2024

SYNERGIA ENGINEERING

ENGINEERING EXCELLENCE

CONTENTS

COMPANY PROFILE

Profile

Armed with a group of best engineers in pipeline industry and structure steels, ***SYNERGIA ENGINEERING*** is always to deliver unparalleled value to client projects through the manufacture, supply and execution of premium quality steel structures.

Our mission is to generate business growth and profit through the customer satisfaction which accompanies quality products and quality services.

We strive to provide quality services through keen, professional and coherent team work. We aim at quality products by sound design and careful execution.

We work for customer satisfaction because without it we would not exist. We work for growth because it sharpens our creativity and therefore ensures our future.

We work for profit because it maintains the confidence into APEC and allows us to mobilize the best people and best services.

STEEL STRUCTURE INTRODUCTION

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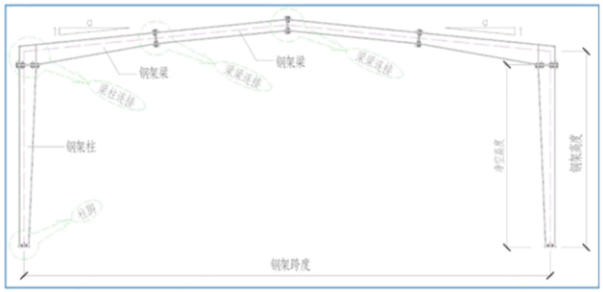
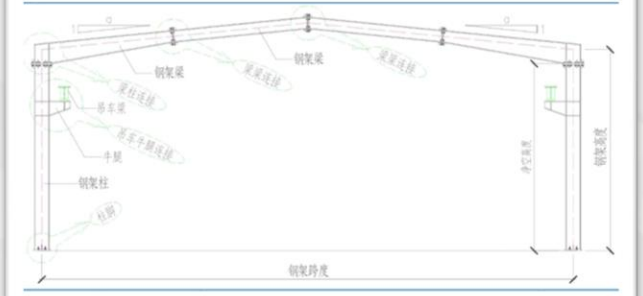
Introduction

Steel structure engineering is a structure mainly made of steel, which is mainly composed of steel beams, steel columns, steel trusses and other components made of section steel and steel plate. Because of its light weight and simple construction, it is widely used in large factories, Bridges, stadiums, aquaculture, super high-rise and other fields。

