148 | 0.182 | 0.197 | 0.181 (13/1) | 0.000 | 0.002 | 107 | 64 | 满足 |

按“绕3轴整体稳定应力比”统计结果表

| 范围 | >1.00 | 1.00~0.90 | 0.90~0.70 | 0.70~0.50 | 0.50~0.00 |
| --- | --- | --- | --- | --- | --- |
| 单元数 | 0 | 0 | 0 | 0 | 213 |
| 百分比 | 0.0% | 0.0% | 0.0% | 0.0% | 100.0% |

## 5.2 设计验算结果表

设计验算结果表 *(强度和整体稳定)*

| 单元号 | 强度 | 绕2轴  整体  稳定 | 绕3轴  整体  稳定 | 沿2轴  抗剪  应力比 | 沿3轴  抗剪  应力比 | 绕2轴  长细比 | 绕3轴  长细比 | 结果 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 0.074 | 0.000 | 0.085 | 0.000 | 0.000 | 47 | 47 | 满足 |
| 2 | 0.092 | 0.000 | 0.094 | 0.000 | 0.000 | 19 | 19 | 满足 |
| 3 | 0.102 | 0.000 | 0.118 | 0.000 | 0.000 | 47 | 47 | 满足 |
| 4 | 0.076 | 0.000 | 0.106 | 0.000 | 0.000 | 75 | 75 | 满足 |
| 5 | 0.071 | 0.000 | 0.082 | 0.000 | 0.000 | 47 | 47 | 满足 |
| 6 | 0.102 | 0.000 | 0.118 | 0.000 | 0.000 | 47 | 47 | 满足 |
| 7 | 0.092 | 0.000 | 0.094 | 0.000 | 0.000 | 19 | 19 | 满足 |
| 8 | 0.041 | 0.000 | 0.000 | 0.000 | 0.000 | 457 | 457 | 满足 |
| 9 | 0.029 | 0.000 | 0.000 | 0.000 | 0.000 | 457 | 457 | 满足 |
| 10 | 0.080 | 0.000 | 0.092 | 0.000 | 0.000 | 47 | 47 | 满足 |
| 11 | 0.112 | 0.000 | 0.115 | 0.000 | 0.000 | 19 | 19 | 满足 |
| 12 | 0.129 | 0.000 | 0.148 | 0.000 | 0.000 | 47 | 47 | 满足 |
| 13 | 0.098 | 0.000 | 0.137 | 0.000 | 0.000 | 75 | 75 | 满足 |
| 14 | 0.129 | 0.000 | 0.148 | 0.000 | 0.000 | 47 | 47 | 满足 |
| 15 | 0.112 | 0.000 | 0.115 | 0.000 | 0.000 | 19 | 19 | 满足 |
| 16 | 0.039 | 0.000 | 0.132 | 0.000 | 0.000 | 155 | 155 | 满足 |
| 17 | 0.032 | 0.000 | 0.111 | 0.000 | 0.000 | 155 | 155 | 满足 |
| 18 | 0.112 | 0.000 | 0.115 | 0.000 | 0.000 | 19 | 19 | 满足 |
| 19 | 0.128 | 0.000 | 0.147 | 0.000 | 0.000 | 47 | 47 | 满足 |
| 20 | 0.097 | 0.000 | 0.134 | 0.000 | 0.000 | 75 | 75 | 满足 |
| 21 | 0.128 | 0.000 | 0.147 | 0.000 | 0.000 | 47 | 47 | 满足 |
| 22 | 0.112 | 0.000 | 0.115 | 0.000 | 0.000 | 19 | 19 | 满足 |
| 23 | 0.025 | 0.000 | 0.084 | 0.000 | 0.000 | 155 | 155 | 满足 |
| 24 | 0.019 | 0.000 | 0.064 | 0.000 | 0.000 | 155 | 155 | 满足 |
| 25 | 0.016 | 0.000 | 0.054 | 0.000 | 0.000 | 155 | 155 | 满足 |
| 26 | 0.017 | 0.000 | 0.060 | 0.000 | 0.000 | 155 | 155 | 满足 |
