GUIDELINES FOR DESIGN OF TEMPORARY SHELTERS AFTER EARTHQUAKES BASED ON COMMUNITY PARTICIPATION

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ABSTRACT :

Of the three kinds of shelters required after the occurrence of a destructive earthquake in a populated area, namely emergency shelters, temporary shelters, and permanent shelters, architectural design of the 2nd group is problematic. In fact, temporary shelters do not need to follow the permanent housing standards on the one hand, since they are not permanent and should be demolished after a year or so, but on the other hand, they should provide the residents with some minimum living standards requirements, of which some are exactly same as the permanent housing. Therefore, architectural design of temporary shelters needs special attention. In this paper some guidelines are proposed for design of temporary shelters form architectural, and to some extent, urban design points of view. The type of spatial setting (linear, central, and hybrid) of shelters, the situation of neighboring textures (regarding the orientation and form considerations), and access ways are among the issues which are discussed. Other issues which are taken into consideration are: type of materials, internal setting of spaces by consideration of behavioral patterns of the stricken community, the location of open areas, and the users expectations. Two major issues in the proposed guidelines are firstly, the community participation, by which some ownership feeling can be created in the stricken people, and secondly, the possibility of changing the temporary shelter to the permanent housing or working space by some simple changes. This last issue needs creative and innovative architectural and structural designs which are also discussed to some extent.

KEYWORDS: Shelter Type, Stricken People, Spatial Setting, Architectural Design

1. INTRODUCTION

After the occurrence of a destructive earthquake in a populated area usually three kinds of shelters are required: 1) emergency shelters, which are mostly some kind of tents, 2) temporary shelters, which are usually constructed for 1 to 2 years, and 3) permanent shelters or housing. For the 1st type there is not much problem to be discussed from architectural design point of view, as they are just for a few weeks, and for the 3rd kind there are several standards in different countries that are continuously in use. However, for the 2nd type there are several problem to be discussed from architectural and urban design points of view, since on the one hand they are not permanent and do not need to follow the permanent housing standards, and on the other hand, they should provide the residents with some minimum living standards requirements, of which some are exactly same as the permanent housing. Therefore, design of temporary shelters, including their architectural design, needs special attention.

Several researchers have studied on the features of temporary shelters since early 90s. Bolin and Stanford (1991) have on the shelter, housing and recovery in U.S. disasters. In that study, the authors examine the issues associated with the temporary sheltering and housing of victims after natural disasters in the United States. Specific topics addressed include differential access to shelter and housing aid according to social class; ethnicity and related demographic factors; the relation between post-disaster shelter and housing and

long-term recovery; the role of social support networks in the sheltering of victims; and the implications of the research for the provision of shelter and housing aid after disasters. The Oct. 17, 1989, Loma Prieta, California earthquake is one of the disasters studied.

Greene and Schulz (1993) have worked on the lessons learned from the Loma Prieta earthquake with regard to emergency shelter and housing issues. Expressing that recent disasters and the changing socioeconomic context of our urban communities demand a reassessment of how we define and plan for post-earthquake shelter and housing, they have claimed that providing shelter and housing after the Loma Prieta earthquake in California raised important questions that must be addressed and that will certainly have implications for other major earthquakes in the United States. They have discussed the major issues in the context of three separate, but interrelated phases of post-earthquake housing: (1) Emergency shelter; (2) Temporary housing; and (3) Permanent or replacement housing. They have notified that the experiences of local jurisdictions in California have prompted many who provide emergency housing to evaluate how the process can be improved. They have also discussed implications for the Central and Eastern United States.

Phillips (Mar. 1993) have worked on cultural diversity in disasters and its effects on sheltering, housing, and long term recovery. Mentioning that demographic shifts have put minority groups and the poor at greater risk to disaster during the last decade, and that problems of sheltering and housing for these groups occurred following the 1989 Loma Prieta earthquake in Watsonville, California, he has claimed that to mitigate future problems, disaster planners must identify various ethnic groups and other groups in a community, diversity must be built into the disaster response during the planning stage, and researchers should continue and expand work related to diversity and disaster.