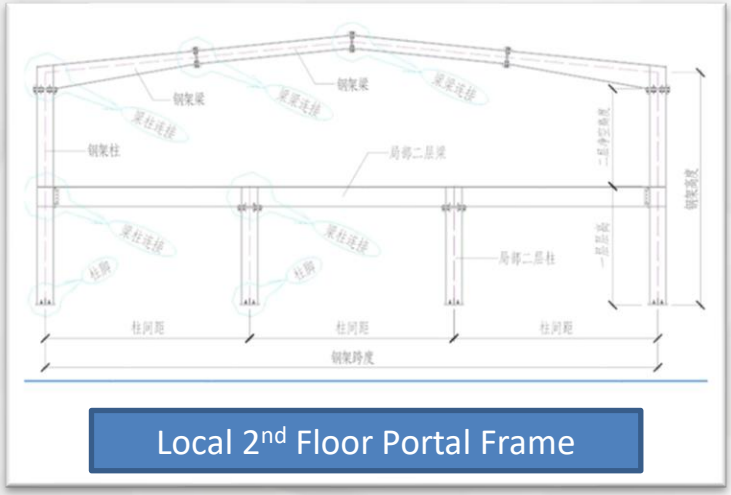
STRUCTURE TYPES



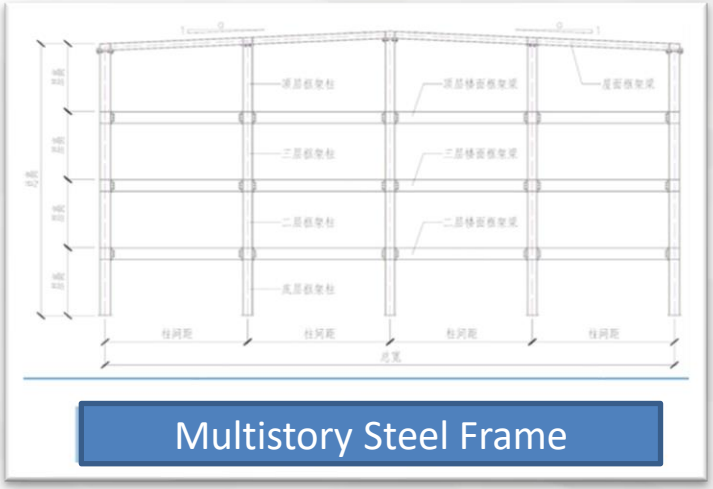
Portal Frame



Portal Frame with crane beam

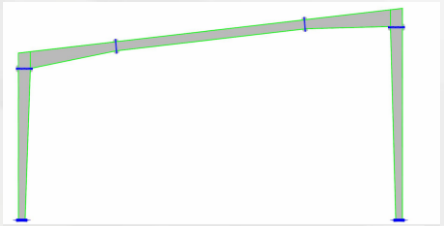


Local 2nd Floor Portal Frame

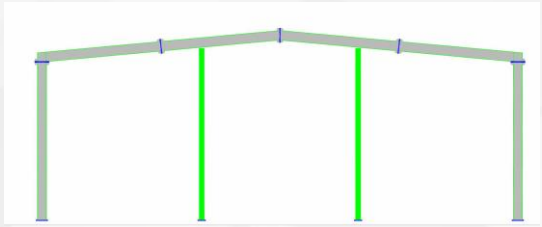


Multistory Steel Frame

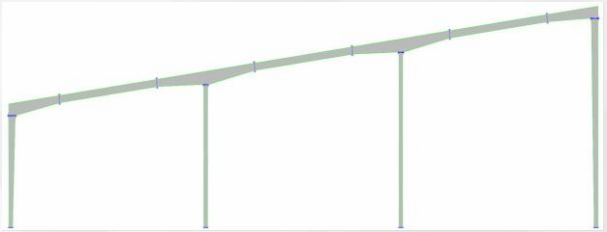
钢结构类型



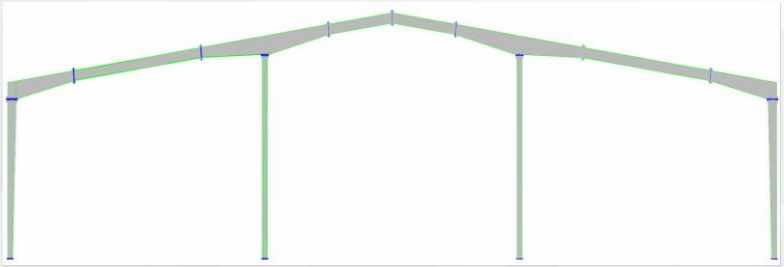
Single slope single span



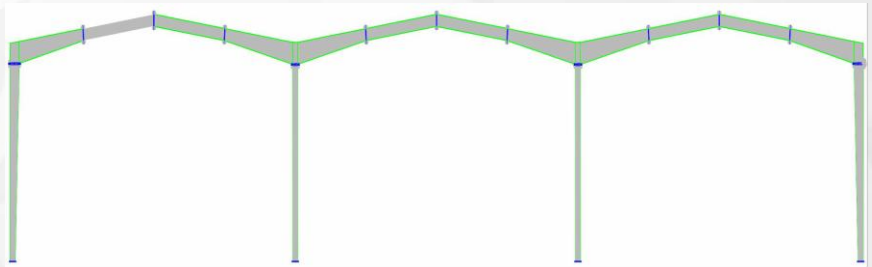
Gable steel structure



Single slope multi span



Multi span, single ridge



Multi span, multi ridge

FEATURES

Sound construction

Applying the steel structure system to the building can give full play to the ductility of the steel structure, the plastic deformation capacity is strong, has the excellent anti-wind performance, greatly improves the safety and reliability of the building. Especially in the case of earthquake, typhoon disaster, steel structure can avoid the collapse of the building damage.

Fast construction

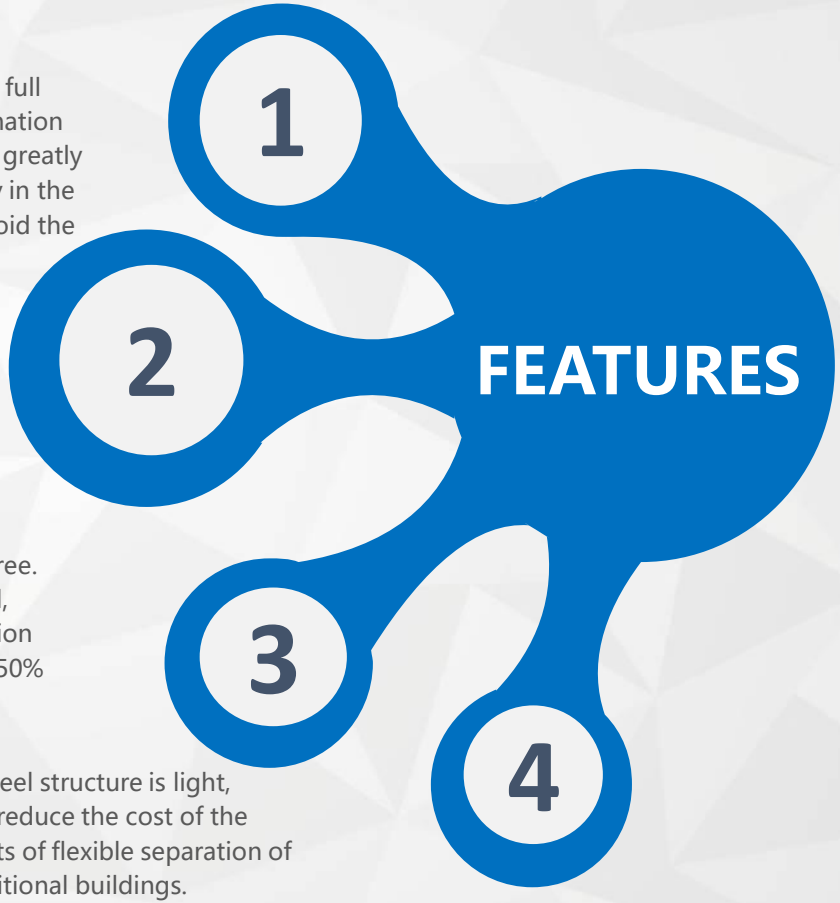
The construction speed is fast, the construction period is shortened by at least one third than the traditional construction system, it's not affected by the environmental season. A building of about 3,000 square meters can be fully installed in 30 working days by 10 workers.

Environmental Care

Materials can be 100% recycled, truly green and pollution-free. The wall adopts light energy saving standard C section steel, square steel and sandwich panel, with good thermal insulation performance and good seismic resistance, which can reach 50% energy saving standard.

Economical and practical

The total weight of the building is light, the weight of the steel structure is light, about half that of the concrete structure, which can greatly reduce the cost of the foundation. Steel structure can better meet the requirements of flexible separation of large Spaces and improve the area utilization rate than traditional buildings.



