

某小区 住宅楼

摘□□要

本设计为某小区 住宅楼，建筑高度 27.500m。地处 7 度抗震设防区域，分组为 1 组。场地土类为 II 类。建筑、结构、施工组织设计是本设计的重点。本设计的计算内容主要有：建筑设计方面（包括柱子、楼梯、门窗等的布置），按照有关规范，进行平面组合设计、交通组织、柱网布局和平面图表达及尺寸标注；结构设计方面：先根据轴压比确定柱的截面尺寸及梁跨度估算梁板截面，用 PKPM 建模计算，计算后看计算结果。观察柱的轴压比、配筋率、周期、层间位移、剪重比、刚重比等参数对结构进行调整，基础采用预制桩基础，计算满足所有条件后画配筋图；施工组织设计方面：根据工程复杂程度及工程结构类型考虑不同的施工因素，以安全的完成施工任务为目标，制定施工计划，并绘制相关图纸。

关键词：建筑设计；结构设计；施工组织设计

A Structure design of Mou XiaoQu

residential building

ABSTRACT

The design for mou residential buildings, floor height 27.500 m.
Is located in the area of 7 degree seismic fortification, grouped

into one group. Classes for II in-situ soil. Construction, structure, construction organization design is the focus of this design. The design calculation of contents mainly include: building design (including columns, stair, door to wait decorate), in accordance with the relevant specification, design, traffic organization, plane composition column grid layout and floor plan and dimensions; Structure design: according to the first axial compression ratio to determine the section size of column and beam slab beam span estimation section, using PKPM modeling calculation, after the calculation results. Observe the column axial compression ratio, reinforcement ratio, cycle, interlayer displacement, shear weight ratio, just heavier than adjust structure parameters, such as, base adopts precast pile foundation, calculate draw reinforcement after meet all the conditions; Construction organization design: according to complex degree and the engineering structure considering different factors of construction, to complete task with safety as the goal, the construction plan, and draw the relevant drawings.

Key words: Architectural design; Structure design; Construction organization design

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本工程为南方某市某公司拟于 2012 年在市丝绸路一地块开发的某住宅小区中的一栋住宅楼，其结构形式为框架剪力墙结构，建筑功能为，地下一层为储藏室，层高 3.6 米，地上一层为商场，层高 5.1 米，地上 2-9 层为住宅楼，层高 2.8 米。设有电梯两部、楼梯等；建筑面积：6000 平米，本工程按任务书提供的地形图的坐标确定该建筑相对位置。室内地坪标高首层地面标高±0.000，相当于绝对高程 30.500m。基本风压 0.35kN/m^2 ，地面粗糙度 B 类；基本雪压 0.20kN/m^2 ，最大冻土深度 600mm。建筑场地类别为 2 类，属可进行建设的一般场地，地下水位埋深>28m，无地基土液化问题。抗震设防烈度为 7 度，设计基本地震加速值为 $0.10g$ （一组），特征周期 0.35s。本工程设计使用年限为 50 年。框架抗震等级为二级，基础形式为条形基础。

This project for the south city hengli estate co., LTD. Is an plot development of the silk road the city in 2012, small high-rise residential area in a high-rise building, its structure form is frame shear wall structure, building function, storage for the underground layer, 3.6 meters high, a layer of the earth as mall, height 5.1 meters, 2-9 layer for residential buildings on the ground, the height is 2.8 meters. Is equipped with two elevators, stairs, etc; Construction area: 6000 square meters, the project in accordance with the specification of topographic map coordinates to determine the relative location of the building. Indoor floor elevation of the first layer of the ground elevation ± 0.000 , is equal to the absolute elevation of 30.500 m. Basic wind pressure of 0.35 kN/m^2 , ground roughness class B; Basic snow pressure of 0.20 kN/m^2 , maximum frozen soil depth is 600 mm. Categories of construction sites to 2 classes, belongs to the general field of construction, can be embedded depth of groundwater table $> 28 \text{ m}$, no liquefaction of foundation soil. Seismic fortification intensity of 7 degrees, design basic seismic acceleration value of 0.10 g (group a), the characteristic period of 0.35 s . This design use fixed number of year for 50 years. Frame aseismic levels for level 2, the basic form of strip foundation.

2 楼梯配筋计算

2.1 楼梯恒荷载计算

梯段板:

$$\text{面层: } (1+1*0.17/0.26)*1.41 = 2.30 \text{ kN/m}^2$$

$$\text{自重: } 25*1*(0.10/0.844+0.17/2) = 5.02 \text{ kN/m}^2$$

$$\text{抹灰: } 20*1*0.02/0.844 = 0.47 \text{ kN/m}^2$$

$$\text{恒荷标准值: } 2.30+5.02+0.47+0.50 = 8.30 \text{ kN/m}^2$$

恒荷控制:

$$1.35*8.30+1.40*0.7*1*3.50 = 14.64 \text{ kN/m}^2$$

$$\text{活荷控制: } \gamma G*P_k + \gamma Q*B*q = 1.20*8.30+1.40*1*3.50 =$$

$$14.86 \text{ kN/m}^2$$

$$\text{荷载设计值: } 4.86 \text{ kN/m}^2$$

平台板:

