

结构设计说明

Structural design description

I. Design basis

1. The applicable building design standards and regulations
 - (1) Structural load norms GB50009-2001(Version 2006)
 - (2) Code for acceptance of construction quality of steel structures GB50205-2001
 - (3) Code for design of steel structures GB50017-2003
 - (4) Technical code of cold-formed thin-wall steel structures (GB 50018-2002)
 - (5) Technical specification for welding of steel structure of light-weight buildings (JGJ81-2002)
 - (6) Technical specification for steel structure of light-weight buildings with gabled frames (CECS 102:2002)
 - (7) Code for seismic design of buildings GB50011-2010
 - (8) Code of design on building fire protection and prevention GB50016-2006
 - (9) Low-alloy high-tensile structural steel GB/T1591-2008
 - (10) Carbon structural steel GB/T700-2006
 - (11) Code for design of masonry structures GB50003-2001
 - (12) Code for design of concrete structures GB50010-2010

本工程结构设计土 0.000 米为板定。

II. Structural design

1. Steel columns and steel beams of the project are calculated by rigid connection, steel columns and foundation are designed by articulated connection.
2. The type of structure of the project is light portal frame structure; the construction site category is II.
3. The design working life of the steel structure of the project is 25 years.
4. The seismic fortification intensity of the project is VI, most design earthquake acceleration of 0.05g, seismic fortification category is C, and safety category is II.
5. Except the elevation whose unit is meter, the rest size unit in the drawings of the project is millimeter.
6. The matters not mentioned in the parts of civil works should be implemented according to the specifications and regulations of building design and construction.
7. The calculation software SIS of series PKPM which is developed by the Chinese Academy of Sciences is used for the steel structure calculation of the project.

IV. Design of materials and load standard value

- 钢材 40N/M2 钢材 39N/M2 钢材 35N/M2
 钢材 50N/M2 钢材(U) 25N/M2

The load surface roughness degree is II. The project design is based on the closed structure; please close the doors and windows when the wind is strong.

V. Materials

1. The main components such as roof steel beams use Q235, E43XX electrode (unless otherwise stated). Its chemical composition and mechanical properties should be consistent with the relevant provisions of the national standards (Carbon structural steel (GB/T700-2006), the joints adopt cold-formed thin-wall steel, their quality standards should be consistent with (Cold forming sectional steel open sectional steel for general structure) GB6723-2008. The design strength, yield strength, and elongation test, the tests of carbon, sulfur, phosphorus and the steel materials should be implemented according to the relevant provisions of the national standards (Steel materials tensile strength of steel and the measured value of yield strength of steel should not be less than 1.25 yield tensile strength should be evident, and the elongation should be greater than 20%; the steel should have good weld ability and qualified impact toughness).
2. The materials of sub-components such as the gables, will be used unless otherwise indicated should adopt Q235 steel.
3. Electrodes
 - a. During the manual welding of steel of grade Q235, E43XX electrode should be adopted, and its performance should be consistent with the provisions of Carbon steel covered electrode (GB/T5117-2012); during the automatic welding or semi-automatic welding, H08 or H08A wires of Q235 wires for welding (GB/T817-77) with manganese-based or high-manganese-based flux should be adopted.
 - b. During the manual welding of steel of grade Q355, E50XX electrode should be adopted, while during the automatic welding or semi-automatic welding, H08Mn wire of Q235 wires for welding (GB/T817-77) with manganese-based or high-manganese-based flux should be adopted.
4. The black bolts, nuts and washers should be produced by Q235 steel stipulated by GB700-98; their heat treatment, production and technical requirements should be consistent with the provisions of (GB5780-86), (GB41-86), (GB95-85).

5. High strength bolts 10.9 adopt bolts with large hexagon head, they should be manufactured by steel 20MnTiB or steel 40B specified by Technical conditions of alloy structure steel (GB3077-82) or by steel 35VB specified by national standards. Specifications of high strength bolts with large hexagon head, large hexagon nuts, plain washers for steel structures (GB231-2006), pre-tension P of each high strength bolt is M16: P = 100KN M20: P = 155KN M22: P=190KN

VI. Production of structure

1. The steel structure should be made strictly in accordance with (GB50205-2001), the 1/1 bulk sample of each component should be checked, the raw materials processing can not be started until the confirmation of the size, pre-assembly inspection should be done before the goods leave the factory. During the production of beam, arch camber should be appropriate in order to reduce the interference degree actually generated by beam.
2. The steel should be corrected before its processing in order to be straight.