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STEEL STRUCTURE COMOSITION

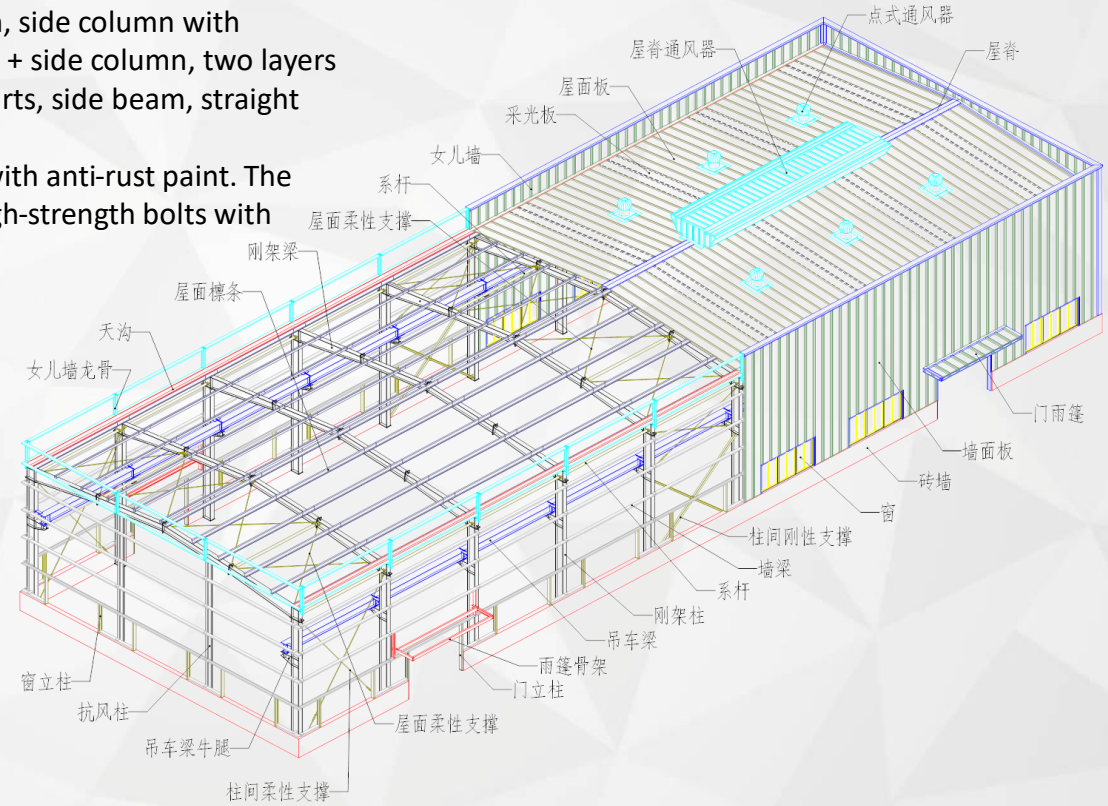
STRUCTURE

Main steels:

Side column, middle column, anti-wind column, side column with children wall keel, with cow leg middle column + side column, two layers of frame column, middle column with shear parts, side beam, straight beam, platform beam, crane beam, crown.
The main steel is made of Q345B and coated with anti-rust paint. The bolts used on the main steel are 10.9 grade high-strength bolts with blackened surface

Secondary steels:

Pull rods and struts, horizontal support, tie rod, corner support, column support, purlin.
The secondary steel is made of Q235B, galvanized or coated with anti-rust paint
Bolts used on secondary steel are plain bolts Q235B, galvanized.



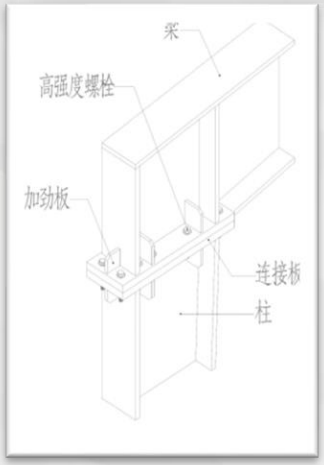
SIDE COLUMN

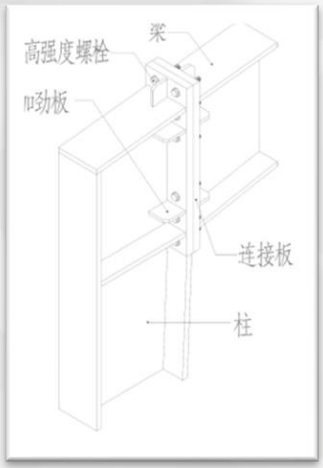
Side column:

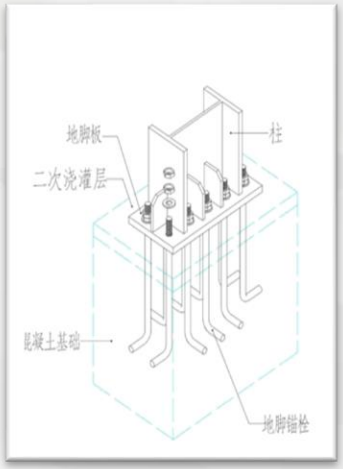
The side column plays a supporting role in the steel structure and bears direct force.Side column is usually based on the design drawing, the steel plate is cut and SAW (submerged arc welding) into h-beam, column feet and scape of stiffening plate by Co2 welding, there is column foot connection plate with a bolt hole which is used for connecting base connection plate. The connection plate is for the beam connection plate, these joints are the high strength bolt connection.

There are many different joints, as follows:

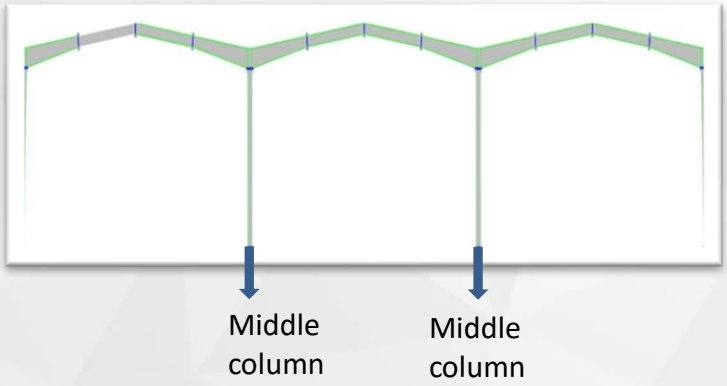
If crane is required, then steel corbel will be added on side column for putting crane beams and tails, as follows:







MIDDLE COLUMN



Middle Column

In addition to serving as support, the middle column also serves to connect each steel beam in the multi-roof steel frame.

