

# Japanese Experiences on Seismic Performance of Historic and Traditional Wooden Buildings

H. Sazanami

## I. Introduction

This paper is intended to introduce Japanese experiences on historic and traditional wooden buildings in relation to conservation and reuse in downtown Kyoto on the one hand and restoration and reconstruction after the Hanshin – Awaji Earthquake.

Today, issues and problems of historic and traditional wooden buildings should be studied in their physical, socio-economic and environmental aspects. It is also quite important to examine institutional issues in both public and private sectors; under globalisation and localization, life and business styles are changing rapidly. In this connection, traditional vs. modern construction is a quite interesting topic.

I discuss issues from an urban planning point of view. Since the Hanshin – Awaji Earthquake in January 1995, urban planning concepts and procedures have changed dramatically. I would like to explain some of these changes through two topics:

- a. Kyoto Townhouse Renaissance Plan.
- b. Lessons from the Hanshin - Awaji Earthquake for Historic and Traditional Wooden Building Restoration.

## II. Kyoto Townhouse Renaissance Plan

Kyoto Townhouses have been gradually constructed since the 18th century and various kinds of house types in each cultural and socio-economic epoch exist in the historic downtown. The crucial issue here is how “tradition” and “modernization” can coexist in the changing life and business styles of today.

According to a survey conducted by the Kyoto City Government in 1999, townhouses in the old downtown area occupy 45% of all building lots in the area. Of these, 76% have a lot size of less than 149 m<sup>2</sup>, and over 1/3 of them contain small factories. The ratio of aged residents is increasing in the district of townhouses. Around 70% of residents expressed their desire to continue habitation there. Most of them have repaired and maintained their houses by themselves.

Based on this survey, the following issues related to conservation and reuse of traditional wooden townhouses should be tackled:

- i. The value of townhouses should be widely recognized and an organization should be set up to deal with issues and problems of residents,
- ii. On the physical side; an information network should be built up in order to repair townhouses smoothly. An improvement should be made in the living performance of townhouse, especially in relation to disaster prevention and aged residents,

- iii. In relation to urban development, residents should take the initiative to support conservation and reuse of Kyoto Townhouses. New type of facilities should be built to sustain and promote Kyoto Townhouses. These facilities should have functions to execute various kinds of activities related to Kyoto Townhouses.

In May, 2000, the Department of City Planning, Kyoto City Governments announced a "Kyoto Townhouse Renaissance Plan", which aims at promoting the conservation and reuse of the traditional wooden houses in downtown Kyoto, where there are around 28,000 units symbolizing the history and culture of Kyoto.

The following 21 action plans are presented in the Plan, which is the output of three years research and study.

If this Action Plan 21 is positively implemented through public and private partnership, traditional residential quarters in the inner city will be greatly regenerated and revitalized. It will also have a significant impact on movements of conservation and modernization of historic cities and traditional towns in Japan and East Asian countries where still possess a large number of traditional wooden houses.

#### Action Plan 21 for Kyoto Townhouse

1. Establishment of a network to promote information sending and exchange on life and value of Kyoto townhouses.
2. Set up a service unit to respond to various issues and problems related to Kyoto townhouse.
3. Better arrangement for proper lease of Kyoto townhouse.
4. Provision to smooth repair work and improvement of repair work contracts.
5. Promotion to develop building materials and construction method suitable for Kyoto townhouses.
6. Dissemination of various kinds of information on restoration of Kyoto townhouses through experimental work.
7. Promotion of restoration through public loan system.
8. Promotion of earthquake-resistant restoration.
9. Study of measures to make construction work possible for sustaining and conserving Kyoto townhouses.
10. Support for conservation and reuse of Kyoto townhouses through official designation as historic design and building.
11. Examinations of detailed surveys of Kyoto townhouse for the purpose of registering them as cultural property.
12. Examinations of establishing Kyoto townhouse.
13. Promotion of urban development at community level.
14. Examination of development measures at district level and policies for conservation and reuse of downtown landscape.
15. Promotion of disaster prevention activities.
16. Examination of conservation and reuse measures for Kyoto townhouses in housing policy.

17. Promotion of reusing cul-de-sacs.
18. Promotion of townhouse type apartments.
19. Revitalization and development of traditional industries.
20. Promotion of urban tourism.
21. Examination of using Kyoto townhouses to new business and commercial promotion activities.