$$\text{面层: } 0.03*20=0.6 \text{ kN/m}^2$$

$$\text{抹灰: } 0.02*20=0.4 \text{ kN/m}^2$$

$$\text{自重: } 0.1*25=2.5 \text{ kN/m}^2$$

$$\text{恒载标准值: } 0.6+0.4+2.5=3.5 \text{ kN/m}^2$$

2.2 楼梯板配筋计算

正截面受弯承载力计算:

$$\text{左端支座反力: } R_l = 15.65 \text{ kN}$$

$$\text{右端支座反力: } R_r = 15.65 \text{ kN}$$

$$\text{最大弯矩截面距左支座的距离: } L_{\max} = 1.05 \text{ m}$$

最大弯矩截面距左边弯折处的距离: $x = 1.05 \text{ m}$

$$\begin{aligned} M_{\max} &= R_l * L_{\max} - P_n * x^2 / 2 \\ &= 15.65 * 1.05 - 14.86 * 1.05^2 / 2 \\ &= 8.24 \text{ kN} \cdot \text{m} \end{aligned}$$

相对受压区高度: $\zeta = 0.108247$ 配筋率: $\rho = 0.004300$

纵筋(1号)计算面积: $A_s = 322.49 \text{ mm}^2$

支座负筋(2、3号)计算面积: $A_s' = \alpha * A_s = 0.25 * 322.49 = 80.62 \text{ mm}^2$

2.3 楼梯梁配筋计算

恒载: $q = 8.3 * 1.82 / 2 + 3.5 * 1.3 / 2 = 9.8 \text{ KN/m}$

活载 $q = 3.5 * 1.82 / 2 + 3.5 * 1.3 / 2 = 5.5 \text{ KN/m}$

$$M_{\max} = 1.2 \times \frac{1}{8} \times 9.8 \times 2.4^2 + 1.4 \times \frac{1}{8} \times 5.5 \times 2.4^2 = 14 \text{ kN} \cdot \text{m}$$

$$V = 1.2 \times 0.5 \times 9.8 \times 2.4 + 1.4 \times 0.5 \times 5.5 \times 2.4 = 23.4 \text{ KN}$$

$$a_s = \frac{M}{a_1 f_c b h_0^2} = \frac{14 \times 10^6}{1 \times 14.3 \times 250 \times 275^2} = 0.052$$

$$\xi = 1 - \sqrt{1 - 2a_s} = 0.053 < \xi_b$$

相对受压区高度: $\zeta = 0.108247$ 配筋率: $\rho = 0.004300$

纵筋计算面积: $A_s = 322.49 \text{ mm}^2$ 取 10@200, 实配面积: 393 mm^2

支座负筋取 8@200, 实配面积: 251 mm^2

$$V = 0.7 f_t b h_0 + 1.25 f_{yv} \frac{A_{sv}}{s} h_0$$

$$V < 0.7 f_t b h_0$$

按构造配筋即可

3 框架结构布置及计算简图

3.1 确定梁板柱尺寸

1. 由表查得 $f_c = 14.3 \text{ N/mm}^2$; $f_t = 1.43 \text{ N/mm}^2$; $f_{tk} = 2.01 \text{ N/mm}^2$;

$$E_c = 3 \times 10^4 \text{ N/mm}^2$$

HRB400 级钢筋: $f_y = 360 \text{ N/mm}^2$; $E_s = 2.0 \times 10^5 \text{ N/mm}^2$

HRB235 级钢筋: $f_y = f_{y'} = 210 \text{ N/mm}^2$; $E_s = 2.1 \times 10^5 \text{ N/mm}^2$

板按塑性内力重分布计算, 主梁按弹性理论计算。

取 3 轴线一榀框架计算

主梁的跨度为 5.4m/6.1m/4.2m, 第二跨主梁有一跨次梁, 距离 C 轴 2.4m。

各层平面图如结施图 2-5:

板厚: 一层 160mm, 2-9 层 100mm, 屋顶 120mm

主梁截面高: 1 层-屋顶层, B-D 轴梁高 600mm, A-B 轴梁高 500mm

2. 柱截面尺寸

本工程为现浇钢筋混凝土结构, 7 度设防, 框架抗震等级为二级, 取底层中柱估算柱尺寸, 根据经验荷载为 15kN/m²:

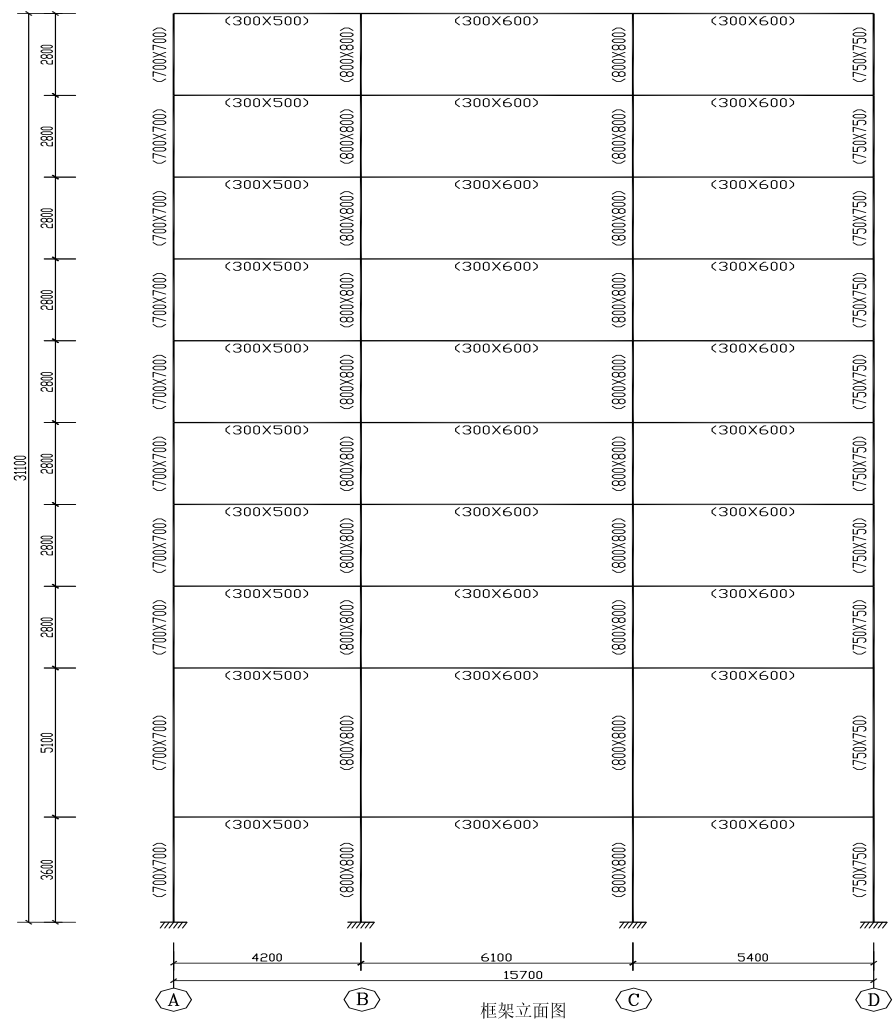
$$N = 15 \times 7.2 \times 5.4 \times 9 = 5248.8 \text{ kN}$$

$$\text{由轴压比限值得 } A_c \geq \frac{N}{0.8 f_c} = \frac{5248.8 \times 10^3}{0.8 \times 19.1} = 343507.85 \text{ mm}^2$$

取柱截面尺寸为 3-D 柱 750 mm * 750 mm, BC-3 柱 800mm * 800mm,

A-3 柱 700 mm * 700 mm

计算截面尺寸如下:



3.2 计算简图

条形基础计算埋深 1.2m 则底层层高为 3.600+1.200=4.800m

AB 跨梁

$$i=2E\times\frac{1}{12}\times0.3\times0.50^3/4.2=1.49\times10^{-3}E$$

BC 跨梁

$$i=2E\times\frac{1}{12}\times0.3\times0.60^3/6.1=1.77\times10^{-3}E$$

CD 跨梁

$$i=2E\times\frac{1}{12}\times0.3\times0.60^3/5.4=2\times10^{-3}E$$

A 柱底层

$$i = E \times \frac{1}{12} \times 0.70^4 / 4.80 = 4.17 \times 10^{-3} E$$

A 柱第一层

$$i = E \times \frac{1}{12} \times 0.70^4 / 5.1 = 3.92 \times 10^{-3} E$$

A 柱其余各层

$$i = E \times \frac{1}{12} \times 0.70^4 / 2.8 = 7.15 \times 10^{-3} E$$

B、C 柱底层

$$i = E \times \frac{1}{12} \times 0.80^4 / 4.80 = 7.11 \times 10^{-3} E$$

B、C 柱第一层

$$i = E \times \frac{1}{12} \times 0.80^4 / 5.1 = 6.69 \times 10^{-3} E$$

B、C 柱其余各层

$$i = E \times \frac{1}{12} \times 0.80^4 / 2.8 = 12.19 \times 10^{-3} E$$

D 柱底层

$$i = E \times \frac{1}{12} \times 0.75^4 / 4.80 = 5.49 \times 10^{-3} E$$

D 柱第一层

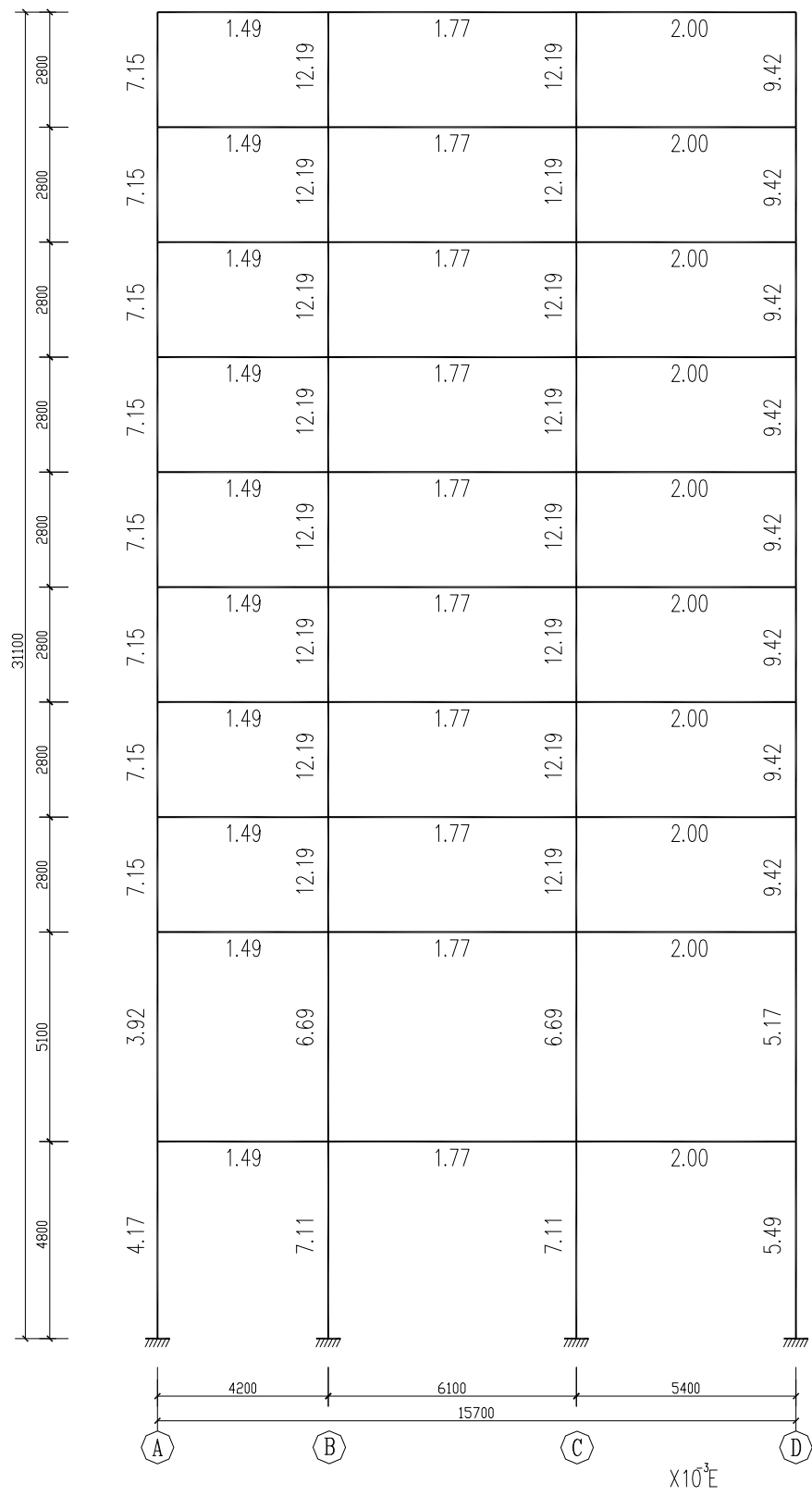
$$i = E \times \frac{1}{12} \times 0.75^4 / 5.1 = 5.17 \times 10^{-3} E$$

D 柱其余各层

$$i = E \times \frac{1}{12} \times 0.75^4 / 2.8 = 9.42 \times 10^{-3} E$$

(其中 $E = 3.25 \times 10^4 \text{N/mm}^2$)

