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## **Chinese construction market and potential for wood construction**

## **Potentiale für den Holzhausbau im boomenden chinesischen Baumarkt**

## **Mercato edile cinese e potenziale per costruzioni in legno**

**Document in English**



# Chinese construction market and potential for wood construction

## Abstract

Current state of Chinese construction market and the existing problems are presented in this paper. The related policies, measures and the potential for wood construction are also depicted.

## 1 The size of Chinese construction market

As Chinese population is large, Chinese construction market has developed quickly in recent 20 years. Statistic data indicates that from 1996 to 2000 the building construction completion area reached to 8.327 billion m<sup>2</sup> and the average annual area was 1.665 billion m<sup>2</sup>. From 2001 to 2005 the building construction completion area reached to 2 billion m<sup>2</sup>. Fig. 1 shows the change of building construction completion area of Shanghai in recent 20 years. It can indicate the development of Chinese construction market.

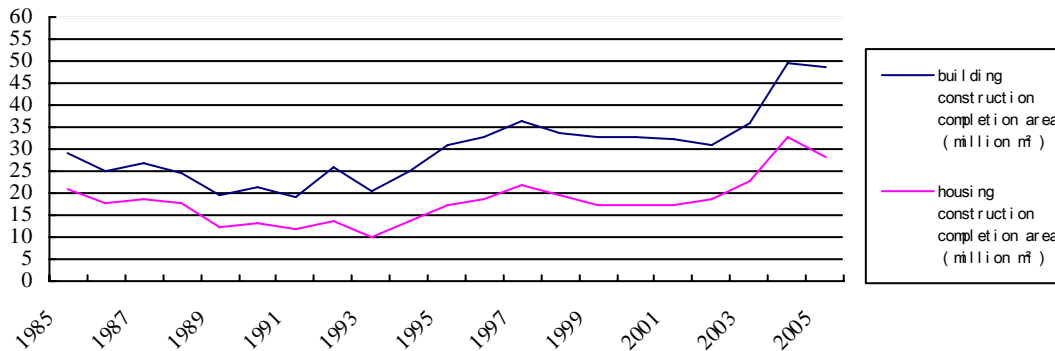


Figure 1: The building construction completion area of Shanghai in recent 20 years

In next 5 years, the size of Chinese construction market will be enlarged continually. The building products will be improved to meet the new requirement of the market. For example, the demand of the infrastructures and the housing buildings will be increased since the need of accelerated city constructions. Secondary industry will be benefited and the market demand will be increased. A lot of big projects, such as, 2008 Olympic Games, 2010 Shanghai Expo, National hydraulic engineer are abuilding. A big new potential market is coming due to the development of China's Western Region, the boom of China's Middle Region and the prosperity of the Northeast industrial district. The construction of the countryside will also bring a large potential market. The support of positive policies and the acceleration of the construction bring the challenge and opportunities to Chinese construction market.

## 2 The main building forms in China

In China, the building forms are various.

The large public buildings, such as airports, exhibition halls, gymnasiums, theatres and libraries, are usually made of steel structures or the combination structures of steel and concrete. Fig. 2 shows some examples.



Shanghai Pudong International Airport



National gymnasium



National theatre



National library

Figure 2: Main forms of large public buildings

The usual forms of housing buildings are high-rise buildings, multi-story buildings and villas. They can be the reinforced concrete structures, brick-concrete structures, steel structures and wood structures as Fig. 3 shows. Among them the reinforced concrete structures and brick-concrete structures are more popular.



High-rise building



Villas



Multi-story buildings  
(Less than 6 stories)



Multi-story buildings

Figure 3: The usual forms of housing buildings

The office buildings can be high-rise buildings, multi-story buildings and low-rise buildings as Fig. 4 shows. As the land is limited in big cities so the new-built office buildings are always the high-rise buildings.



Shanghai world financial  
Center Shanghai JinMao  
Skyscraper



Multi-story office buildings



Canada Wood DHC

Figure 4: The usual forms of office buildings

### 3 The main existing problems of Chinese construction market and the goal of next 5 years

The main existing problems of Chinese construction market are the problem of limited land and large population and the problem of energy waste. According to the statistic data published by National Construction Section, our unit building area energy consumption is 2-3 times than developed countries. The proportion of energy used for constructions and the total energy consumption was 10% in 1970's and it has reached to 27.45% in recent years. The annual building completion area is about 2 billion  $m^2$ , and 80% of them can not meet the requirements of design code for building energy conservation. In a word, there is still a long way to improve the building energy conservation performance.

In next 5 years, the related codes and standards will be ameliorated. More consideration will be taken on energy conservation and environment protection. The organization, management and efficiency of construction will be improved. More effective market access system and better construction quality and supervisory system will be established, which will make the construction market transfer to modern pattern. Modern management, new technology, energy-saving system and safe construction will be introduced. Construction trade plays a very important role in the development of Chinese economy.