3. Welding requirements

- 3.1 The attachment welds between seam-butting plate and column end and between the endplate and beam, and the butt welds of beam flange, column flange and web plate, should be full penetration weld, these welding joints' quality should be consistent with the requirements of grade II, all other welding joints should be consistent with the requirements of grade III.
- 3.2 During the welding, the right welding sequence should be chosen in order to reduce the welding stress and welding deformation generated in steel structure, or other methods should be adopted to achieve the same purpose, such as warm-up, hammering, and whole temper treatment.
- 3.3 During the butt welding of frame beams and frame columns, the position of butt weld of their flange and web plate should be staggered of more than 250mm.
- 3.4 Each component should be numbered and be placed immediately by class after its production.
- 3.5 Except the above welding joints, all other welding joints should be inspected according to the criteria of grade III.
- 3.6 When the butt welding thickness is greater than or equal to 8 millimeter, ultrasonic inspection should be done according to the criteria of welding joints of grade II, when the thickness is less than 8 millimeter, visual inspection is necessary, and the inspection should be done according to the criteria of grade II.
- 3.7 Except the above welding joints, all other welding joints should be inspected according to the criteria of grade III. All other welding joints will be only inspected visually. The visual inspection of endplate should be done according to the criteria of grade II.
- 3.8 For all the fillet welds not indicated in the drawing, their fillet weld size HF is equal to the thickness of the thin piece, the weld length is equal to the lap length of components, and all are full weld. The steel should be corrected before its processing in order to be straight.

VII. Installation of structure

1. The complete inspection of the structure should be done before the installation of structure, such as the number, length, vertical components, and whether the distance between the bolt holes in the installation joints is consistent with the design requirements, methods could be adopted to achieve the same purpose, such as warm-up, hammering, and whole temper treatment.
2. Appropriate measures should be taken during the lifting of structure in order to prevent the generation of excessive bending deformation.
3. When the structure is lifted to the right place, the supporting parts and other like parts should be fastened in time in order to ensure the stability of components.
4. The lifting of all the upper structure can not be done until the lower structure have been in place, calibrated, and the supporting parts have been fastened.
5. The construction requirements of high-strength bolts
 - (1) The high-strength bolt holes should adopt the drilled hole.
 - (2) The bolts and nuts should be in pairs before installation, and a small amount of mineral oil should be wiped in the nut.
 - (3) In the area of the connection of high-strength bolt, the contact surface of the components should adopt the sand blasting, the anti-slip coefficient U_{sl}, no paint or contamination will be permitted.

VIII. De-rust and paint of steel structure

1. All steel components shall be de-rusted by shot blasting before painting, de-rust grade reaches SD 2.5.
2. 钢结构除锈等级为 Sa 2.5
2. All steel components will be painted two layers, anti-rust oil red lead primer, dry film thickness of 60um, two layers light gray alkylid finish paint, dry film thickness of 65um.

3. During the use of steel structure, the paint should be regularly maintained.
- VIII. Concerning the contents not mentioned herein, it should be implemented strictly in accordance with the applicable national standards and regulations.

