

Design of steel structures: history and features



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Since the 80's the 20th century, the steel as a building material, being more widely used, this office and commercial building contractors in the performance is particularly important. In residential construction, the steel is also a certain proportion of the market. Structural steel is mainly used for roof and facade on the framework. However, from another point of view, the market shares of steel is not ideal, mainly due to technical limitations by 80's, steel structures, product range is very limited.

90's of economic recession slowed the momentum of development of residential steel, and then recovering somewhat in a few years. During this period, the architects and structural engineers have done a lot of fruitful research, the most representative of an invention is the invention of steel rib, use the steel ribs of the light steel dragon wall, no longer a ' cold bridge' phenomenon.

This dissertation shows the history of steel constructions, illustrated introduction to these building characteristics, structure and even including the construction, structural aspects of some cases. Also shows what is steel structure and the features of steel structure and stabilities and safety.

Introduction

In many industrialized countries like the United States, Japan, Britain and Australia, steel is most popular in residential building activity. In Australia the 50% of residential building is made by steel structure; more than 50% of steel structure is used for constructions in Japan; and in Finland, Sweden, Denmark and France have formed a certain scale of industrial steel building system.

In U. S. the steel structure is mainly used for multi-storey apartments, hotels, the first steel construction was designed in 1990. So far a total area of the steel structure is developed till approximately 300, 000 m². Up to now, to use the steel structure in the low-rise construction in the U. S has developed 25% from 5% in 90's, and technology of use the steel structure has matured and perfected.

The history of steel structure in Japan is more than 100 years. In recent years the steel structure construction has been quickly developed in Japan, steel building construction was increased each year to 50% until now since 1965. Use 90% of steel structure for low-rise building is very common in Japan, there are use approximately 30 tons of steel structure for average area of 300 m² of construction.

History of steel structure

The first used of steel structure in construction of countries can be traced back to the end of 18th century in British. A century later, when the French engineers built the famous Eiffel Tower, people began to try to use the steel structure to build the single-family house, thence the steel construction completely changed the previous model of building forms, building design concepts and methods.

Steel structure was already been widely used. The high-rise, residential high-rise steel structures are very common in the developed countries. The steel column, H column, round column are more superficial; H steel is generally been use for beams; the column nodes is connected with high strength bolts or welding or both them. Steel deck floor is usually cast composite slab

structure a mainly uses light energy to maintain standardization of prefabricated wall panels. For fire protection is mainly use the fire trucks on fire coating or coated plate. Currently the steel structure is became popular residential industrial countries. In Australia, Japan the 50% of the residential is made by steel structure, 20% in United State,

The first of modern architecture, in France were known as the ' New art nouveau', and were known as the ' Modernism' in Spain. But this phase was too short, and it was less than 20 years which from 90's the 19th century until before the First World War. For example, in the United States and Finland, the impact of the ' New art nouveau' was very weak, and it turned better in beginning of 30's the 20th century. The ' New art nouveau' architecture was emphasized that the basic characteristics of the main building and the environment harmonization.

The second phase of modern architecture began in the after the First World War in 20's the 20th century, and quickly became popular in industrialized countries, the same as the ' New art nouveau'. This phase of the design ideas, including new materials, new structures of understanding and application of the additional focus on new technology applications and innovative architectural languages. Therefore, this phase is also often known as ' Structuralism', ' Functionalism', ' The international style' and so on.

The second phase of the design trend of modern architecture began after the large-scale industrialization in many countries, this also gives both the positive and negative effects. While the corresponding negative, especially staggering impact on the environment.

A key feature of modern architecture is innovative. Steel construction is the synthesis of the material, structure, technology and the request of the people are comfortable living environment.

Throughout the history of the development of steel structure, we can see that architects are always trying to put the structure and construction together, and to show the structural system that an artistic forms. At the same time, the architects constantly explore the issues of how the river of steel and other materials to be used together perfectly.