| 27 | 0.181 | 0.184 | 0.184 | 0.000 | 0.000 | 83 | 50 | 满足 |
| 28 | 0.172 | 0.171 | 0.172 | 0.000 | 0.000 | 85 | 51 | 满足 |
| 29 | 0.154 | 0.159 | 0.151 | 0.000 | 0.001 | 33 | 20 | 满足 |
| 30 | 0.181 | 0.184 | 0.184 | 0.000 | 0.000 | 83 | 50 | 满足 |
| 31 | 0.172 | 0.171 | 0.172 | 0.000 | 0.000 | 85 | 51 | 满足 |
| 32 | 0.154 | 0.159 | 0.151 | 0.000 | 0.001 | 33 | 20 | 满足 |
| 33 | 0.182 | 0.185 | 0.184 | 0.000 | 0.000 | 83 | 50 | 满足 |
| 34 | 0.172 | 0.172 | 0.173 | 0.000 | 0.000 | 85 | 51 | 满足 |
| 35 | 0.017 | 0.000 | 0.058 | 0.000 | 0.000 | 155 | 155 | 满足 |
| 36 | 0.019 | 0.000 | 0.066 | 0.000 | 0.000 | 155 | 155 | 满足 |
| 37 | 0.011 | 0.000 | 0.036 | 0.000 | 0.000 | 155 | 155 | 满足 |
| 38 | 0.014 | 0.000 | 0.047 | 0.000 | 0.000 | 155 | 155 | 满足 |
| 39 | 0.154 | 0.159 | 0.151 | 0.000 | 0.001 | 33 | 20 | 满足 |
| 40 | 0.182 | 0.185 | 0.184 | 0.000 | 0.000 | 83 | 50 | 满足 |
| 41 | 0.172 | 0.172 | 0.173 | 0.000 | 0.000 | 85 | 51 | 满足 |
| 42 | 0.154 | 0.159 | 0.151 | 0.000 | 0.001 | 33 | 20 | 满足 |
| 43 | 0.086 | 0.083 | 0.088 | 0.000 | 0.000 | 67 | 40 | 满足 |
| 44 | 0.139 | 0.142 | 0.141 | 0.000 | 0.000 | 83 | 50 | 满足 |
| 45 | 0.132 | 0.132 | 0.133 | 0.000 | 0.000 | 85 | 51 | 满足 |
| 46 | 0.125 | 0.129 | 0.123 | 0.000 | 0.001 | 33 | 20 | 满足 |
| 47 | 0.087 | 0.091 | 0.084 | 0.000 | 0.001 | 104 | 62 | 满足 |
| 48 | 0.139 | 0.142 | 0.141 | 0.000 | 0.000 | 83 | 50 | 满足 |
| 49 | 0.132 | 0.132 | 0.133 | 0.000 | 0.000 | 85 | 51 | 满足 |
| 50 | 0.125 | 0.129 | 0.123 | 0.000 | 0.001 | 33 | 20 | 满足 |
| 51 | 0.089 | 0.099 | 0.090 | 0.000 | 0.001 | 104 | 62 | 满足 |
| 52 | 0.028 | 0.000 | 0.048 | 0.000 | 0.000 | 95 | 95 | 满足 |
| 53 | 0.021 | 0.000 | 0.036 | 0.000 | 0.000 | 95 | 95 | 满足 |
| 54 | 0.022 | 0.000 | 0.000 | 0.000 | 0.000 | 822 | 822 | 满足 |
| 55 | 0.018 | 0.000 | 0.000 | 0.000 | 0.000 | 822 | 822 | 满足 |
| 56 | 0.009 | 0.000 | 0.000 | 0.000 | 0.000 | 831 | 831 | 满足 |
| 57 | 0.018 | 0.000 | 0.000 | 0.000 | 0.000 | 831 | 831 | 满足 |
| 58 | 0.011 | 0.000 | 0.000 | 0.000 | 0.000 | 831 | 831 | 满足 |