Similar to the side column, the steel plate is cut and welded into H beam by submerged arc welding according to the design drawing, or hot rolled H beam. The stiffening plate of the column foot and column body is welded manually, and the connecting plate is welded at the bottom of the column foot.

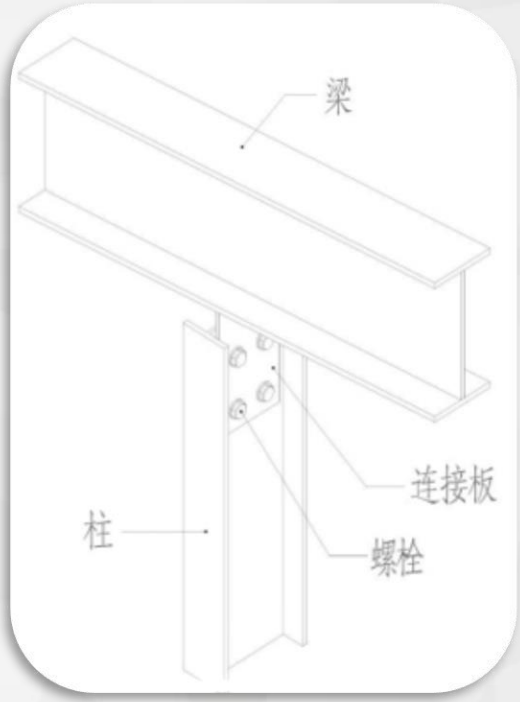
Single slope single span steel frame is without middle column

In the steel structure of multiple roof ridges, the side of the middle column will have downpipe, which connects gutter.

Middle column in the crane steel structure needs corresponding corbel to side column,The middle column shall also have the column foot and the connecting plate connected with the steel beam.

the shear parts of middle column and side column under are optional, seismic action.

ANTI-WIND COLUMN



Anti-wind column

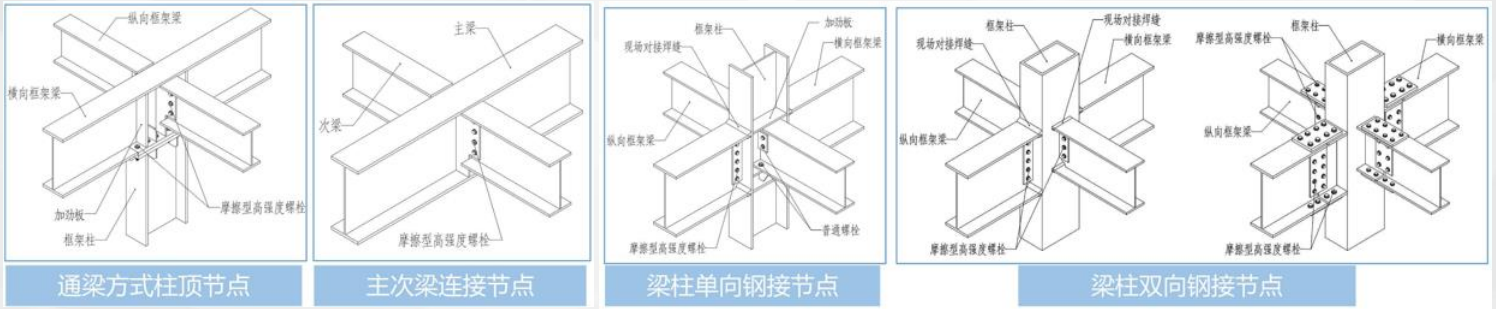
Anti - wind column mainly plays the role of anti - wind pressure, in addition to enhance the stability of the steel structure.
The wind column is connected with the steel beam by high-strength bolts, and the connection mode is shown in the figure.

CRANE BEAM

Crane Beam

Crane beam is installed on the corbels of middle and side beams, rail on it, crane on rail, it undertakes the weight of crane, crane beam design differs from the tonnage of crane.

Following is two stories and multi story beam joint's types:

