

Necessity for Studies of Seismic Performance on Modern Bamboo Structure

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Abstract: Modern bamboo structure is a new kind of structure, it plays an important role in the development of environmentally friendly architecture. China has abundant bamboo resource. The research on modern bamboo structure emerges in this condition. It is necessary to form a theory of modern bamboo and provide a theoretical basis for engineering design. Structural styles and the seismic performance and other aspects of the mechanical properties should be researched in the future.

Keywords: Modern bamboo; Seismic performance; Environmentally friendly architecture; Connection

1. Introduction

Modern bamboo structure is a new type of environmentally friendly structure which is used bamboo plywood as the main building materials and based on modern engineering mechanics, experimental science, engineering seismic theory and so on. With the development of the age, the use of concrete and steel becomes more and more popular in real life, meanwhile, the influence on social and ecological environment are also increasingly prominent, especially in developing countries. Now finding out new kinds of environmentally friendly materials is the most urgent task. we need a new kind of environmentally friendly material to reduce or even replace the traditional steel and concrete gradually, it has also become a new challenge of the civil engineering in twenty-first Century. The research on modern bamboo structure also emerges in this condition.

The earthquake caused more than one hundred thousand casualties, direct economic loss are more than eight hundred billion. The great damage caused by the earthquake gave us a wake-up call. Also a new topic was put forward to the civil engineering researchers. And the topic is about how to reduce the harm caused by the earthquake, especially how to maximize the protection of the life of the occupants when the earthquake happens.

In contrast, the Northridge earthquake and the Kobe earthquake, the seismic performance of light wood structure building was perfect. The wooden structure houses only had slight deformation and collapse did not occurred. Even if the whole house was pushed forward a few meters or thrown out, the structure still can not be fallen apart. So casualties and property losses were avoid. The light wood structure is widely used in North America, Japan and Europe and other countries. Taking USA con-

struction for example, 90% of the annual new houses are wood structures. In addition, the wooden structure has also been applied to a large number of multi-storey office, commercial buildings and large-span stadium construction.

2. Materials and Structure Modern Bamboo

China has abundant bamboo resources. Using natural materials, processing technology, structural elements are made by bamboo. Replacing steel and cement gradually, bamboo is used as main structural materials. It is one of the measures to build sustainable development. And it is gradually accepted by people [1]. China's timber are seriously lacking, but the bamboo is rich. Bamboo is used in buildings, thus it can realize green building and improve the quality of environment [2-4]. Bamboo is the natural resources which can be used in civil engineering. Bamboo is used as main structural materials, in order to developing the new bamboo structure, it can achieve "take-shiro wood" and "wood steel". Not only the significant role of sustainable development and protection of forest resources of China are made, but also it can promote the development of bamboo industry and improve the development of bamboo industry and the market competitiveness of the bamboo industry in the social [5].

Modern bamboo is made of round bamboo through modern cementing technology. Materials of round bamboo were transformed and restructured by this technology. Bamboo plywood which meets the requirement of modern building industry rules is made. It is similar with glued laminated timber used widely in foreign countries (plywood and Glulam).

The physical and mechanical properties of bamboo and processing performance of bamboo are good. Slender bamboo fiber is the main component of bamboo, the elas-

tic modulus and longitudinal strength of bamboo are very close to ordinary wood. Compared with steel and concrete, bamboo has good stiffness and strength.

Although there are some similarities between bamboo and wood, The structural form of Wood structure and bakelite structure can be used in Modern bamboo structure. After all the processing methods and material properties, and mechanical properties of bamboo are different from wood , so it is necessary to do a series of studies on the seismic performance of modern bamboo structure.

3. Necessity for Studies of Seismic Performance

Architecture of modern bamboo structure has the advantages of light weight, short construction period, good seismic performance and good economic benefit. In recent years, the structure of the system began in the popularization and application of China and obtained good social and economic benefits. As to now, the researches on capacity of modern bamboo structure system under earthquake are absent, it is necessary to study the seismic performance of these structures deeply.

However, the seismic performance of node directly affects the mechanical properties of the whole structure under earthquake, so the node design and construction in this new building has an important influence. Nails, screws, nail of stype U, bolts, frame connector and anchor bolt are used in the light wood structure commonly. The bottom of the wall by bolts is anchored in the concrete foundation. Roof panel and wall panel nail are fixed in the lumber by nails, nails, screws, glue are used in floor panel. A variety of metal nails and connecting plate are used among the various components of building frame usually. In the connection of bamboo structure, types of connections can be also used. For example, steel splint-bolt connections are in Figure 1 and Figure 2.

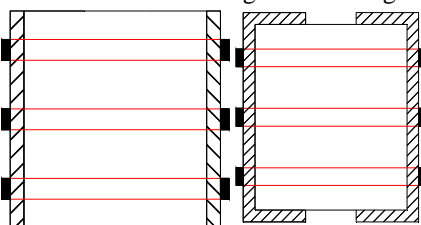


Figure 1. Steel splint-bolt

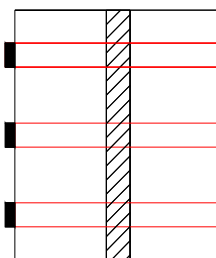


Figure 2. Inside steel splint-bolt

4. Conclusions

- (1) Modern bamboo structure is a kind of new structure, it plays an important role in the development of environmentally friendly architecture, China has abundant bamboo resource, the development of bamboo structure building is of profound significance to the country.
- (2) Based on the studies of bamboo material properties, it is necessary to form a theory of modern bamboo and provide a theoretical basis for engineering design.
- (3) In order to develop the multi-storey and high-rise structure of morden bamboo, structural styles and the seismic performance and other aspects of the mechanical properties should be researched in the future.

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