### 4 Construction energy conservation and related policies of environment protection

Design code for building energy conservation issued in 1986 was the beginning of Chinese building energy conservation program. To save energy in civil buildings, Energy conservation management for civil buildings was carried out in 2000 by national construction section. It was amended in 2005 and put into use in Jan.1st 2006. The main content of this regulation is to improve the management of building energy conservation, enhance the energy utilization and ameliorate the interior thermal environment. New technologies, new materials, new structures, new equipment and new management are encouraged. Both the new-built buildings and the reconstructed buildings should consider about energy-saving.

From 2006 to 2010, 0.101 billion ton coals should be saved in construction, that is to say 0.4 billion ton  $CO_2$  will be cut down. The total area of energy-saving construction will be over 2.16 billion  $m^2$ , among them the area of new-built buildings will be 1.6 billion  $m^2$  while the area of reconstruction buildings will be 0.56 billion  $m^2$ .

To achieve the goal, some measures should be taken as follows.

- (1) All the new-built buildings should be designed as 50% energy conservation.
- (2) The reconstruction buildings, especially the public buildings should be energy-saving. There are about 40 billion m<sup>2</sup> completion construction and among them 13 billion m<sup>2</sup> are going to be altered as energy-saving buildings.
- (3) Renewable energy should be used in the construction.
- (4) Some compulsory rules and laws should be carried out by government.

As timber structures are good at energy-saving and the usage of renewable resource, they have little influence on environment. Modern timber structures are very young in China and they are very potential.

## **5 The feasibility of timber structures' promotion**

### **5.1 Supports of policies**

With the entrance of World Trade Organization and Asia Pacific Economic Cooperation, Chinese government takes a series of policies to reduce the customs duties on the wood products to meet the demand of the market. The customs duties on log and lumber were free from Jan. 1999, which cause the expansion of import of logs and lumbers and the amount was over 10 million m<sup>3</sup> by the end of 1999.

### **5.2 The improvement of codes**

The applicable codes are Code for Design of Timber Structures GB 50005-2003, Code for Construction Quality Acceptance of Timber Structures GB 50206-2002, Standard for Methods Testing of Timber Structures GB/T 50329-2002 and Technical Code for Partitions with Timber Framework GB/T 50361-2005.

Along with the new products and the new structures, some new codes and standards will be carried out. A complete code system will offer an good environment for timber structures to develop in China.

### **5.3 Development of Chinese forestry and the close international trade relationship**

Except for Russian, Brazil, Canada and USA forest area of China is the 5th in the world, among which the area of man-made forest is the largest in the world. Our forest products have developed a lot in recent years and the output value of forest products in 2005 has reached to 726.9 billion Yuan. Modern management of forest will be introduced and the relationship between nature and economy will be balanced well.

During the process of Chinese forest development, more and more international cooperation are taken in. In recent years, the foreign trade of forest products develops quickly. The gross amount has been over 30 billion dollars. There is a good prospect for Chinese forest market.

### **5.4 Education of timber structures**

Now some of the universities have opened courses for timber structures. In the postgraduate, some students are doing research work for timber structures. More and more people begin to know timber structures and to realize the benefits of wood products.

Many famous companies and international organizations also offer lectures and train for timber structures, from which a lot of new technologies and information can be transferred into China. Professional designers are expected to promote timber structures in China.

## 5.5 Research work about timber structures

Some universities and institutes have begun to research in timber structures. For example, Tongji University research in the earthquake-resistance performance of timber structures, Harbin Institute of Technology research in structural design and National Institute of Forest Products research in performance of timber products and the evaluation of timber housing performance.

Research work of structural design, connection, materials, termite proof, corrosion, fire resistance and durability should be done at first. Correspondingly the codes and evaluation measures for structural design, material strength and engineering products should be issued. All the research work is based on cooperation and coordination of the universities and institutes.

## 5.6 International promotion

Chinese market is potential and attractive, so many international companies and organizations want to promote timber structures in China. They offer the related technologies and skills.

For example, Canada Wood had been cooperated with National Construction section and Shanghai Construction Management Section in the past several years. They helped to establish the codes and standards, introduced the engineering products and corresponding technologies into China. They offer the recent information about international timber market to the contractors, designers and engineers. They also offer some free train to help people know timber structures.

On the other hand, Canada Wood also cooperates with National Institute of Forest Products. They offer a demonstration timber house to show timber products and the advantages of timber structures to public. This project cost more than 275,000 Yuan. This house is also used as a testing base to test the performance of timber structures.

There are some other international companies and organizations help to promote timber structures in China, they also bring a lot of new technologies and investments.

## 6 Conclusion

Wood constructions are good at energy-saving and environment protection. Wood buildings are very popular in Europe, USA and Japan. Especially in North America, forest resource is abundant and more than 90% of the housing buildings are wood structures. Modern timber structures are newly introduced into China, they will be more and more popular for their obvious advantages. Of course, to promote timber structures in Chinese market a lot of research work should be done. It is convinced that timber structures will develop well in China.