将梁柱线刚度标于计算简图中：



4 恒、活荷载内力计算

4.1 恒荷载计算统计

1. 屋面框架梁荷载标准值

20 厚水泥混凝土找平 $0.02 \times 20 = 0.46 \text{ kN/m}^2$

40~120 厚（1%找坡）膨胀珍珠岩 $(0.08 + 0.16) \div 2 \times 7 = 0.546 \text{ kN/m}^2$

四层作法防水层 0.36 kN/m^2

120mm 厚钢筋混凝土楼板 $0.12 \times 25 = 3.0 \text{ kN/m}^2$

20mm 厚石灰砂浆抹底 $0.02 \times 17 = 0.34 \text{ kN/m}^2$

屋面恒荷载 4.51 kN/m^2

边框架梁 AB 自重 $0.3 \times 0.50 \times 25 = 3.75 \text{ kN/m}$

边框架梁 AB 粉刷 $2 \times (0.50 - 0.12) \times 0.02 \times 17 = 0.26 \text{ kN/m}$

框架梁 BD 自重 $0.3 \times 0.6 \times 25 = 4.5 \text{ kN/m}^2$

框架梁 BD 粉刷 $2 \times (0.6 - 0.12) \times 0.03 \times 17 = 0.48 \text{ kN/m}$

则作用于屋面框架梁上线荷载标准值为：

$$g_{AB1} = 3.75 + 0.26 = 4.01 \text{ kN/m}$$

$$g_{BD1} = 4.5 + 0.48 = 4.98 \text{ kN/m}$$

$$g_{AB2} = 4.2 \times 4.51 = 18.94 \text{ kN/m}$$

$$g_{BC2} = 4.51 \times 3.7 = 16.69 \text{ kN/m}$$

$$g_{CD2} = 4.51 \times 3.6 = 16.24 \text{ kN/m}$$

$$\text{跨中集中荷载 } V_{BC} = 0.25 \times (0.5 - 0.12) \times 25 + 2.4 \times 3.6 \times 4.51 = 41.34 \text{ kN}$$