Bolin, R. C.; Stanford, L. M. (1993) have studied the emergency sheltering and housing of earthquake victims for the case of Santa Cruz County. That report examines selected issues such as the provision of emergency shelter, temporary shelter, and temporary housing for a large population of victims in Santa Cruz County after the earthquake. The focus of that work is on the special shelter and housing problems of ethnically diverse victims who are marginalized by demographic and socioeconomic factors. The report concludes with a series of recommendations.

Hakan and Alper (1998) have studied the evaluation of community participation in housing reconstruction projects after Duzce earthquake. That paper examines the housing reconstruction process carried out in Duzce city that was heavily damaged by the Marmara Earthquake of 17 August 1999 and latterly Duzce Earthquake on November 12 1999. They have summarized the Priority of the Turkish government as: firstly, physical reconstruction by means of reconstructing or improving the existing infrastructure and superstructure of the city as soon as possible and secondly, construction of houses for house owners only. They have claimed that the social and psychological situation of the affected population seemed not to be clearly considered in all reconstruction phases. In that study the problem of sheltering and housing after the disaster is determined and evaluated from emergency shelter to temporary housing and permanent housing in case of Duzce. For this purpose, primarily interviews were made with the administrators. Latterly questionnaires were conducted to determine users' expectation level about the shelters, housing units and their environment. They have analyzed permanent housing projects comparatively according to the community participation level, and have studied post disaster housing implementations in a relatively broad view including social, psychological and environmental variables. That study aims to assist design and planning guidelines for future housing project implementations.

Comerio (2000) have worked on the expenditures for housing by comparing the costs of temporary shelter and rebuilding in Northridge and Kobe. Mentioning that the 1995 Hanshin-Awaji, Japan, and the 1994 Northridge, California, earthquakes both had significant impacts on housing, and expressing that in the immediate aftermath of any disaster, sheltering the victims is one of the great challenges posed to government officials, she has claimed that in the long term, financing the reconstruction of public and private sector housing poses other challenges for governments and financial institutions. She believes that after several years, it is useful to examine public expenditures for temporary and long-term housing to ask what can be done to improve or expedite the delivery of housing and how such goals can be achieved with limited public resources.

Lee, Wei Ting (2000) has studied the psychological rehabilitation process of 921 earthquake victims in a temporary shelter. That study is based on a clinical psychologist's works in a temporary shelter with victims of the 1999 Chi-Chi, Taiwan, earthquake. Three themes have been discussed: the worlds of the victims, the reflections of the psychologist, and the victim-psychologist relation. The findings and reflections in the rehabilitation process have been described, and the procedure and meaning of "post-traumatic psychological rehabilitation" have been reconsidered.

Finally, Hosseini and his colleagues (2008) have discussed the lessons learnt from shelter actions and reconstruction of Bam after the destructive earthquake of December 26, 2003. They have considered the issues of temporary shelters and reconstruction from three points of view: 1) Government involvement, 2) Community contribution, and 3) International community participation, and have investigated the role of management in coordination of activities of all sectors contributing in temporary actions as well as reconstruction activities and have discussed its weakness and strengths. In that study the development of temporary and permanent shelters has been addressed in various aspects. The first is the technical aspect to find out how appropriate the shelters have been reconstructed to resist the future earthquakes. The second aspect deals with the social and cultural characteristics of the city and its people, and the degree that the architectural features could match the local culture in the recovered area. Issues such as adaptability of people with the new situation and their resilience have been also discussed. The last aspect is with regard to economical issues and how they have influenced the livelihoods of affected people. At the end, based on the lessons learnt, some recommendations have been made which are believed to be useful for preparing the plans for the shelter actions as well as the reconstruction process for future similar cases.

