STUDY ON WOODEN TEMPORARY HOUSES SUPPLIED BY LOCAL BUILDERS AFTER THE TOHOKU EARTHQUAKE

Shiro Watanabe 1, Hideaki Sumikura 2 and Kaori Fujita 3

ABSTRACT: This paper demonstrates how wooden temporary houses were produced after the Tohoku Earthquake 2011 and work in their habitability and sustainability. We clarified differences of supply systems of temporary houses between this event and the Kobe Earthquake in 1995, and pointed out that the local home builders made a substantial contribution in providing wooden temporary houses. We then conducted case studies of wooden temporary houses of local builders and found out that some local builders applied original techniques using local timber, although major home builder used only prefabricated constructions. Based on analysis of technical characteristics of each project, wooden houses of local builders can provide better habitability and sustainability than prefabricated houses.

KEYWORDS: The Tohoku Earthquake, Wooden temporary house, Local timber, Local builder

1 INTRODUCTION

In the afternoon of March 11, 2011, an earthquake struck Tohoku area in Japan. Due to destructive shaking and massive tsunami, more than 15,000 lives were taken over and 106,446 buildings totally collapsed in Tohoku area [1]. The Japanese government had to resettle more than 250,000 people and requested JFHO (Japan Federation of Housing Organization) to ensure tens of thousands units as early as possible. The federation designated JPCA (Japan Prefabricated Construction Suppliers and Manufacturers Association) as the main supplier of prefabricated temporary houses. But the number of the units JPCA could supply proved insufficient. Thus, wooden temporary houses were supplied by local home builders as a complementary supply approach. This study aims to demonstrated how wooden temporary houses were produced after the Tohoku Earthquake 2011 and work in their habitability and sustainability

2 METHODOLOGIES

We conducted following survey: 1) reference of the literatures relevant to the Kobe earthquake and the statistical data on casualties and temporary houses published by the prefectural governments or the governmental organizations after the Tohoku earthquake and 2) field surveys including interviews with local builders involved in the construction of temporary houses and technical observations of the temporary houses build by the builders

3 SUPPLY SYSTEM OF TEMPORARY HOUSES IN CASE OF DISASTERS

3.1 The main supplier, JPCA

JPCA has been a main supplier responsible for providing temporary shelters for early recovery from natural disasters in Japan. The association consists of 16 home builders which supply prefabricated buildings, and has their own storages and distribution routes for prefabricated shelters. Each prefecture makes an alignment with the association so that in case of disaster the association can make a quick response to requests for temporary houses from prefectures.

3.2 Comparison of supply systems of temporary houses

Figure 1 shows supply system of temporary houses in the Kobe earthquake and the Tohoku earthquake. In both cases, JPCA served as the main supplier, but some differences were found out. In the Kobe earthquake, major home builders undertook construction operations from JPCA and Housing Corp. Thus, 95.3% of all units were prefabricated buildings built by major builders [2, 3], whereas 84.5% in Tohoku [4-6, 8]. It means small builders made more contribution to supplying than Kobe, building 15.5% of all units. The local builders supplying the shelters in the Tohoku can be divided into following three groups according to who requested or ordered the builders [7].

(a) Local builders assigned by JFHO
(b) Local builders publicly-recruited by the prefecture
(c) Local builders ordered by the municipality

In Iwate, Miyagi and Fukushima, less than 50 units were provided by local builders of group (a) [8]. As for group
(b) Iwate and Fukushima conducted an open recruitment of local builders in order to compensate the deficit units but also activate the local industries. Sumita town in Iwate ordered 93 units to a local construction company that is third sector. This builder is included in group (c).

KOBE EQ, 1995 (Hyogo)

TOHOKU EQ, 2011 (Miyagi, Iwate, Fukushima)

Figure 1: Supply systems of temporary houses in the Kobe earthquake and the Tohoku earthquake (source: Kobe [2,3], Tohoku[4-8])

4 CASE STUDY OF WOODEN TEMPORARY HOUSES

So many local builders participated in the constructions of temporary houses after the Tohoku earthquake. And local home builders are characterized by building wooden houses to which original techniques are applied. The most of temporary houses built by local builders were built of wooden post and beam construction.

Figure 2 shows wooden row houses by post and beam construction built in parallel in Iwate. The supplier was a local builder assigned by JFHO. Local cedar is used in not only structure but also sidings and fitting frames.

Figure 3 shows that wooden detached houses in a row in Iwate. These houses were ordered by municipality, Sumita town. What is observed characteristically is separation of each unit. This planning could preserve much more privacy than typical one of row houses like in Figure 2. These two types of the houses have gable roof in common that provides more relaxing space.

Figure 4 shows temporary houses with log cabin structure supplied by the affiliate local builders of Japan Log House Association. The builders had been recruited publicly by Fukushima prefecture. Most wooden members will be reused after demolition. In this way, the project focused on sustainable utilization.

5 CONCLUSION

Since more local builders participated in supply system of temporary houses than in the Kobe Earthquake, with richer diversity of techniques and constructions using local timber were supplied. The wooden temporary houses can be superior to prefabricated houses in habitability and sustainability. Utilization of local timber and builders should be institutionalized in policies for disaster mitigation as well as prefabricated temporary houses built by major builders.

Figure 2: Wooden row temporary houses by post and beam construction, Iwate (Photo by Hideaki Sumikura)

Figure 3: Wooden detached temporary houses by post and beam construction, Iwate (Photo by Shiro Watanabe)

Figure 4: Log cabin houses, Fukushima (Source: [9])

ACKNOWLEDGEMENT

The authors extend our thanks to all of the involved in this accomplishment, particularly Researcher Yongsun Kim and the graduate students from the University of Tokyo for great assistance of the field survey in Iwate.

REFERENCES