| 59 | 0.018 | 0.000 | 0.000 | 0.000 | 0.000 | 831 | 831 | 满足 |
| 60 | 0.023 | 0.000 | 0.000 | 0.000 | 0.000 | 822 | 822 | 满足 |
| 61 | 0.019 | 0.000 | 0.000 | 0.000 | 0.000 | 822 | 822 | 满足 |
| 62 | 0.009 | 0.000 | 0.000 | 0.000 | 0.000 | 831 | 831 | 满足 |
| 63 | 0.018 | 0.000 | 0.000 | 0.000 | 0.000 | 831 | 831 | 满足 |
| 64 | 0.017 | 0.000 | 0.000 | 0.000 | 0.000 | 831 | 831 | 满足 |
| 65 | 0.018 | 0.000 | 0.000 | 0.000 | 0.000 | 831 | 831 | 满足 |
| 66 | 0.011 | 0.000 | 0.000 | 0.000 | 0.000 | 680 | 680 | 满足 |
| 67 | 0.018 | 0.000 | 0.000 | 0.000 | 0.000 | 680 | 680 | 满足 |
| 68 | 0.030 | 0.000 | 0.000 | 0.000 | 0.000 | 457 | 457 | 满足 |
| 69 | 0.020 | 0.000 | 0.000 | 0.000 | 0.000 | 457 | 457 | 满足 |
| 70 | 0.011 | 0.000 | 0.000 | 0.000 | 0.000 | 680 | 680 | 满足 |
| 71 | 0.022 | 0.000 | 0.000 | 0.000 | 0.000 | 680 | 680 | 满足 |
| 72 | 0.030 | 0.000 | 0.000 | 0.000 | 0.000 | 457 | 457 | 满足 |
| 73 | 0.020 | 0.000 | 0.000 | 0.000 | 0.000 | 457 | 457 | 满足 |
| 74 | 0.011 | 0.000 | 0.000 | 0.000 | 0.000 | 680 | 680 | 满足 |
| 75 | 0.020 | 0.000 | 0.000 | 0.000 | 0.000 | 680 | 680 | 满足 |
| 76 | 0.041 | 0.000 | 0.000 | 0.000 | 0.000 | 457 | 457 | 满足 |
| 77 | 0.029 | 0.000 | 0.000 | 0.000 | 0.000 | 457 | 457 | 满足 |
| 78 | 0.039 | 0.000 | 0.132 | 0.000 | 0.000 | 155 | 155 | 满足 |
| 79 | 0.032 | 0.000 | 0.111 | 0.000 | 0.000 | 155 | 155 | 满足 |
| 80 | 0.025 | 0.000 | 0.084 | 0.000 | 0.000 | 155 | 155 | 满足 |
| 81 | 0.019 | 0.000 | 0.064 | 0.000 | 0.000 | 155 | 155 | 满足 |
| 82 | 0.016 | 0.000 | 0.054 | 0.000 | 0.000 | 155 | 155 | 满足 |
| 83 | 0.017 | 0.000 | 0.060 | 0.000 | 0.000 | 155 | 155 | 满足 |
| 84 | 0.181 | 0.184 | 0.184 | 0.000 | 0.000 | 83 | 50 | 满足 |
| 85 | 0.171 | 0.171 | 0.172 | 0.000 | 0.000 | 85 | 51 | 满足 |
| 86 | 0.154 | 0.159 | 0.151 | 0.000 | 0.001 | 33 | 20 | 满足 |
| 87 | 0.181 | 0.184 | 0.184 | 0.000 | 0.000 | 83 | 50 | 满足 |
| 88 | 0.171 | 0.171 | 0.172 | 0.000 | 0.000 | 85 | 51 | 满足 |
| 89 | 0.154 | 0.159 | 0.151 | 0.000 | 0.001 | 33 | 20 | 满足 |
| 90 | 0.086 | 0.083 | 0.088 | 0.000 | 0.000 | 67 | 40 | 满足 |