It is seen that although several studies have been performed with regard to temporary shelters, very few cases have discussed the issue form architectural and urban design point of view. In this paper some guidelines are proposed for design of temporary shelters form architectural, and to some extent, urban design points of view. The type of spatial setting (linear, central, and hybrid) of shelters, the situation of neighboring textures (regarding the orientation and form considerations), and access ways are among the issues which are discussed. Other issues which are taken into consideration are: type of materials, internal setting of spaces by consideration of behavioral patterns of the stricken community, the location of open areas, and the users expectations. Two major issues in the proposed guidelines are firstly, the community participation, by which some ownership feeling can be created in the stricken people, and secondly, the possibility of changing the temporary shelter to the permanent housing or working space by some simple changed. This last issue needs creative and innovative architectural and structural designs which will be discussed as well.

2. SITE SELECTION CRITERIA FOR TEMPORARY SHELTERS

To select an appropriate site for temporary shelters several criteria has been suggested by various scholars (OCHA, 1995; Bologna, 1997a and 1997b; Bahrami Movini et al., 2004; Hosseini et al., 2006). These criteria can be summarized as:

1. Number of refugees
2. Functionality of the site
3. Infrastructures available at the site
4. Configuration of the site
5. Accessibility

There are some issues with regard to each of the above criteria which are explained hereinafter briefly.

2.1. Number of refugees

With regard to number of refugees two main issues should be considered which are number of people in different settlement groups, or the aggregation, and the maximum capacity of each complex. Bologna (1997a) has suggested three numbers of 100, 250, and 400 as appropriate one for the maximum number of people in settlement groups, depending on the situation of the stricken city, the total number of homeless people, the

number of aid workers and their capabilities, situation of aid resources, and other criteria which are discussed in the next sections.

2.2. Functionality

Relatively high efficiency, minimum adverse interaction with other components of the city with various functions, and existence of open areas for required development are the issues which should be considered with regard to functionality of the site.

2.3. Infrastructures

Water and wastewater systems, energy supply system, surface water drainage system, and communication system are the issues related to the infrastructures. Parks and other public green areas, malls, stadiums, and parking lots are potentially good places, which usually have enough infrastructures. Camping areas which are usually provided with required out-lets and in-lets of urban utilities are the best place for temporary shelters.

2.4. Configuration

With regard to the site configuration the land geometry, ground slope, and orientation should be taken into consideration. In the case of limited spaces for temporary shelters the architectural design roles will be much important to make the best use of the limited available area.

2.5. Accessibility

Closeness to the main highways or avenues, as well as closeness to the essential facilities, like hospitals, are important issues with regard to accessibility. Other important issues in this regard are the width of access ways, and the traffic current in the aftermath of earthquake.

3. SYSTEMS OF TEMPORARY SHELTERS

Based on a demand and capacity logic the temporary shelters system can be divided into three sub-systems as follow:

- Temporary housing
- Temporary social elements
- Temporary common services or facilities

Each of the above sub-systems has its specific spatial unit(s), and these units can be of three private, semi-private, and public type. It is suggested that these units are planned based on the following measures:

- Providing a minimum level of comfort and welfare
- Providing the mental support for refugees
- Following the standards for various functions of spaces
- Organizing the spaces based on their pre-planned functions
- Taking into consideration the local and environmental factors
- Considering multi-functioning for some spaces, if possible
- Creating the tendency of returning back to permanent residence
- Considering the sustainable development principles

Using the experiences gained form the past earthquakes as well as “post occupancy evaluation” are very helpful for meeting the above measures.

4. SMALL RESIDENTIAL UNITS IN TEMPORARY SHELTERS

The most important spatial unit in any settlement is the residential unit, which dictates the setting of other units. Various kind of residential units can be considered based on the available space, as follow:

1. Limited space or Housing Model (H.M)
2. Relational spaces, which include the Entrance (En), the External Area (E.A), Service Area (S.A),

Storage Area (St.A)

3. Complementary spaces, which include Neighborhood Units (N.U), Parking, Green Area (G.A), and Road Network (R.N).

A sample of small residential units and complementary space is shown in Figure 1.