2. 楼面框架梁荷载标准值

20mm 厚水泥砂浆找平 $0.02 \times 20 = 0.40 \text{ kN/m}^2$

100mm 厚钢筋混凝土楼板 $0.10 \times 25 = 2.5 \text{ kN/m}^2$

20mm 厚石灰砂浆抹底 $0.02 \times 17 = 0.34 \text{ kN/m}^2$

水磨石面层 0.65 kN/m^2

楼面恒荷载 3.89 kN/m^2

边框架梁 AB 自重 $0.3 \times 0.50 \times 25 = 3.75 \text{ kN/m}$

边框架梁 AB 粉刷 $2 \times (0.50 - 0.12) \times 0.02 \times 17 = 0.26 \text{ kN/m}$

框架梁 BD 自重 $0.3 \times 0.6 \times 25 = 4.5 \text{ kN/m}^2$

框架梁 BD 粉刷 $2 \times (0.6 - 0.12) \times 0.03 \times 17 = 0.48 \text{ kN/m}$

填充墙自重 $0.24 \times (2.8 - 0.5) \times 18 = 9.94 \text{ kN/m}$

填充墙粉刷 $2 \times 0.02 \times 2.3 \times 17 = 1.56 \text{ kN/m}$

则作用于楼面框架梁上线荷载标准值为：

$$g_{AB1} = 3.75 + 9.94 + 1.56 = 15.25 \text{ kN/m}$$

$$g_{BD1} = 4.5 + 0.48 + 9.94 + 1.56 = 16.48 \text{ kN/m}$$

$$g_{AB2} = 4.2 \times 3.89 = 16.34 \text{ kN/m}$$

$$g_{BC2} = 3.89 \times 3.7 = 14.39 \text{ kN/m}$$

$$g_{CD2} = 3.89 \times 3.6 = 14.00 \text{ kN/m}$$

$$\text{跨中集中荷载 } V_{bc} = 41.43 + (9.94 + 1.56) \times 3.6 = 82.83 \text{ kN}$$

3. 首层框架梁荷载标准值

20mm 厚水泥砂浆找平 $0.02 \times 20 = 0.40 \text{ kN/m}^2$

160mm 厚钢筋混凝土楼板 $0.16 \times 25 = 4.0 \text{ kN/m}^2$

20mm 厚石灰砂浆抹底 $0.02 \times 17 = 0.34 \text{ kN/m}^2$

水磨石面层 0.65 kN/m^2

楼面恒荷载 5.39 kN/m^2

边框架梁 AB 自重 $0.3 \times 0.50 \times 25 = 3.75 \text{ kN/m}$

边框架梁 AB 粉刷 $2 \times (0.50 - 0.12) \times 0.02 \times 17 = 0.26 \text{ kN/m}$

框架梁 BD 自重 $0.3 \times 0.6 \times 25 = 4.5 \text{ kN/m}^2$

框架梁 BD 粉刷 $2 \times (0.6 - 0.12) \times 0.03 \times 17 = 0.48 \text{ kN/m}$

则作用于楼面框架梁上线荷载标准值为：

$$g_{AB1} = 3.75 + 0.26 = 4.01 \text{ kN/m}$$

$$g_{BD1} = 4.5 + 0.48 = 4.98 \text{ kN/m}$$

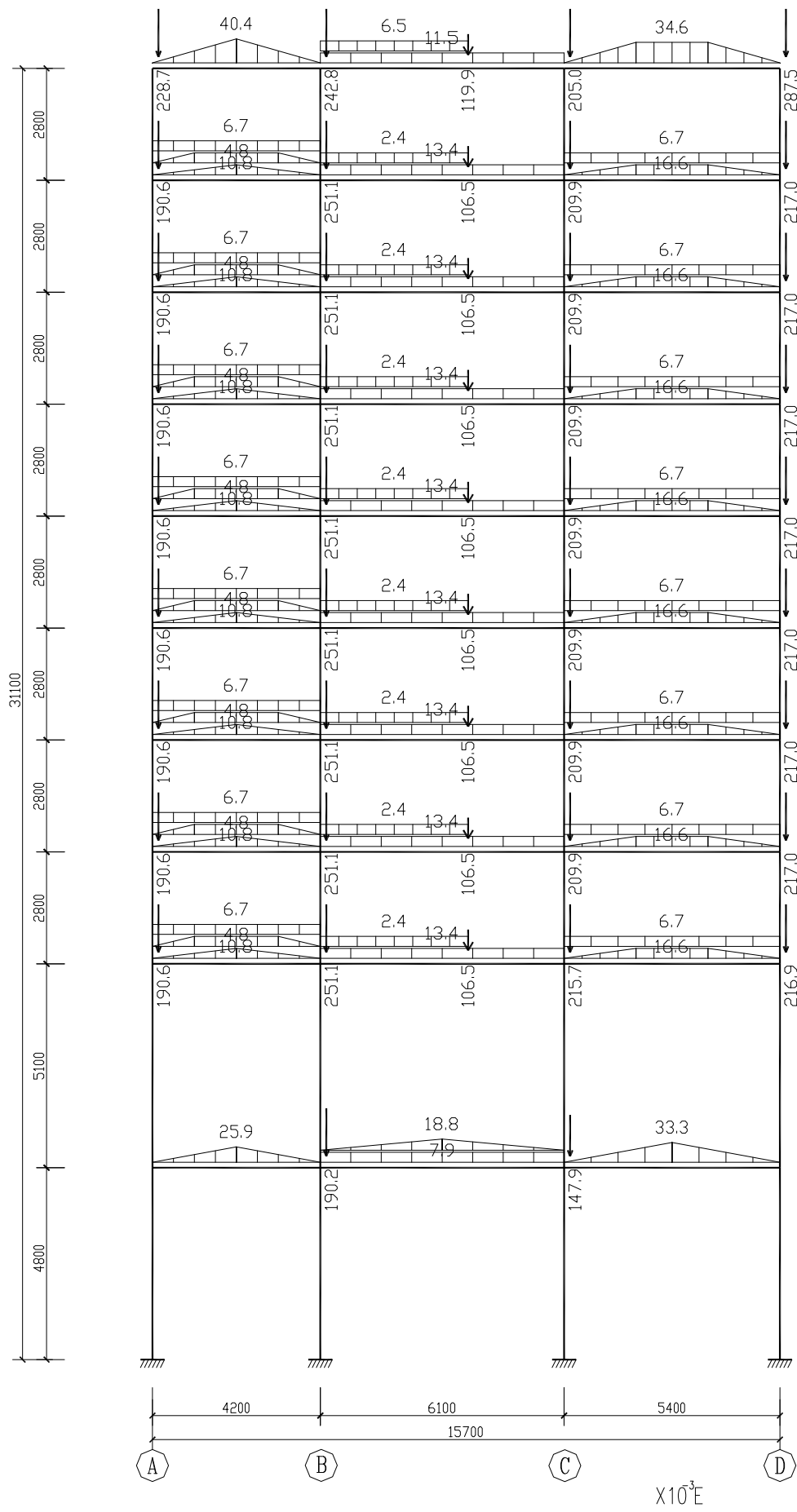
$$g_{AB2} = 4.2 \times 5.39 = 22.64 \text{ kN/m}$$