| 91 | 0.139 | 0.141 | 0.141 | 0.000 | 0.000 | 83 | 50 | 满足 |
| 92 | 0.131 | 0.131 | 0.132 | 0.000 | 0.000 | 85 | 51 | 满足 |
| 93 | 0.125 | 0.129 | 0.123 | 0.000 | 0.001 | 33 | 20 | 满足 |
| 94 | 0.087 | 0.090 | 0.084 | 0.000 | 0.003 | 104 | 62 | 满足 |
| 95 | 0.139 | 0.141 | 0.141 | 0.000 | 0.000 | 83 | 50 | 满足 |
| 96 | 0.131 | 0.131 | 0.132 | 0.000 | 0.000 | 85 | 51 | 满足 |
| 97 | 0.125 | 0.129 | 0.123 | 0.000 | 0.001 | 33 | 20 | 满足 |
| 98 | 0.089 | 0.099 | 0.090 | 0.000 | 0.003 | 104 | 62 | 满足 |
| 99 | 0.074 | 0.000 | 0.085 | 0.000 | 0.000 | 47 | 47 | 满足 |
| 100 | 0.092 | 0.000 | 0.094 | 0.000 | 0.000 | 19 | 19 | 满足 |
| 101 | 0.099 | 0.000 | 0.114 | 0.000 | 0.000 | 47 | 47 | 满足 |
| 102 | 0.075 | 0.000 | 0.104 | 0.000 | 0.000 | 75 | 75 | 满足 |
| 103 | 0.070 | 0.000 | 0.081 | 0.000 | 0.000 | 47 | 47 | 满足 |
| 104 | 0.099 | 0.000 | 0.114 | 0.000 | 0.000 | 47 | 47 | 满足 |
| 105 | 0.092 | 0.000 | 0.094 | 0.000 | 0.000 | 19 | 19 | 满足 |
| 106 | 0.080 | 0.000 | 0.092 | 0.000 | 0.000 | 47 | 47 | 满足 |
| 107 | 0.112 | 0.000 | 0.115 | 0.000 | 0.000 | 19 | 19 | 满足 |
| 108 | 0.128 | 0.000 | 0.148 | 0.000 | 0.000 | 47 | 47 | 满足 |
| 109 | 0.098 | 0.000 | 0.135 | 0.000 | 0.000 | 75 | 75 | 满足 |
| 110 | 0.128 | 0.000 | 0.148 | 0.000 | 0.000 | 47 | 47 | 满足 |
| 111 | 0.112 | 0.000 | 0.115 | 0.000 | 0.000 | 19 | 19 | 满足 |
| 112 | 0.017 | 0.000 | 0.058 | 0.000 | 0.000 | 155 | 155 | 满足 |
| 113 | 0.019 | 0.000 | 0.066 | 0.000 | 0.000 | 155 | 155 | 满足 |
| 114 | 0.011 | 0.000 | 0.036 | 0.000 | 0.000 | 155 | 155 | 满足 |
| 115 | 0.014 | 0.000 | 0.047 | 0.000 | 0.000 | 155 | 155 | 满足 |
| 116 | 0.028 | 0.000 | 0.048 | 0.000 | 0.000 | 95 | 95 | 满足 |
| 117 | 0.018 | 0.000 | 0.030 | 0.000 | 0.000 | 95 | 95 | 满足 |
| 118 | 0.022 | 0.000 | 0.000 | 0.000 | 0.000 | 822 | 822 | 满足 |
| 119 | 0.018 | 0.000 | 0.000 | 0.000 | 0.000 | 822 | 822 | 满足 |
| 120 | 0.009 | 0.000 | 0.000 | 0.000 | 0.000 | 831 | 831 | 满足 |
| 121 | 0.018 | 0.000 | 0.000 | 0.000 | 0.000 | 831 | 831 | 满足 |
| 122 | 0.011 | 0.000 | 0.000 | 0.000 | 0.000 | 831 | 831 | 满足 |