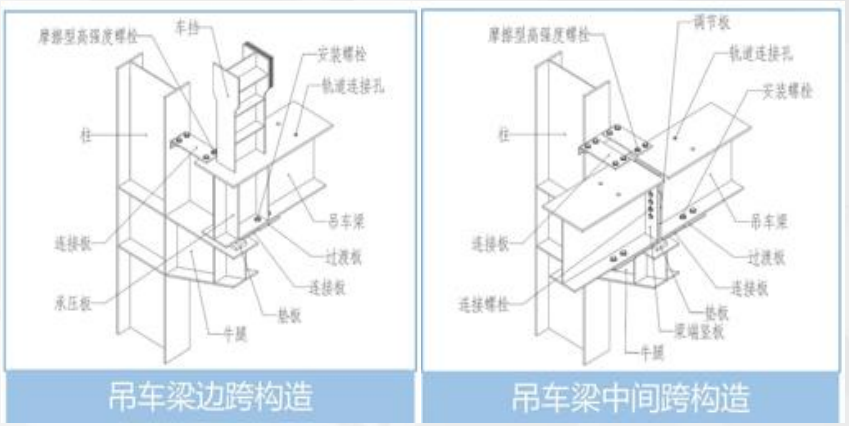


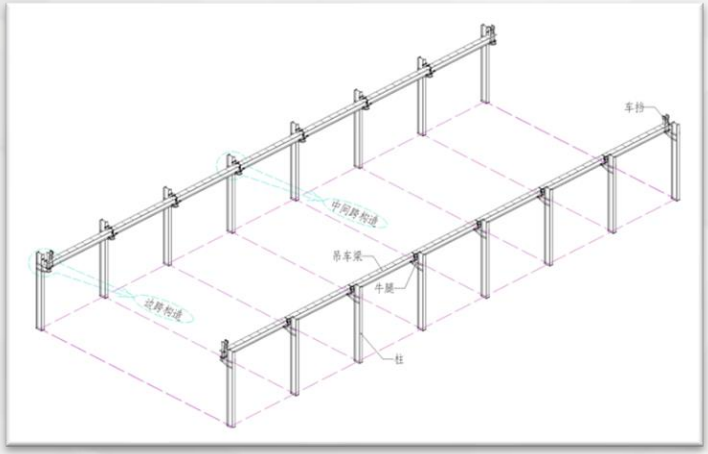
CRANE BEAM

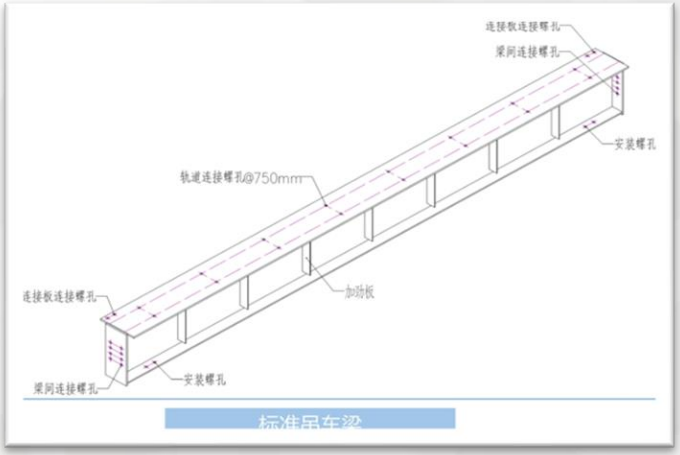
Crane beam is the main load bearing component of crane, which is welded from steel plates.

Brake truss or brake beam is needed to resist horizontal lateral load if it's large tonnage.

There are stopping plates at the ends of crane beams to prevent sliding out and failing, it's welded on crane beam, crane beam and the corbel of side column are connected by high strength bolts.



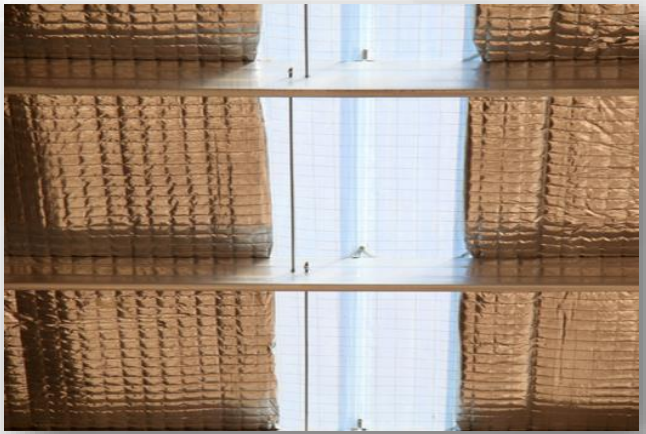




SECONDARY STEEL

Pull rod

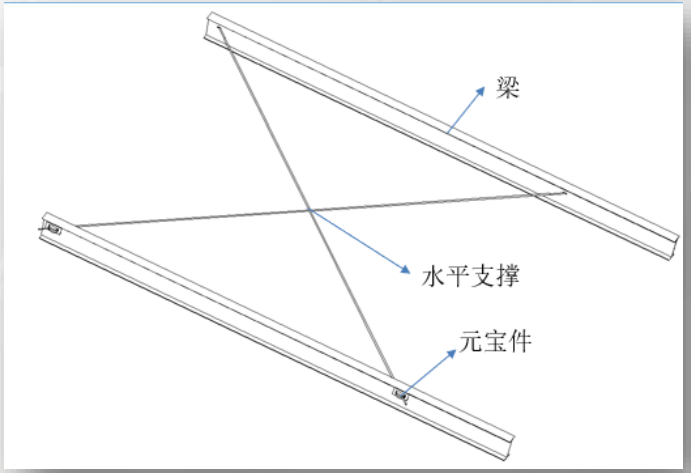
It’s material is generally Q235B, galvanized, installed in between the purlin, adjacent pull rods are dislocated to connect purlin, because the purlin connection hole can not put two pull rodat the same time.
Its role is to fix the purlin and prevent purlin from outward or inward deformation.



SECONDARY STEEL

Horizontal support bar

Its material is generally Q235B round bar, and is used between beams to enhance beam's stress strength, prevent beam from deformation when it suffers stresses.
It's installed between beams of antiwind beam side and fixed by wing piece.



SECONDARY STEEL

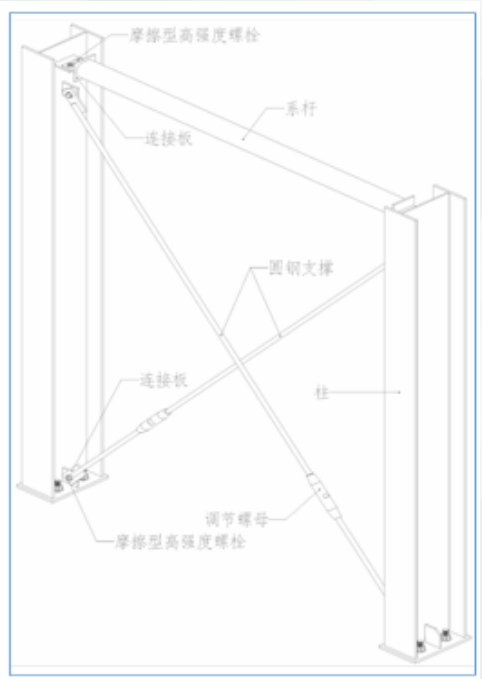
Tie rod and knee-bracing

Tie rod material is generally Q235B round tube, and is used between beams to enhance beam's stress strength, prevent beam from deformation when it suffers stresses

Knee-bracing is generally Q235B Galv angel bar and is installed between beam and purlin, fixed by bolts to enhance purlin's stress intensity.