$$g_{BC2} = 5.39 \times (4.6 + 7.2) / 2 = 31.80 \text{ kN/m}$$

$$g_{CD2} = 5.39 \times 3.6 = 19.40 \text{ kN/m}$$

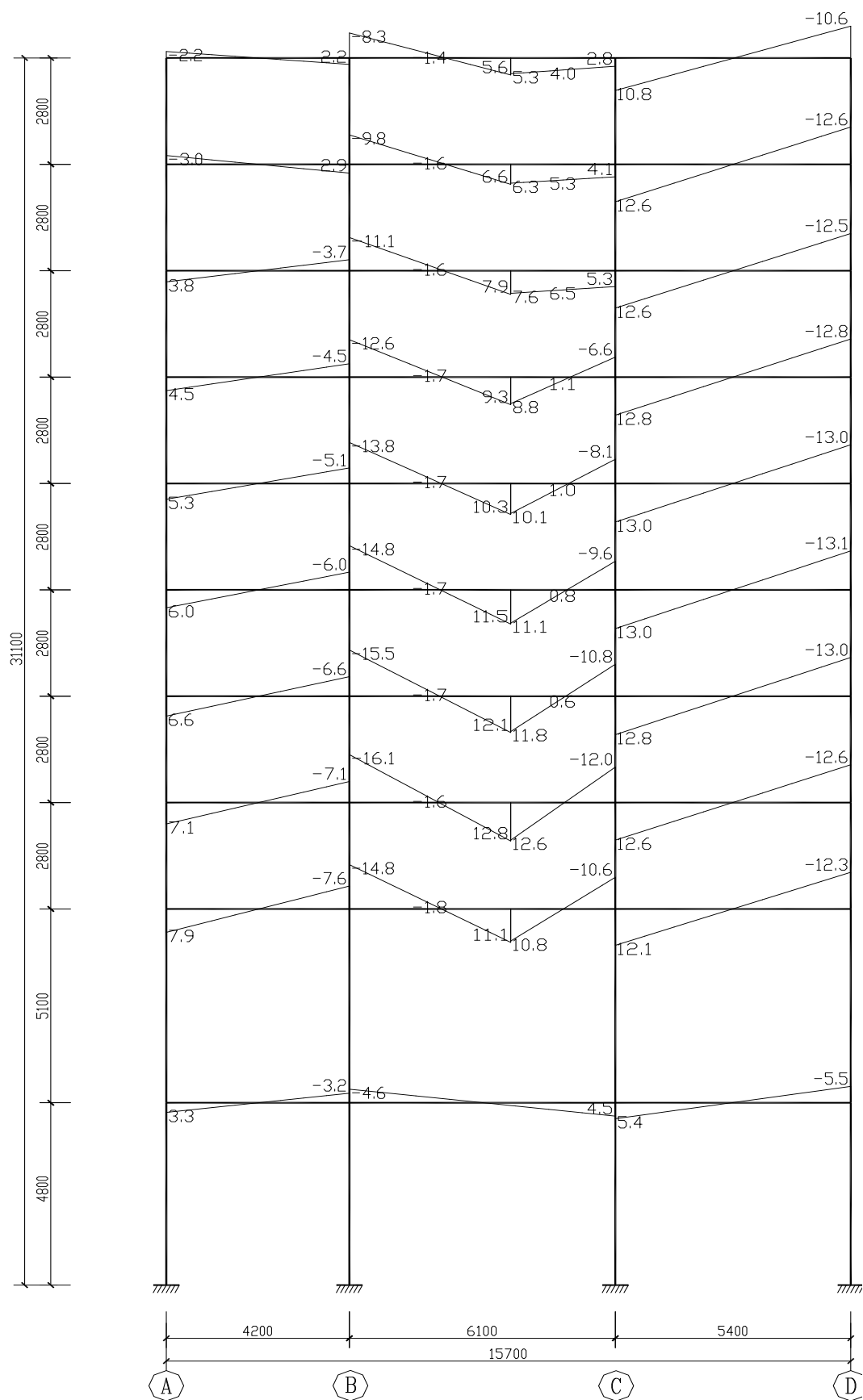
4.2 恒荷载作用下内力计算

1. 计算简图



计算简图

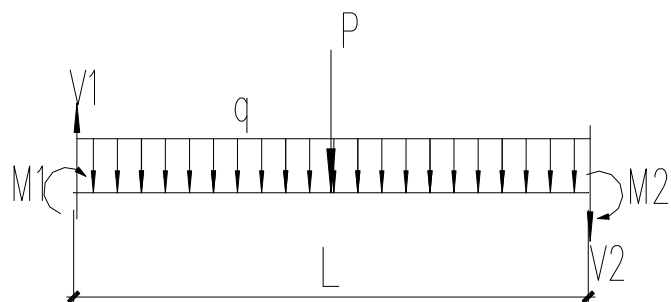
经剪力分配调幅计算后的弯矩图为：



M 图（单位：kN·m）

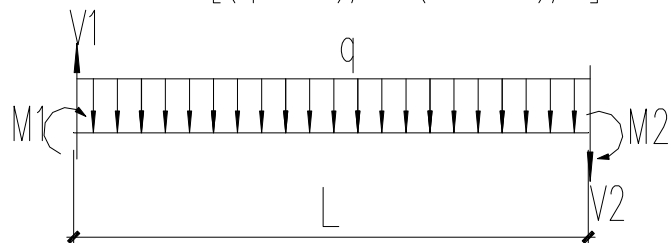
2. 剪力计算

计算原理：



$$V1 = (q \cdot L + P) / 2 - (M1 + M2) / L$$

$$V2 = -[(q \cdot L + P) / 2 + (M1 + M2) / L]$$



$$V1 = q \cdot L / 2 - (M1 + M2) / L$$

$$V2 = -[q \cdot L / 2 + (M1 + M2) / L]$$

则：

$$V_{9AB} = 1\text{kN} \quad V_{9BA} = -1\text{kN}$$

$$V_{9BC} = 3.8\text{kN} \quad V_{9CB} = -3.8\text{kN}$$

$$V_{96CD} = 4.0\text{kN} \quad V_{9DC} = -4.0\text{kN}$$

$$V_{5AB} = 2.9\text{kN} \quad V_{5BA} = -2.9\text{kN}$$

$$V_{5BC} = 7.0\text{kN} \quad V_{5CB} = -8.8\text{kN}$$

$$V_{5CD} = 4.8\text{kN} \quad V_{5DC} = -4.81\text{kN}$$

$$V_{4AB} = 3.21\text{kN} \quad V_{4BA} = -3.2\text{kN}$$

$$V_{4BC} = 7.4\text{kN} \quad V_{4CB} = -8.8\text{kN}$$