| 123 | 0.018 | 0.000 | 0.000 | 0.000 | 0.000 | 831 | 831 | 满足 |
| 124 | 0.026 | 0.000 | 0.000 | 0.000 | 0.000 | 822 | 822 | 满足 |
| 125 | 0.019 | 0.000 | 0.000 | 0.000 | 0.000 | 822 | 822 | 满足 |
| 126 | 0.009 | 0.000 | 0.000 | 0.000 | 0.000 | 831 | 831 | 满足 |
| 127 | 0.018 | 0.000 | 0.000 | 0.000 | 0.000 | 831 | 831 | 满足 |
| 128 | 0.017 | 0.000 | 0.000 | 0.000 | 0.000 | 831 | 831 | 满足 |
| 129 | 0.018 | 0.000 | 0.000 | 0.000 | 0.000 | 831 | 831 | 满足 |
| 130 | 0.011 | 0.000 | 0.000 | 0.000 | 0.000 | 680 | 680 | 满足 |
| 131 | 0.013 | 0.000 | 0.000 | 0.000 | 0.000 | 680 | 680 | 满足 |
| 132 | 0.182 | 0.188 | 0.184 | 0.000 | 0.002 | 42 | 25 | 满足 |
| 133 | 0.182 | 0.221 | 0.181 | 0.000 | 0.001 | 107 | 64 | 满足 |
| 134 | 0.067 | 0.000 | 0.069 | 0.000 | 0.000 | 19 | 19 | 满足 |
| 135 | 0.072 | 0.000 | 0.074 | 0.000 | 0.000 | 19 | 19 | 满足 |
| 136 | 0.073 | 0.000 | 0.075 | 0.000 | 0.000 | 19 | 19 | 满足 |
| 137 | 0.072 | 0.000 | 0.074 | 0.000 | 0.000 | 19 | 19 | 满足 |
| 138 | 0.076 | 0.077 | 0.074 | 0.000 | 0.000 | 27 | 16 | 满足 |
| 139 | 0.081 | 0.077 | 0.082 | 0.000 | 0.000 | 68 | 41 | 满足 |
| 140 | 0.078 | 0.079 | 0.075 | 0.000 | 0.000 | 27 | 16 | 满足 |
| 141 | 0.082 | 0.078 | 0.083 | 0.000 | 0.000 | 68 | 41 | 满足 |
| 142 | 0.076 | 0.077 | 0.074 | 0.000 | 0.000 | 27 | 16 | 满足 |
| 143 | 0.080 | 0.077 | 0.081 | 0.000 | 0.000 | 68 | 41 | 满足 |
| 144 | 0.178 | 0.184 | 0.180 | 0.000 | 0.002 | 42 | 25 | 满足 |
| 145 | 0.177 | 0.221 | 0.178 | 0.000 | 0.001 | 107 | 64 | 满足 |
| 146 | 0.067 | 0.000 | 0.069 | 0.000 | 0.000 | 19 | 19 | 满足 |
| 147 | 0.182 | 0.188 | 0.184 | 0.000 | 0.002 | 42 | 25 | 满足 |
| 148 | 0.182 | 0.197 | 0.181 | 0.000 | 0.002 | 107 | 64 | 满足 |
| 149 | 0.067 | 0.000 | 0.069 | 0.000 | 0.000 | 19 | 19 | 满足 |
| 150 | 0.072 | 0.000 | 0.074 | 0.000 | 0.000 | 19 | 19 | 满足 |
| 151 | 0.073 | 0.000 | 0.075 | 0.000 | 0.000 | 19 | 19 | 满足 |
| 152 | 0.072 | 0.000 | 0.074 | 0.000 | 0.000 | 19 | 19 | 满足 |
| 153 | 0.076 | 0.077 | 0.074 | 0.000 | 0.000 | 27 | 16 | 满足 |
| 154 | 0.081 | 0.077 | 0.082 | 0.000 | 0.000 | 68 | 41 | 满足 |