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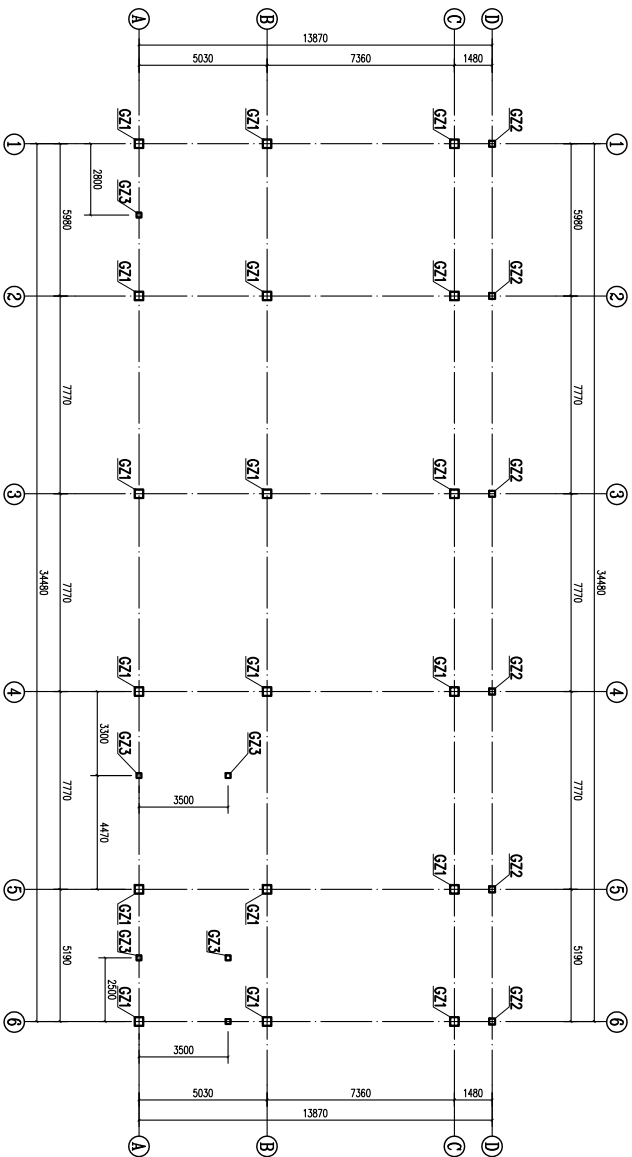
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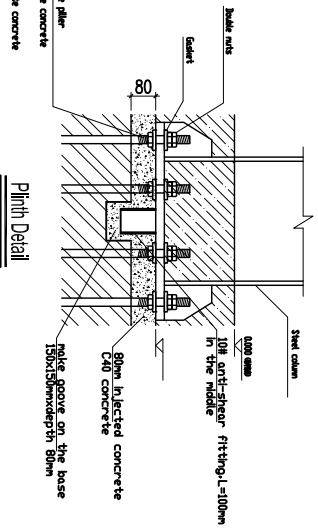
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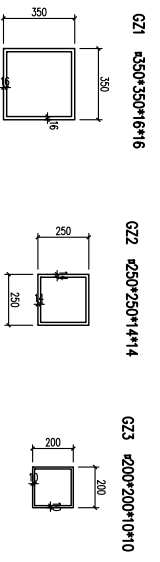
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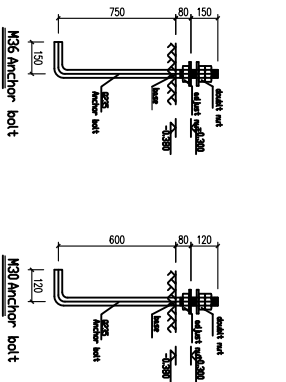
Column plan



Piling Detail

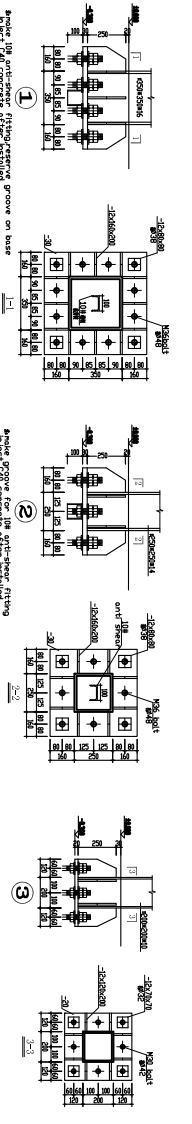


GZ1 350*350*16*16
GZ2 250*250*14*14
GZ3 200*200*10*10



H36 Anchor bolt
H30 Anchor bolt

| No. | Section | Material |
|-----|----------------|----------|
| GZ1 | 350*350*16*16 | Q345 |
| GZ2 | 250*250*14*14 | Q345 |
| GZ3 | 200*200*10*10 | Q345 |
| G1 | H600*240*10*14 | Q345 |
| G2 | H400*200*10*12 | Q345 |
| G3 | HN346*174*6*9 | Q235 |
| G4 | HN298*149*5*8 | Q235 |



1) Reinforcement detail for GZ1
2) Reinforcement detail for GZ2
3) Reinforcement detail for GZ3
4) Reinforcement detail for GZ1