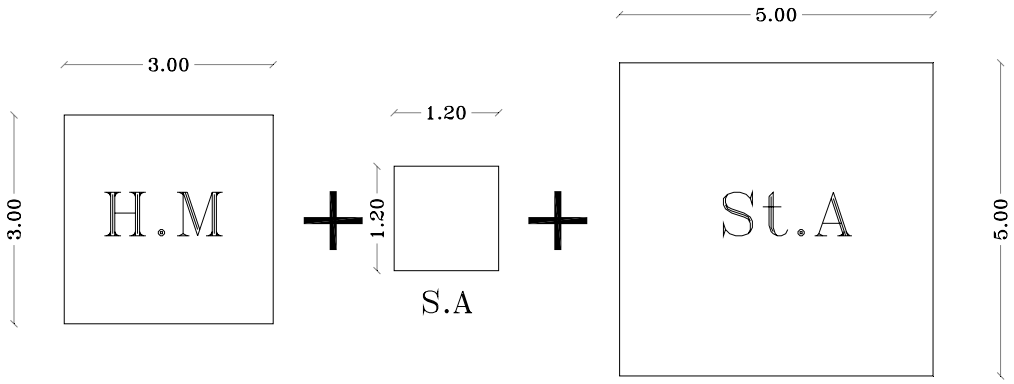

Figure 1. A model of small residential units and complementary spaces

Three various settings can be considered for residential units:

1. Linear system
2. Linear-central system
3. Central system

The above settlement systems are briefly explained in the following sections.

4.1. Linear Settlement Model

In this model the houses are located in two or more parallel lines and the green area fills between these lines. The complementary area is located at one end, and the road network goes around the residential unit. A sample of this model is shown in Figure 1.

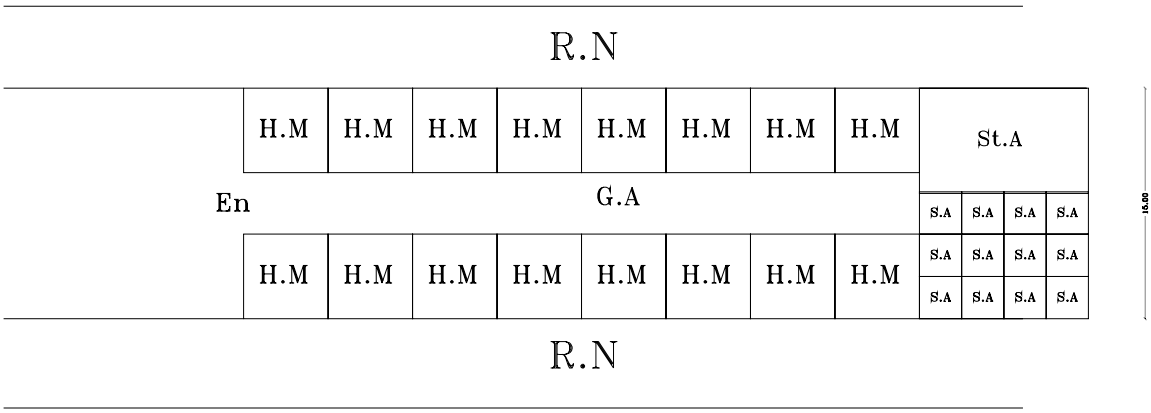

Figure 2. A sample of linear settlement model

4.2. Central Settlement Model

In this model houses are located as a ring around a large central green area, and can if necessary the houses can be developed as co-centered rings. A sample of this model is shown in Figure 3.