| 155 | 0.078 | 0.079 | 0.075 | 0.000 | 0.000 | 27 | 16 | 满足 |
| 156 | 0.082 | 0.078 | 0.083 | 0.000 | 0.000 | 68 | 41 | 满足 |
| 157 | 0.076 | 0.077 | 0.074 | 0.000 | 0.000 | 27 | 16 | 满足 |
| 158 | 0.080 | 0.077 | 0.081 | 0.000 | 0.000 | 68 | 41 | 满足 |
| 159 | 0.178 | 0.184 | 0.180 | 0.000 | 0.002 | 42 | 25 | 满足 |
| 160 | 0.177 | 0.193 | 0.178 | 0.000 | 0.002 | 107 | 64 | 满足 |
| 161 | 0.065 | 0.000 | 0.066 | 0.000 | 0.000 | 19 | 19 | 满足 |
| 162 | 0.010 | 0.000 | 0.024 | 0.000 | 0.000 | 124 | 124 | 满足 |
| 163 | 0.011 | 0.000 | 0.025 | 0.000 | 0.000 | 121 | 121 | 满足 |
| 164 | 0.011 | 0.000 | 0.025 | 0.000 | 0.000 | 121 | 121 | 满足 |
| 165 | 0.010 | 0.000 | 0.024 | 0.000 | 0.000 | 124 | 124 | 满足 |
| 166 | 0.020 | 0.000 | 0.047 | 0.000 | 0.000 | 121 | 121 | 满足 |
| 167 | 0.015 | 0.000 | 0.035 | 0.000 | 0.000 | 121 | 121 | 满足 |
| 168 | 0.010 | 0.000 | 0.024 | 0.000 | 0.000 | 124 | 124 | 满足 |
| 169 | 0.010 | 0.000 | 0.023 | 0.000 | 0.000 | 121 | 121 | 满足 |
| 170 | 0.010 | 0.000 | 0.023 | 0.000 | 0.000 | 121 | 121 | 满足 |
| 171 | 0.009 | 0.000 | 0.021 | 0.000 | 0.000 | 124 | 124 | 满足 |
| 172 | 0.035 | 0.000 | 0.000 | 0.000 | 0.000 | 553 | 553 | 满足 |
| 173 | 0.040 | 0.000 | 0.000 | 0.000 | 0.000 | 553 | 553 | 满足 |
| 174 | 0.040 | 0.000 | 0.000 | 0.000 | 0.000 | 553 | 553 | 满足 |
| 175 | 0.035 | 0.000 | 0.000 | 0.000 | 0.000 | 553 | 553 | 满足 |
| 176 | 0.040 | 0.000 | 0.000 | 0.000 | 0.000 | 553 | 553 | 满足 |
| 177 | 0.035 | 0.000 | 0.000 | 0.000 | 0.000 | 553 | 553 | 满足 |
| 178 | 0.035 | 0.000 | 0.000 | 0.000 | 0.000 | 553 | 553 | 满足 |
| 179 | 0.040 | 0.000 | 0.000 | 0.000 | 0.000 | 553 | 553 | 满足 |
| 180 | 0.020 | 0.000 | 0.047 | 0.000 | 0.000 | 121 | 121 | 满足 |
| 181 | 0.017 | 0.000 | 0.041 | 0.000 | 0.000 | 121 | 121 | 满足 |
| 182 | 0.013 | 0.000 | 0.000 | 0.000 | 0.000 | 657 | 657 | 满足 |
| 183 | 0.010 | 0.000 | 0.000 | 0.000 | 0.000 | 657 | 657 | 满足 |
| 184 | 0.010 | 0.000 | 0.000 | 0.000 | 0.000 | 657 | 657 | 满足 |
| 185 | 0.013 | 0.000 | 0.000 | 0.000 | 0.000 | 657 | 657 | 满足 |
| 186 | 0.015 | 0.000 | 0.000 | 0.000 | 0.000 | 657 | 657 | 满足 |