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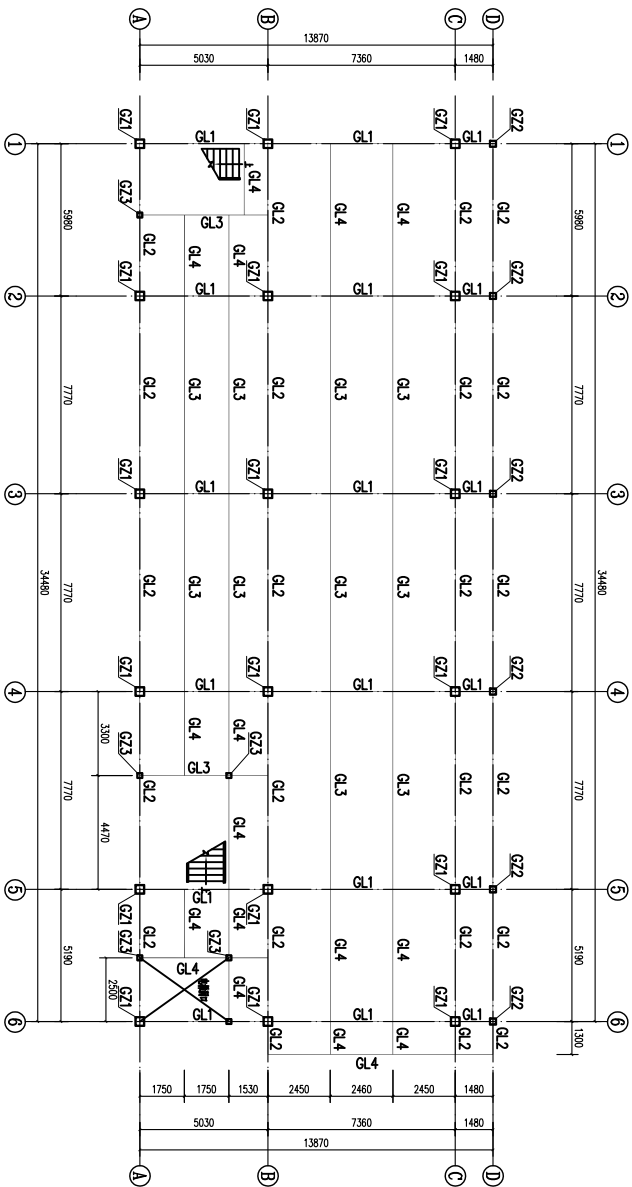
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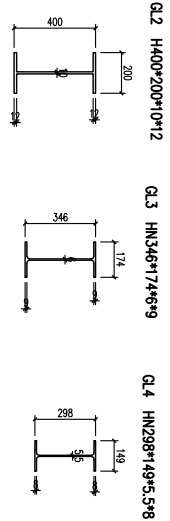
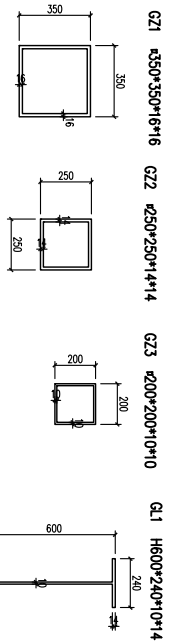
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First floor plan
Height: 3.600m



| No. | Section | Material |
|-----|-----------------|----------|
| GZ1 | 350*350*16*16 | Q345 |
| GZ2 | 250*250*14*14 | Q345 |
| GZ3 | 200*200*10*10 | Q345 |
| Q1 | H600*240*10*14 | Q345 |
| Q2 | H400*200*10*12 | Q345 |
| Q3 | HN346*174*9*9 | Q235 |
| Q4 | HN298*149*5.5*8 | Q235 |