SECONDARY STEEL

Column support



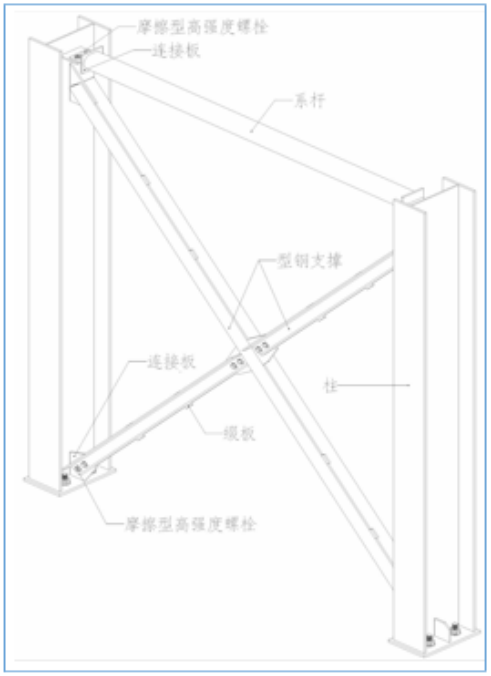
Flexible support

It has two types; flexible support and rigid support and is installed between columns to enhance its stability.

Flexible support is used in portal steel structure, material is Q235B GALV round bar.

Rigid support is used in the steel structure with cranes, material is Q235B H beam or other welded supports.

Column supports have many shapes, like V,K,Portal,L,Y,etc.



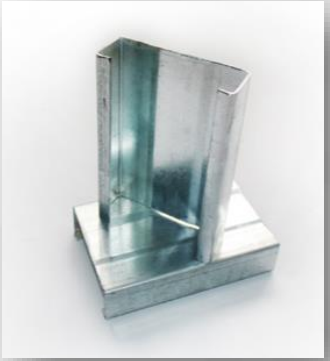
Rigid support

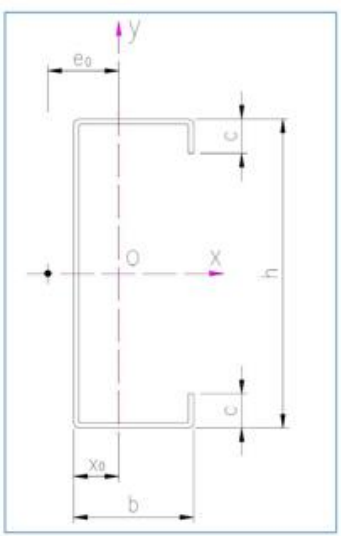
SECONDARY STEEL

Purlin

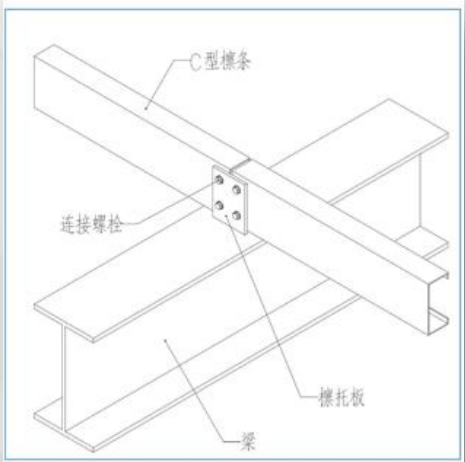
C channel purlin

Purlin is generally galvanized Q235B C channel, Z shape is also available, it's installed between beams, fixed by purlin support plate.

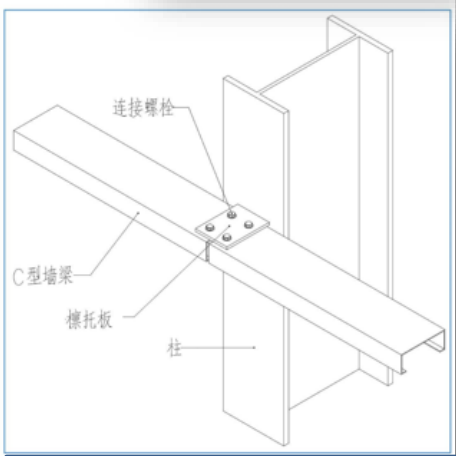




C channel



Installation joint on roof



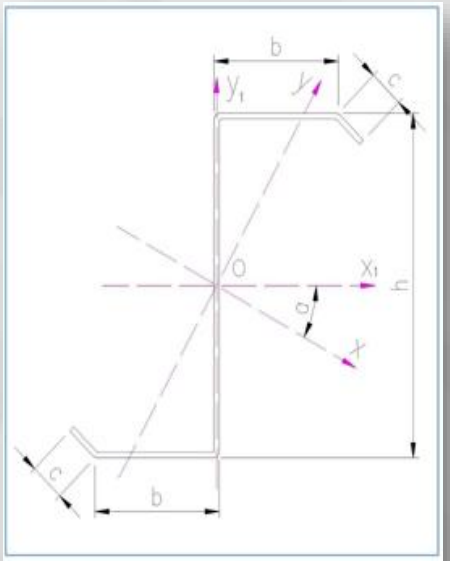
Installation joint on wall

SECONDARY STEEL

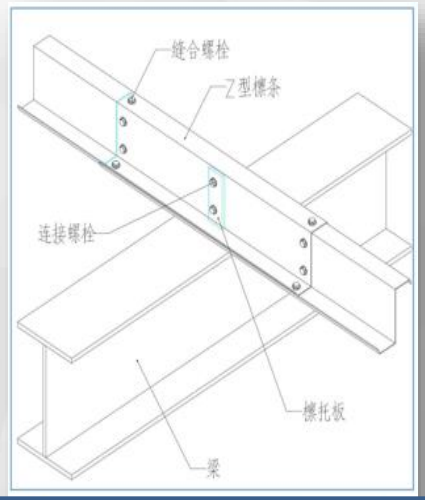
Z Shape Purlin

Z purlin is generally galvanized Q235B C channel, it’s installed between beams, fixed by purlin support plate.