How to transform the existing residential areas, to adapt them to modern of urban structure, characteristics of the times and adapt modern construction and materials technology is also a rather challenging problems.

Steel structure was widely used as building materials in 19th century

In mid-19th century, steel as a building material widely used in Western Europe, with the price of steel for residential structure also occur at this time. There were many large public buildings with steel structure in this time, including the famous Train Station in Paris which is North station and East station, sanctity of that for the library and the French National Library.

At the same time, iron component, in particular prefabricated cast iron components into the structural members or even the entire structural system has also been widely used in the 10 industrialized countries in Europe.

Crystal Palace was a landmark steel structure was built in 1851's for World Expo in London designed by a gardener called Joseph Paxton. Crystal Palace used a lot of steel and large glasses, a perfect combination of two materials, it is a classic although only a temporary building.

The form of steel structure

The construction industry has tried many different styles in 60's to 90's the 20th century. On the one hand, the current style is constantly developed and improved, there is a turning point that before they were critical and negative trends of thought in this phase.

In the period of 60's to 80's, the USM-Haller system which created by the Swiss architect Fritz Haller is characterized by use of bolts, making every part of the structure can disassemble and re-assembly, the components can be recycled many times. In addition, the steel structure is also very popular in Finland, Sweden, Denmark and France and other European countries. Denmark, Sweden and France have a large-scale construction of residential steel system success. The European people tend to put the steel and a healthy lifestyle together.

The famous of steel construction in the world is:

MillenniumDome in London, designed by British architect Richard Rogers; -
Figure 6.

La Tour Eiffel in Paris, designed by Gustave Eiffel

The concept of steel structure

What is steel structure?

Production of steel is one of the main types of building structures. Steel is characterized by high strength, light weight, rigidity, and it is for the construction of large span and high, especially suitable for building ultra-heavy, homogeneous and isotropic material is good, and ideal elastomer, the most general engineering mechanics of the basic assumptions; material plasticity, toughness, and may have a larger deformation, can well withstand dynamic loads; short construction period; its high degree of industrialization, mechanization can be a high degree of specialized production; high precision, high efficiency, sealed good, it can be used for the construction of cylinders, tanks and transformers. The disadvantage is poor fire resistance and corrosion resistance. Mainly used for heavy load-bearing skeleton of the workshop, subject to dynamic loads of the house structure, shell structures, tall tower and mast structures, bridges and libraries and high-rise construction.

The basic properties of steel structure

The intrinsic properties of steel used by it endured a series of raw materials and process decisions. The role of the outside world, including various types of load and the performance of its meteorological environment is also not overlook. Construction projects, steel structure of steel are used in relatively good plastic materials under the action of the tension, stress-strain curve at more than obvious after the elastic yield point and a yield platform. Then included in the strengthening phase. Traditional steel design, steel strength to yield point as a limit, and as the carrying capacity of the local yield criteria. However, the plastic properties of steel under certain conditions can <https://assignbuster.com/design-of-steel-structures-history-and-features/>

be utilized; simple bracket allows the surface of the plastic contained in the moment of maximum development; continuous beam and the plastic design of the framework has been on the agenda was.

Structural steel and other building materials, the intensity is much higher. In the same loading conditions, steel structure containing surface is small, containing part of the thickness of surface is also small. Therefore, the stability in the steel design is a prominent issue. As long as there is compression of local structures and the possibility should be considered in the design of how to prevent instability. Sometimes, the locality is not ask the ultimate bearing capacity of components, you cannot add to prevent, and take advantage of post-buckling strength.

Structural steel has good self-willed. Therefore, an important dynamic role in steel structures often do. But the design of such steel must also be the correct selection of steel, when the load when repeated, also from the calculation, construction and construction aspects to consider fatigue.

The toughness of steel is not immutable. Material, class, stress state, temperature, etc. will be affected by it, the steel structure used to have brittle fracture of the accident, began to promote from the age of welded structures, the brittle has become an attractive issue.