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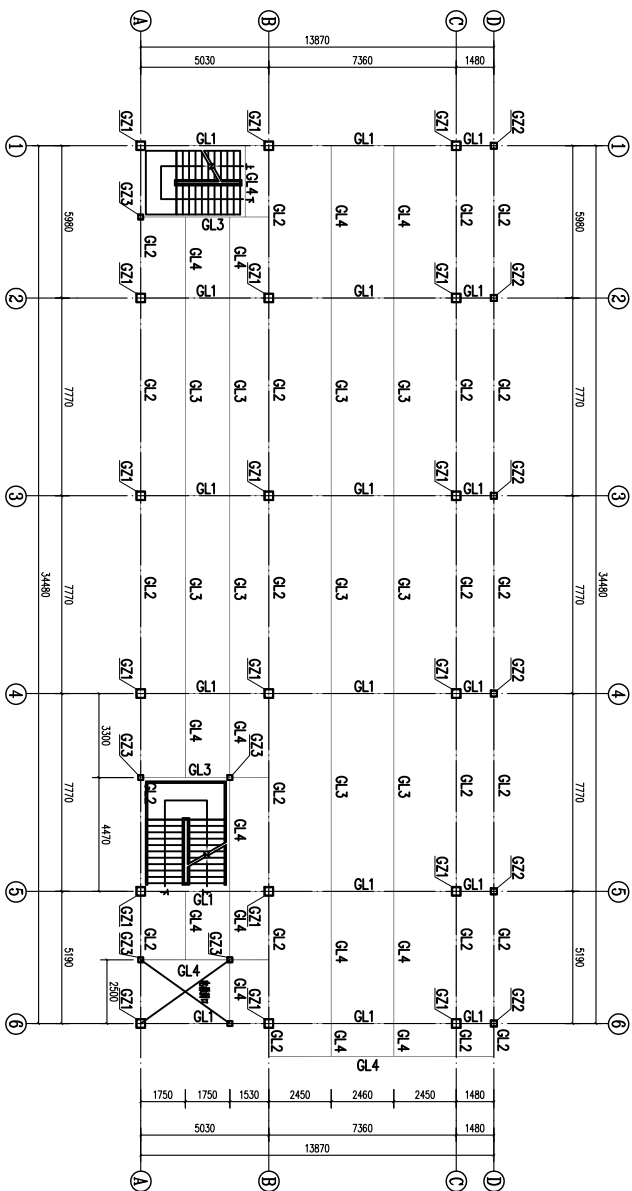
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Second floor plan
Height: +7.200m

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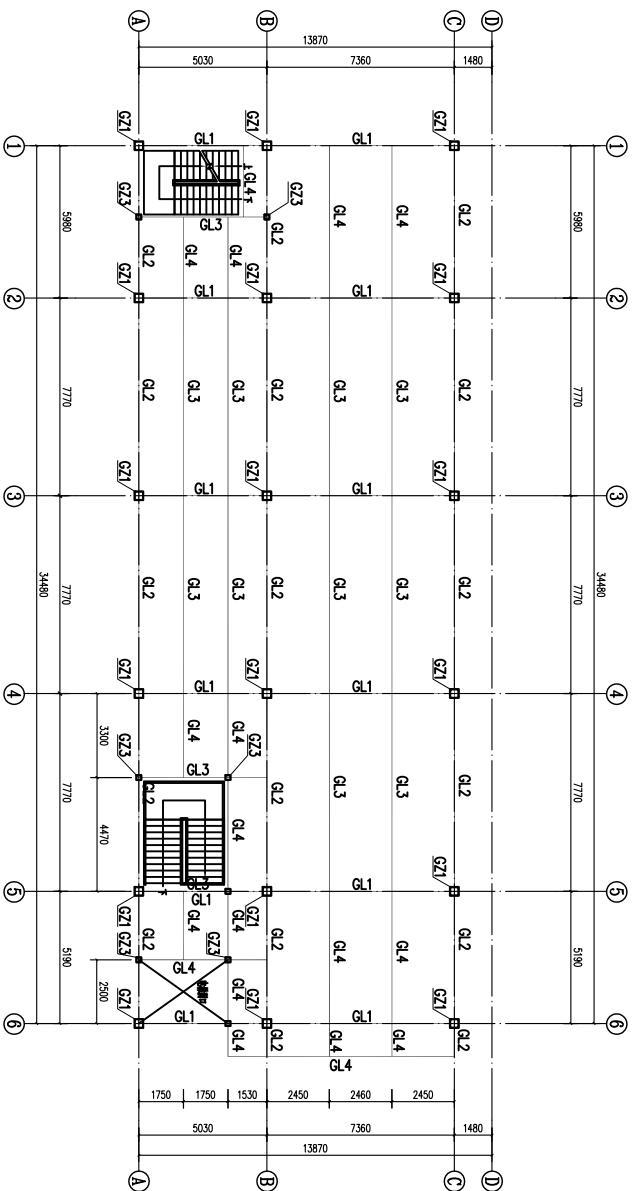
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Third floor plan
height: +10.800m

