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Prefabs as a shelter solution in the northern areas of Pakistan affected by October 08, 2005 earthquake

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Abstract

Earthquake is a natural disaster. Ill- designed and poor seismic resistance housing was the major cause of high death toll and severe destruction of physical infrastructure by the October 08, 2005 earthquake. After occurrence of this natural calamity, prefab were installed as a shelter solution in the Red Zone area of Balakot. Although prefabs are an established solution of shelter for earthquake affected areas, this solution needs a complete knowledge of social life and cultural values, as well as climatic features of the areas concerned. It is noted that most people in the Balakot Red Zone are not satisfied with these prefabs. A number of factors were found to be responsible for this: low quality of material used; non-professional and unskilled workmanship; unnecessary interference by the local government; minimum community participation; lack of security; cultural adaptability; climatic suitability.

1. Introduction

A disaster is an event concentrated in time and space, in which a society or one of its parts undergoes physical harm and social disruption, such that all or some essential functions of the society or part of it are impaired. Earthquakes are the most destructive short-term natural force on earth and have plagued civilizations for millennia.

The geographical area of Pakistan has experienced 139 natural calamities for the last eighty years, including floods, droughts, cyclones, land sliding; earthquakes etc. Indeed Pakistan is the fifth most sensitive nation of the world in term of earthquake. Seismic activity in Pakistan is mainly concentrated in the north- western region of the country, along the boundary of the Indian plate and the Iranian and Afghan microplates (UNDP, 2007).

The October 2005 earthquake was the most debilitating natural disaster in Pakistan's history. The Geological Survey's measurement of earthquake was 7.6 on Richter scale. The epicenter was 100 miles northeast of Islamabad. This earthquake caused more than 73,000 deaths, 125,000 severe injuries or disability, and more than 3.5 million people's homelessness, making it the 13th deadliest earthquake in recorded history. Balakot is a famous historical and tourist site of northern Pakistan having an altitude of 1200 m. This town consists of two portions of population separated by river Khunar, the old Balakot Graian Balakot and modern settlement Garlat Balakot. The whole tehsil was named after this historical town. According to 1998 census, the total population of the town was 23307 in which Balakot Graian had a population 11351 and Garlat 11956. As per the local governance mechanism, both settlements have separate union councils, i.e., UC Balakot and UC Garlat Balakot. Total population of the town, according to Ahmed (2006) was estimated to be 30,000 in 2005 before earthquake.

The town of Balakot, one of the hardest hit towns in the devastating earthquake that hit the area is no more present. It gives the look of the German city of Dresden after it was flattened by American and British bombers in February 1945.

This tragedy caused death toll of 2565 people in UC Balakot and UC Garlat Balakot in which the majority of deaths belong to the town area. All houses located in the town area were completely destroyed by the quake, these were 4209 residential units. Besides, 16 acres commercial areas (1500 shopes, 45 hotels and 400 rooms for visitors), three acres of educational area, two acres

Mosque area, eight acres public building area and three acres graveyard areas of the Balakot town were affected (NESPAK, 2006).

Immediately after the occurrence of this calamity, various national and international agencies conducted seismic studies of the area of Balakot including Chinese, Turkish and Norwegian agencies. National Engineering Services Pakistan (NESPAK) conducted five studies, i.e. Seismic Hazard Zoning, Microzonation (at town level), Landslide Studies, Geotechnical & Geophysical Studies and Instrumental Recording of Seismic Activity of the Balakot area (NESPAK, 2006).

Earthquake Reconstruction and Rehabilitation Authority (ERRA) and Provincial Earthquake Reconstruction & Rehabilitation Authority (PERRA) convened a special session at Mansehra on March 29, 2006. This session was briefed by the NESPAK that Balakot area has close proximity with epicenter and 78% of the town area lies on the two fault line which might cause future earthquakes. It was, therefore, recommended that the town area of old Balakot (Graian old settlement and Garlat new settlement) be declared RED ZONE area and prohibited for construction and related activities. Later on, the Government announced construction of New Balakot city for the Red Zone population of Balakot. The site of this proposed city is 18 km away from the old city; it will take three years for completion (Ahmed, 2006). It was unfortunate that ERRA and PERRA decided to relocate the specific area of Balakot Red Zone and prohibited all types of construction in the same area while they did not provide the provisional residential solution to the affected population. It was the major gap of ERRA construction policy pointed out by the stakeholders during the survey in the study area.

In the meantime, as a temporary shelter provision (till the construction and development of NBC), various organization started construction of prefabricated houses for the affected population of the Balakot (RZA). Among them, the Saudi Public Assistance for Pakistan Earthquake Victims (SPAPEV), Kuwait Joint Relief Committee (KJRC), National Engineering & Scientific Commission (NESCOM), United States-sponsored International Relief (IR) are the major organization in terms of quantity of prefabricated houses for the area.

2. Methodology

This study was focused on the assessment of prefabricated houses in respect of affected people's residential needs and their perception about them. Universe of the study is the Balakot Red Zone of the union council Balakot and union council Garlat Balakot which is collectively known as Balakot town. Four thousands affected household were decided to get prefabs; whereas twenty eight houses were completed and handed over to the owners till the completion of this study in the study area.