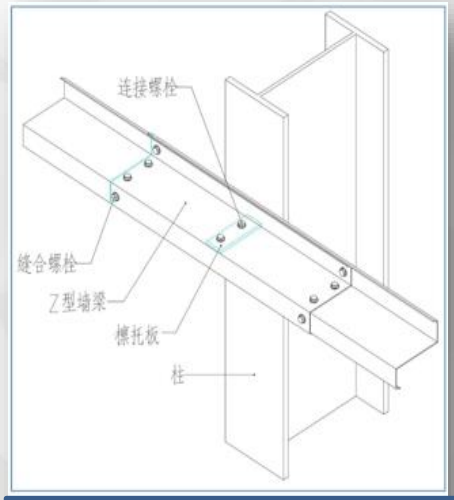
Z shape purlin is usually because of design requests.



Z channel

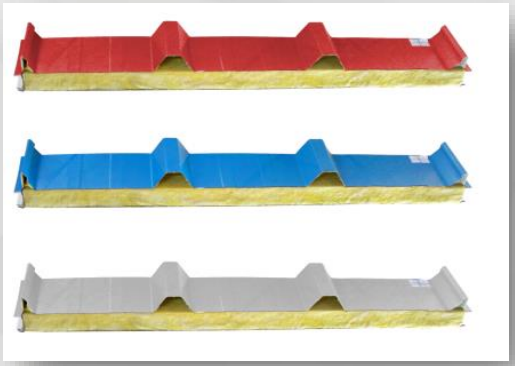


Installation joint on roof

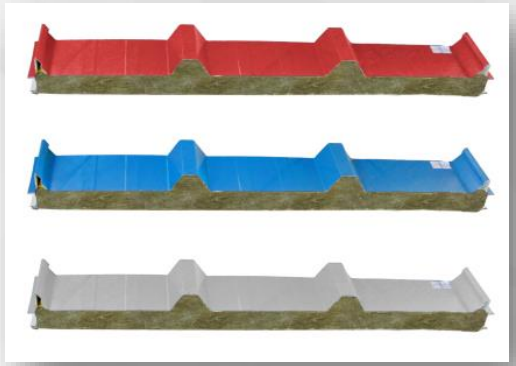


Installation joint on wall

ROOF AND WALL PANEL MATERIAL



Glass silk Roof panel



Rock wool roof panel

PU roof panel

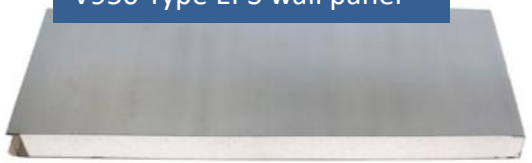
Glass silk wall panel

Rock wool wall panel

PU wall panel

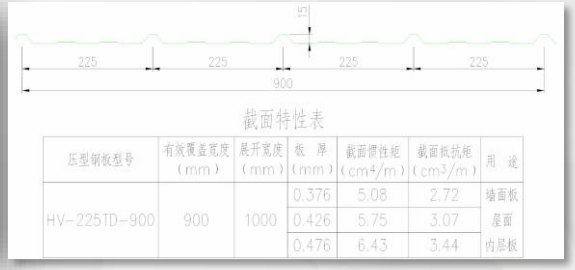
ROOF AND WALL PANEL

V950 Type EPS wall panel



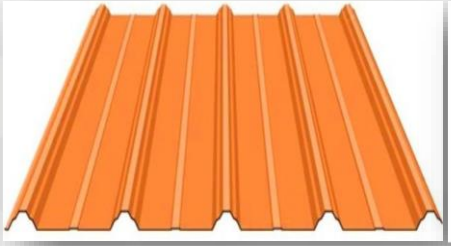
V970 type EPS roof panel

V900 wall sheet

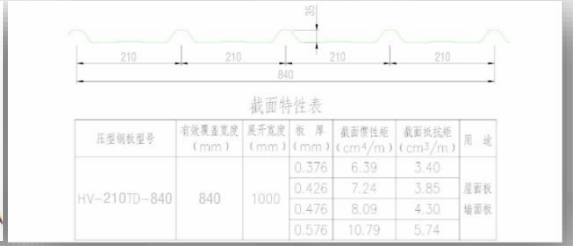


截面特性表

压型钢板型号	有效覆盖宽度（mm）	展开宽度（mm）	板 厚（mm）	截面惯性矩（cm⁴/m）	截面抵抗矩（cm³/m）	用 途
HV-225TD-900	900	1000	0.376	5.08	2.72	墙面板
			0.426	5.75	3.07	屋面
			0.476	6.43	3.44	内层板



V840 roof sheet



截面特性表

压型钢板型号	有效覆盖宽度（mm）	展开宽度（mm）	板 厚（mm）	截面惯性矩（cm⁴/m）	截面抵抗矩（cm³/m）	用 途
HV-210TD-840	840	1000	0.376	6.39	3.40	
			0.426	7.24	3.85	屋面板
			0.476	8.09	4.30	墙面板
			0.576	10.79	5.74	

→ Left extra peak is for connection between panels

ROOF AND WALL PANEL

Feature of glass silk, rock wool, PU, EPS.

Glass silk and rock wool have higher fire rating, are not flammable, and are heavier.
Polyurethane and EPS(polystyrene) have moderate fire rating and light weight.
We use glass silk for wall panels and roof panels
Outside grey color steel 0.47mm thickness, inside white color steel 0.4mm thickness.