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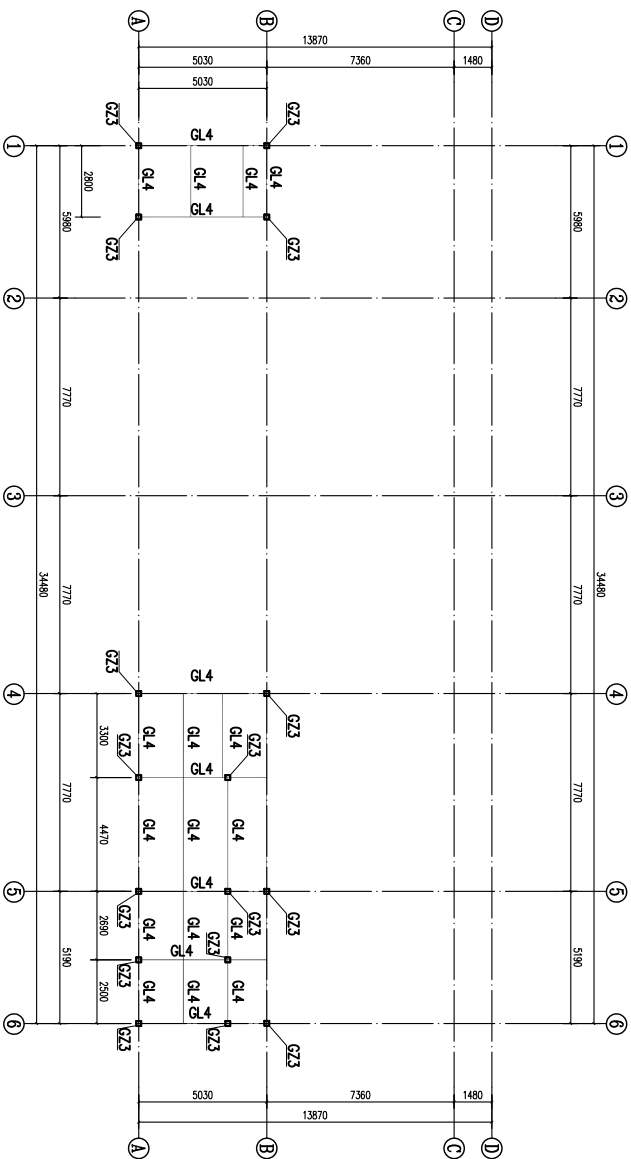
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Roof Floor Plan
Height: +14.400m