| 187 | 0.010 | 0.000 | 0.000 | 0.000 | 0.000 | 657 | 657 | 满足 |
| 188 | 0.010 | 0.000 | 0.000 | 0.000 | 0.000 | 657 | 657 | 满足 |
| 189 | 0.015 | 0.000 | 0.000 | 0.000 | 0.000 | 657 | 657 | 满足 |
| 190 | 0.072 | 0.000 | 0.074 | 0.000 | 0.000 | 19 | 19 | 满足 |
| 191 | 0.100 | 0.103 | 0.098 | 0.000 | 0.000 | 33 | 20 | 满足 |
| 192 | 0.104 | 0.105 | 0.105 | 0.000 | 0.000 | 85 | 51 | 满足 |
| 193 | 0.012 | 0.000 | 0.021 | 0.000 | 0.000 | 95 | 95 | 满足 |
| 194 | 0.012 | 0.000 | 0.022 | 0.000 | 0.000 | 98 | 98 | 满足 |
| 195 | 0.072 | 0.000 | 0.074 | 0.000 | 0.000 | 19 | 19 | 满足 |
| 196 | 0.100 | 0.103 | 0.098 | 0.000 | 0.000 | 33 | 20 | 满足 |
| 197 | 0.104 | 0.105 | 0.105 | 0.000 | 0.000 | 85 | 51 | 满足 |
| 198 | 0.011 | 0.000 | 0.018 | 0.000 | 0.000 | 95 | 95 | 满足 |
| 199 | 0.011 | 0.000 | 0.019 | 0.000 | 0.000 | 98 | 98 | 满足 |
| 200 | 0.072 | 0.000 | 0.074 | 0.000 | 0.000 | 19 | 19 | 满足 |
| 201 | 0.100 | 0.103 | 0.098 | 0.000 | 0.000 | 33 | 20 | 满足 |
| 202 | 0.104 | 0.105 | 0.105 | 0.000 | 0.000 | 85 | 51 | 满足 |
| 203 | 0.012 | 0.000 | 0.021 | 0.000 | 0.000 | 95 | 95 | 满足 |
| 204 | 0.012 | 0.000 | 0.022 | 0.000 | 0.000 | 98 | 98 | 满足 |
| 205 | 0.072 | 0.000 | 0.074 | 0.000 | 0.000 | 19 | 19 | 满足 |
| 206 | 0.100 | 0.103 | 0.098 | 0.000 | 0.000 | 33 | 20 | 满足 |
| 207 | 0.104 | 0.105 | 0.105 | 0.000 | 0.000 | 85 | 51 | 满足 |
| 208 | 0.011 | 0.000 | 0.018 | 0.000 | 0.000 | 95 | 95 | 满足 |
| 209 | 0.011 | 0.000 | 0.019 | 0.000 | 0.000 | 98 | 98 | 满足 |
| 210 | 0.009 | 0.000 | 0.000 | 0.000 | 0.000 | 740 | 740 | 满足 |
| 211 | 0.025 | 0.000 | 0.000 | 0.000 | 0.000 | 740 | 740 | 满足 |
| 212 | 0.028 | 0.000 | 0.000 | 0.000 | 0.000 | 740 | 740 | 满足 |
| 213 | 0.009 | 0.000 | 0.000 | 0.000 | 0.000 | 740 | 740 | 满足 |

最严控制表 *(强度和整体稳定)*

|  | 强度 | 绕2轴  整体  稳定 | 绕3轴  整体  稳定 | 沿2轴  抗剪  应力比 | 沿3轴  抗剪  应力比 | 绕2轴  长细比 | 绕3轴  长细比 |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 所在单元 | 132 | 133 | 33 | 136 | 98 | 58 | 58 |
| 数值 | 0.182 | 0.221 | 0.184 | 0.000 | 0.003 | 831 | 831 |

# 附录



**圆管截面截面示意图**



**圆形截面截面示意图**



**轧制H型钢截面示意图**