特性	聚氨酯发泡	玻璃丝棉
保温性能	热传导系数≤0.023W(m.k)	热传导系数≤0.034W(m.k)
燃烧性能	B1 级难燃材料	A 级难燃材料
降噪性	平均隔声量≥22.6dB(50mm)	平均隔声量≥32dB(50mm)
耐久性	不受无机酸、油类、有机溶剂的影响	具有机材料不可比拟的化学稳定性
物理性能	结力优于自身抗拉强度 0.34-0.48Mpa 杜绝企口开裂和皱折	经 90 度转向，事纤维和钢板成垂直状态，抗压强度提高 35%-50%，具有建筑构件的实用价值
不吸水性	传 蒸汽量 0.9-1.1g/m .24h 吸水量 15-30g/m 不存在导热率升高的问题.	在潮湿的环境下发生潮解
自重	18-28kg/m 谨为岩棉的六分之一	48-70kg/m 谨为岩棉的二分之一

使用以下三种芯材的复合板做成长宽高都为 2 米的试验房，在房内进行燃烧试验：（燃烧时间 单位：分钟）

燃烧状态的变化	聚苯乙烯	聚氨酯	玻璃丝棉
点火	0	0	0
房顶隔热材料开始燃烧	1 分钟	2 分钟	没有变化
墙体隔热材料开始燃烧	1.5 分钟	4 分钟	没有变化
房顶钢板开始裂开	2 分钟	8 分钟	没有变化
墙体钢板开始裂开	2.5 分钟	8.5 分钟	没有变化
外部能看见火焰	2.5 分钟	9 分钟	粘结界面燃烧后,自然灭火
房顶耐燃钢板脱落	3 分钟	10 分钟后出现倒塌现象	没有变化
房顶倒塌	4 分钟完成倒塌	部分倒塌	没有变化
(强行)灭火	17 分钟	12 分钟	5 分钟
灭火特点	可迅速灭火,灭火时产生大量浓烟	隔热材料的蚀热和蚀火需要很长的完全灭火时间	可迅速灭火
有毒气体	大量	较少	无
实验后,产品功能状态	功能丧失	功能丧失	保持形状和功能

The roof adopts 1.5mm galvanized wire mesh +100mm glass silk wadding + aluminum foil cloth + blue color steel 0.47mm thick combination.
The reason why we did not use composite plate is because of its cost, heavier weight of glass silk panel, large size, transport cost high, second, it's flexible and convenient installation.

Roof sheet peak is related with waterdraining, the higher, the better.

DOOR & WINDOW

Sandwich Panel Sliding Door

Roller shutter door

Sandwich Panel Sliding Door

Henhouse Security door

DOOR AND WINDOW

Bar window

Bar window+independent window

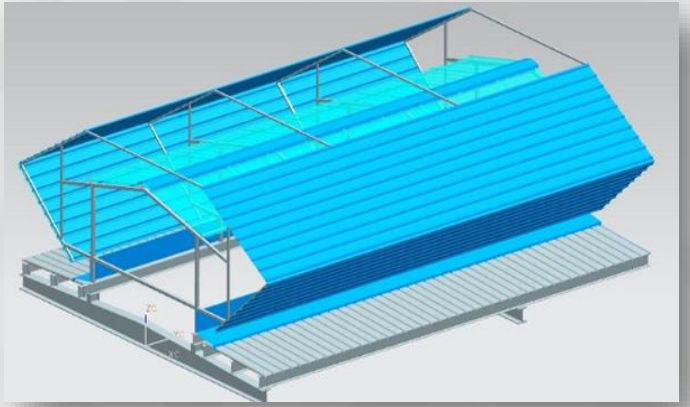
Independent window

Independent vertical window

VENTILATION

Besides of door and window ventilation, the main ventilation is roof ventilation and No power ventilator and clerestory.

Roof ventilation



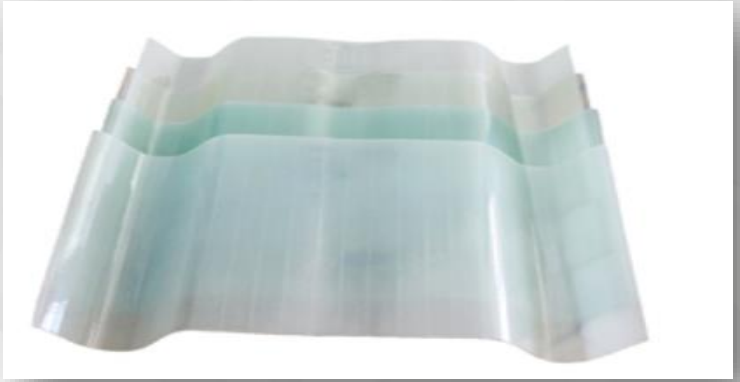
Clerestory.

No power ventilator

SKYLIGHT

The panels are mainly made of PP, PC, PET, APET, or PVC material. The mining plate is fixed by aluminum profile fastener, the corrugated mining plate is fixed by the mining plate bracket and the self-tapping screw, and then sealed with glue.
To facilitate the lighting of our roof. Anti - ultraviolet anti - static effect.

(1)Light transmission is pretty good.
(2)Strong impact resistance
(3)Light weight.
(4)Sound insulation.



BOLT

No galvanizing is required for anchor bolts and high strength bolts, which are used for connection of main steels.

Anchor bolt

High strength bolt

Self tapping screw

Rivet

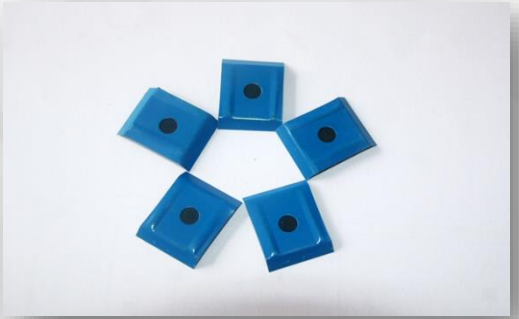
Normal bolt

TOOLS

Installation tools:

Rivet gun

Glue gun



Saddle pad

Wrench

INSTALLATION

INSTALLATION

1-Foundation

2-Install column

3-Install beams

4-Install secondary steel

5-Install purlin

6-Install roof and wall panel

7-Install accessories

8-Install door and window

THANK YOU