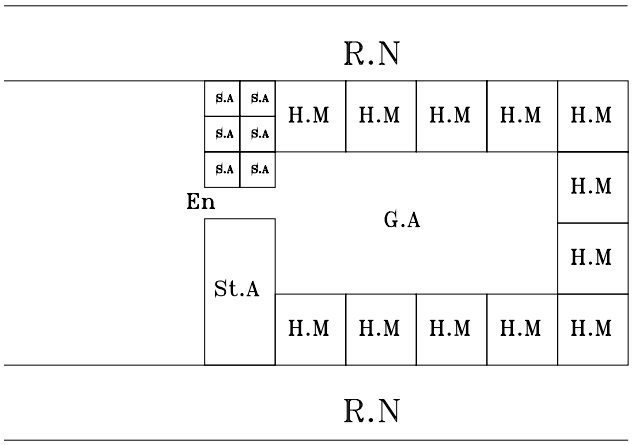

Figure 3. A sample of central settlement model

4.3. Linear-Central Settlement Model

This model, as it can be realized from its name, is a combination of the two linear and central models. Usually when there is limitation of space this model can better fit the available space. A sample of this model is shown in Figure 4.

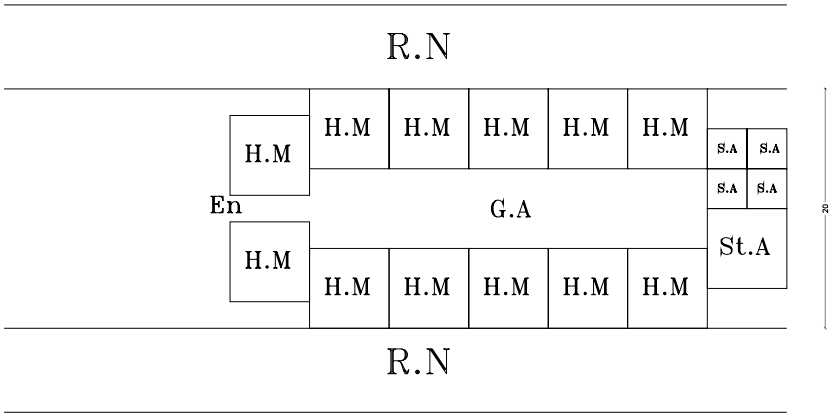

Figure 4. A sample of linear-central settlement model

5. PLANNING THE TEMPORARY SHELTERS

Selection of settlement model is dependent on land conditions, climate, and other affecting factors, mentioned in the previous sections. However, the very important factor which should not be overseen is the will of the people, and their contribution in planning process. Whenever, the will of people has not been considered in a proper manner, they have abandoned the provided temporary shelters and have tried to build their permanent residences with the minimum possible facilities and available materials, or, if it has been not possible or them to reconstruct their permanent residences they have preferred to migrate to other nearby cities. Just if they have had no other choice they have tolerated the temporary shelters.

It has happened in many past earthquake that the people of different cultures, backgrounds and life styles, and even different ethnicities have had to live together in one complex, and this have resulted in dissatisfaction of various groups. People with urban background, which had used to live near their working places, have had to utilize the transportation system much more than before. Also people with rural background, which had used to live near their farms, have gotten in trouble for reaching their farms. Another factor which may create dissatisfaction in the people is the mandatory stay in multi-family residences for the people who had used to live in single dwellings (Bektas, 1998; Hakan and Alper, 1998).

6. CONCLUSIONS

Based on the matters discussed in the previous sections it can be said that without community participation no temporary shelter program will be successful. The community participation not only results in decrease in the project costs, but also decrease the construction time. For attracting the community participation it is suggested that the following points are taken into consideration:

- Designing the houses based on the family size
- Considering some entertainment spaces with easy access in the complex
- Considering the cultural tendencies of various groups of people and creating some spaces to meet their cultural needs
- Paying attention to the tendency of the people to have easy access to the places of their permanent residences
- Considering various house architectural designs for the different tastes of people with difference lifestyles
- Trying to use the local materials if they can be used appropriate in earthquake resistant design, and if not trying to improve their characteristics
- Telling to people about the costs of temporary shelters of various styles

It is believed that the community participation is not only very important in successful construction of temporary shelters, this participation is also very helpful for mental and spiritual restoration of the stricken community.

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