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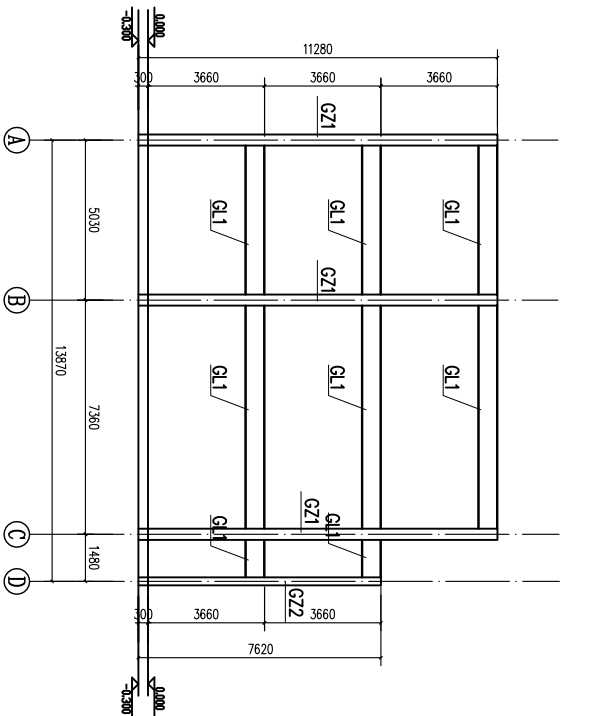
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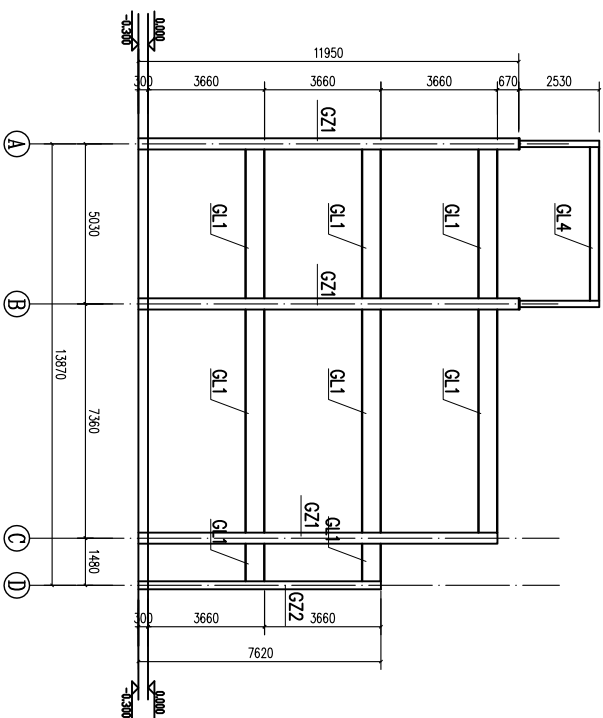
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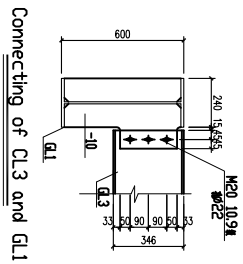
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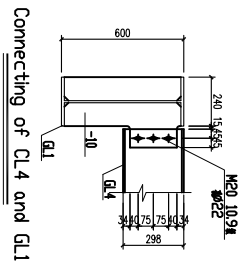
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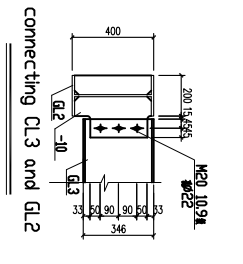
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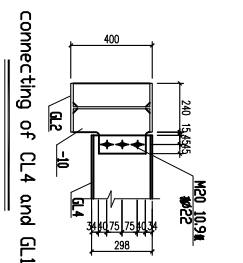
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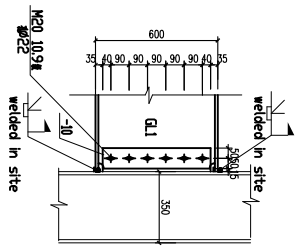
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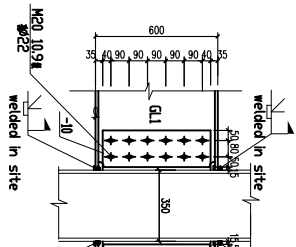
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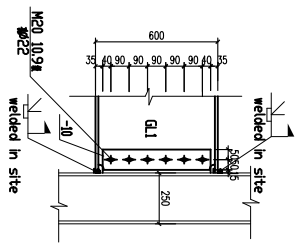
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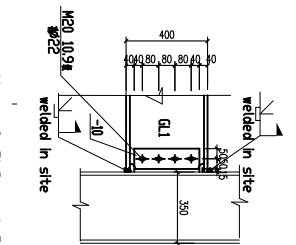
Connecting of GL1 and GZ1



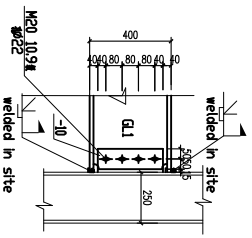
connecting of GL1 and GL1



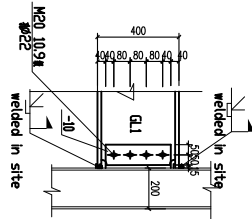
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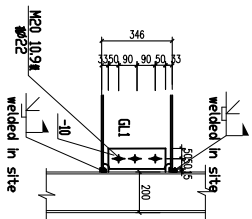
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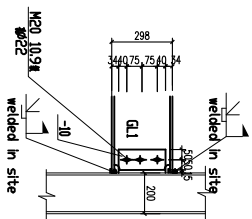
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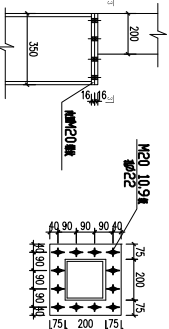
connecting of GL2 and GZ3



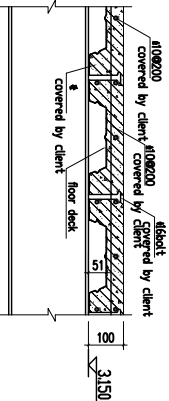
connecting of GL3 and GZ3



connecting of GL4 and GZ3



connecting of GZ1 and GZ3



Floor detail

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 Hangzhou Tongpu Architecture Design Institute Co., Ltd.

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| Project Leader | | |
| 檢 查 人 | | |
| Checked By | | |
| 設 計 人 | | |
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The drawing is valid only after being stamped and released by the ITO