### III. Historic and Traditional Wooden Building Restoration, Lessons from the Hanshin – Awaji Earthquake

The historic and traditional wooden buildings in the Hanshin and Awaji Regions were destroyed or damaged by two great earthquake on January 17, 1995. Especially in the Hanshin Region, the valuable building heritages in Japan such as western style mansions in Kobe, sake storehouses in Nara and Magnificent mansions in Ashiya, which were built in the late 19 century and the early 20 century, were severely damaged. It was urgently needed to get damage information on these historic buildings. However, the central and local governments had to cope with enormous life relief works for the emergency period and had no time to spend other activities including damage survey of historic buildings.

Under these circumstances, technical staff of the central and local government agencies concerned with conservation of the cultural heritage started the survey of specific historic buildings designated by the central and prefectural governments one week after the earthquake. On the other hand, members of the Architectural Institute of Japan (AIJ) working in the historic building study have been doing a damage survey since February, 1955. Most of these buildings were undesignated ones. Out of 1260 units surveyed by AIJ team, buildings of wooden frame structure were 945 units; totally collapsed - 138 units, severally damaged – 88 units, partially damaged – 198 units, tilted – 55 units, lightly damaged – 261 units, no damage – 203 units, and under demolition and repair –2 units. These data shows that, totally collapsed and severely historic wooden buildings were about one quarter of the total wooden buildings

Regarding the Hanshin - Awaji Earthquake Reconstruction Work, a lot of timber buildings including traditional ones were demolished. There are two major reasons, (i) property owners wanted to modernise and attain a more comfortable and pleasant daily life; (ii) the government measures for debris disposal. At that time, property owners had not much time to make a cost/benefit comparison between demolition and repair of their properties. It was announced that costs of demolition and disposal of damaged buildings would be borne by public bodies but financial assistance for repair work by the government was not settled. The building owners, therefore, preferred demolition of their damaged buildings.

Later, the Earthquake Disaster Restoration Subsidy for the Hanshin – Awaji Earthquake Disaster was provided, with an upper limit of JPY 5,000,000 per unit for a privately owned traditional buildings. According to the financial report on this

programme, about 30% of the total building owners got 50% of the subsidy, while about 50% of owners got 40% of the subsidy. For the traditional temples and shrines, around 50% of the total number got a 50% subsidy.

These subsidies are quite high and it was pointed out that there is a great need to set up a formula on how to calculate construction costs for both new construction and repair of existing ones.

In Japan, a lot of old wooden buildings withstood big earthquakes over the past several hundred years. However, there is a great need to upgrade and strengthen countermeasures against natural disasters, for example, risk management on traditional timber buildings should be thoroughly examined by both public and private sectors and effective systems should be established by organizations and groups concerned with disaster preparedness and reduction.

It is quite useful to make a periodic check on the traditional building structure by professionals; the rotten parts of timbers are easily checked through such investigation. It is also quite important to record detailed information on a repair work, including building materials and constructions techniques of various kinds of workers.

It is well known that a manual or guideline for earthquake-safe traditional construction should be made by each country. However, it is often found that in some countries, responsible central and local governments, private companies, etc. did not pay serious attention to these instructions and can not respond effectively to earthquake disasters. We found similar situations in Japan in the case of Hanshin - Awaji Earthquake, thus the lessons of the past earthquake disaster have not served us effectively so far.

#### IV. Conclusion

In the last 30 years, the system of mass production and mass construction representing the industrial society has changed into a proper production and consumption system of the newly emerging society. The concept of scrap and build is being replaced by “conserve and reuse”.

It is quite true that many existing buildings can be made significantly safer with simple forms of strengthening. A lot of excellent techniques have been developed in the traditional building construction. The issue is how to revitalize these techniques.

It was rather difficult to mobilize community residents and the general public into a movement to conserve the traditional buildings in Japan. However, NPO activities are becoming quite active in the conservation of traditional houses and buildings. Instead of top-down, the bottom-up approach of NPOs is expanding over many cities and towns, and various kinds of citizen groups are working to revitalize historic and traditional inner city areas. Their efforts are accelerated by wider and better communications networks.

It is strongly emphasized that the disclosure of information and NPO participation in disaster rehabilitation and reconstruction are greatly needed. Especially in parallel with IT development, more detailed and concrete information is becoming available to public and private organizations. Still more information should be collected and disclosed by both the public and private sectors for traditional wooden buildings.

There are two main issues, one related to individual traditional buildings and other to group buildings. Issues of group traditional buildings in particular, should be dealt with closely through urban planning and design. SAFRANBOLU, a city of the World Cultural Heritage in Turkey, provides a good example.

In this connection, it is essential to promote international collaboration and cooperation on the issues discussed at the Conference. Through the exchange of detailed and substantial information, we can learn quite a lot on various issues and countermeasures in our professional and related fields. It is strongly recommended to set up an international network for the conservation and protection of historic and traditional settlements.