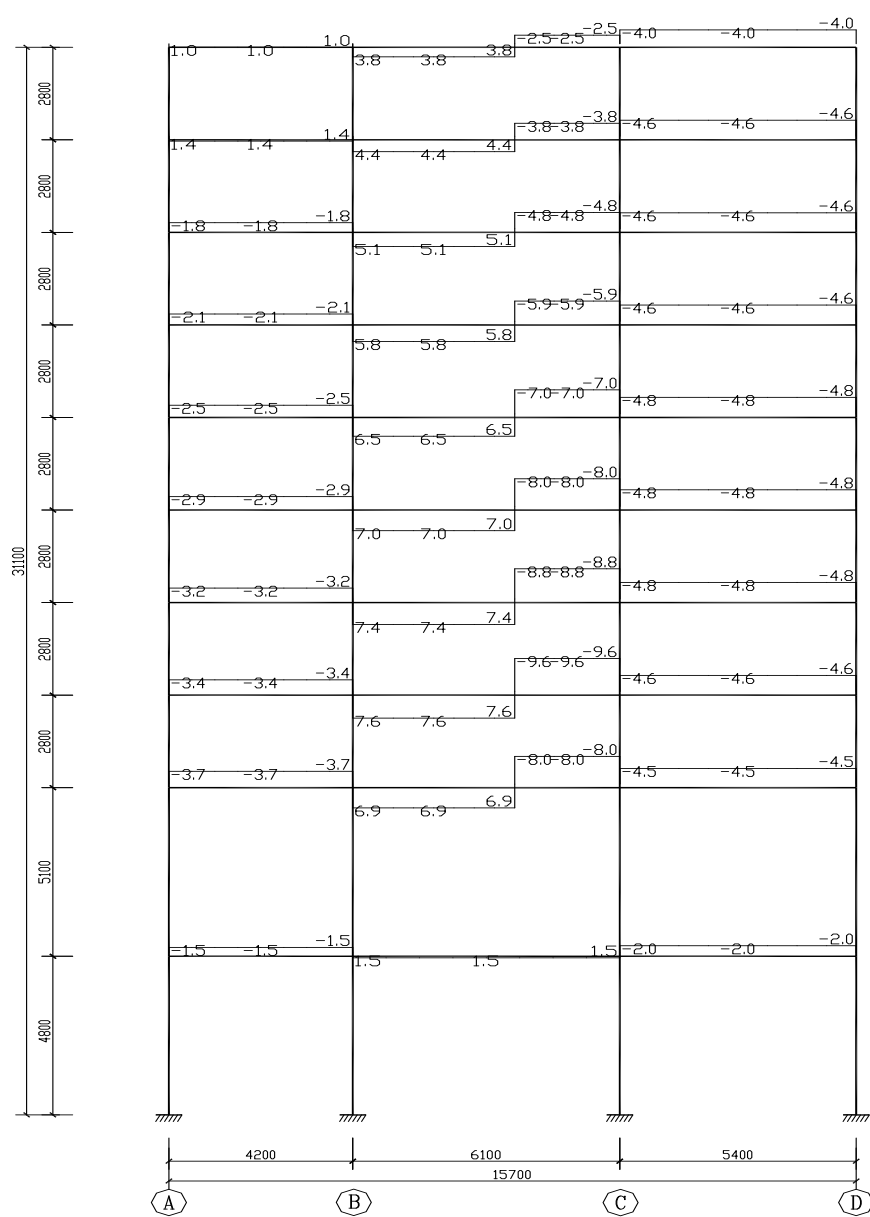
$$V_{4CD} = 4.8\text{kN} \quad V_{4DC} = -4.8\text{kN}$$

$$V_{1AB} = 1.5\text{kN} \quad V_{1BA} = -1.5\text{kN}$$

$$V_{1BC} = 1.5\text{kN} \quad V_{1CB} = -1.5\text{kN}$$

$$V_{1CD} = 2.0\text{kN} \quad V_{1DC} = -2.0\text{kN}$$

剪力图:



4.3 活荷载计算

之后的省略

详见：

<http://item.taobao.com/item.htm?id=37608997906>

Q 扣 Q----:1443697617

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-小刘建筑设计所

5 风荷载信息

基本风压 $w_0=0.35\text{kN/m}^2$ ，地面粗糙度为 B 类。本章计算以左风为例。

5.1 风荷载计算

$w_k=\beta_z\mu_s\mu_zw_0$ ，建筑物高度 $<30\text{m}$ ，故 $\beta_z=1.0$

迎风时 $\mu_{s1}=+0.8$ ，背风时 $\mu_{s2}=-0.5$ ，则 $\mu_s=0.8+0.5=1.3$

计算过程见下表

楼层	高度 H(m)	μ_z	W_0	A(m ²)	P(kN)
九	27.5	1.24	0.35	24.09	12.73
八	24.7	1.21	0.35	45.18	24.83

七	21.9	1.18	0.35	45.18	24.22
六	19.1	1.15	0.35	45.18	23.64
五	16.3	1.11	0.35	45.18	22.82
四	13.5	1.07	0.35	45.18	22.00
三	10.7	1.03	0.35	45.18	21.17
二	5.1	1.0	0.35	45.18	20.56
一	0	1.0	0.35	0	0.00

计算简图（单位：kN

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