In the light of the objectives, a questionnaire was designed. The validity and reliability of the questionnaire was pre-tested on four respondents from the sample. These pre-tested respondents were included in the list of respondents. In order to collect reliable and valid information from the respondents, this pretested questionnaire was used for data collection. Though the language of the questionnaire was English and Urdu, for understanding and clarification of questions, local language (Hindko) was used to collect necessary and valid required information. Similarly, unstructured interviews of local government representatives and installing companies' personnel were conducted in the study area. Secondary data, like population reports, various studies on Balakot earthquake, and web resources were used for completion of this study.

3. Prefabricated houses

Prefabricated houses (also known Prefabs, Prefab houses or manufactured houses) are constructed inside a factory and transferred to required and desired place for installation. Prefabrication has a long history; it is claimed that the world oldest known engineered roadway, The Sweet Track constructed around 3800 BC, employed prefabricated timber.

Prefabricated home construction now references more modern design homes that have had sections produced off site. Now entire rooms and entire multi-floor homes can be manufactured to buyer's specifications off site and then be

shipped as per desire. More than half a century ago prefabs were thought a temporary solution to housing shortage but now they are not only a viable option, but also a wise choice, particularly in disaster prone areas. In the United States, the northeast has been the biggest adopter of prefabs. Since Hurricane Katrina, the south has also increased its number of prefabricated houses. Prefab houses have gained popularity as green alternatives to stick-built houses.

Prefabricated houses refer to several different types of building systems in which a home is partially or entirely constructed or assembled in factory, plant or yard. Prefabricated houses have great energy efficiency, produce less waste during the construction process, are considerably faster to build, and are built using techniques designed to promote their strength.

4. Results and Discussion

This portion represents the result of the analysis conducted in the light of objectives outlined for the study. A necessary discussion has also been added along with the finding at appropriate places.

4.1. Installing companies' contracts

There were four installing companies responsible for 4700 prefabricated houses in the study area. Among them, three were funded by SPAPEV and one was funded by KJRC. Three Prefabricated houses installing companies of SPAPEV were awarded contracts of 4000 prefabricated houses in 2006. Among them, Michigan Builders was awarded a contract of 1500 prefabricated houses in Union Council Garlat Balakot; United Business System was awarded contract of 1500 prefabricated houses, 1100 for UC Balakot and 400 for UC Garlat Balakot, and DynoShell was awarded a contract of 1000 prefabricated houses, 700 for UC Balakot and 300 for UC Garlat Balakot. KJRC awarded 700 prefabricated houses to Hi Tech Installing company.

4.2. Family size

Table 1 shows the size of the family members living in each prefabricated house. Every house has two rooms and one kitchen. The room size is 21 feet in length, 18 feet in width and 17 feet in height. Similarly, the kitchen is 17 feet in length, 6 feet in width and 17 feet in height. Intially, a washroom was not installed, later on, addition of a wash room was announced to every house, but actual work was not started till the conclusion of this study.

Table 1. Family size.

No of Family Members	No.	%age
up to - 02	23.00	19.17
03 - 04	55.00	45.83
05 - 06	40.00	33.33
07 - 08	2.00	1.67
All	120.00	100.00

Source: Field Survey

4.3. Provision criterion

Majority of affected people were not satisfied with the prefabricated provision criterion. As Table 2 shows, the reasons reporting sample respondents dissatisfaction on the prefabricated houses provision criterion. About 24% respondents reported that UC Nazim did not play the real role in public interest and left the constituencies on the mercy of ERRA and military establishment; both were not aware of the social and cultural situation of the study area. Another 22% respondents reasoned that prefabricated houses criterion had been entangled by the management of installing companies, they did not clear their position, people frequently visited them, and they did not bother to coordinate with the Local Government initially. It was also pointed out that field management of the installing companies was not capable.

Table 2. Reasons of dissatisfaction.

Reasons	No.	%age
UC Nazim's Role	22	23.91
Installing Companies		
Employees Negative Attitude	20	21.74
Lack of Planning	20	21.74
Heavy Documentation	12	13.04
Lack of Information	10	10.87
UC Secretary Interference	8	8.70
All	92	100.00

Source: Field Survey

About the same number i.e., 22% respondents pointed out that lack of planning of ERRA, Local Government, and Installing companies made disorder in prefabricated house grant criterion. SPAPEV did not monitor the operation effectively. On the other hand, 13% respondents reported that heavy and unnecessary documentation and frequent survey entangled the situation further. Some 11% respondents stated that lack of information and required community data at UC level created the problem which negatively affected the prefabricated houses provision criterion in the study area. About 9% of the respondents showed reservation on the role of secretaries of both the union councils, Union Council Garlat Balakot and Balakot. According to them; they interfered in the matters and created hurdles in the way of speedy and organized provision of prefabricated houses.

4.4. Quality of work

Fig. 1 indicates the sample respondents' satisfaction situation on the quality aspects of the work done by the three Installing Companies. A majority of the respondents (88%) were not satisfied with the quality and standard of the work done, and installation of the houses in both the union councils of Balakot.

Table 3 shows union council wise respondents' satisfaction on the quality of the work of the installing companies. About 89% respondents of the UC Garalat Balakot were not satisfied with the quality and standard of the work of the Installing companies, whereas 11% respondents were satisfied.

In the case of UC Balaokot, 87% respondents were not satisfied with the quality of the work of the Installing companies and 13% of the total respondents showed their satisfaction.

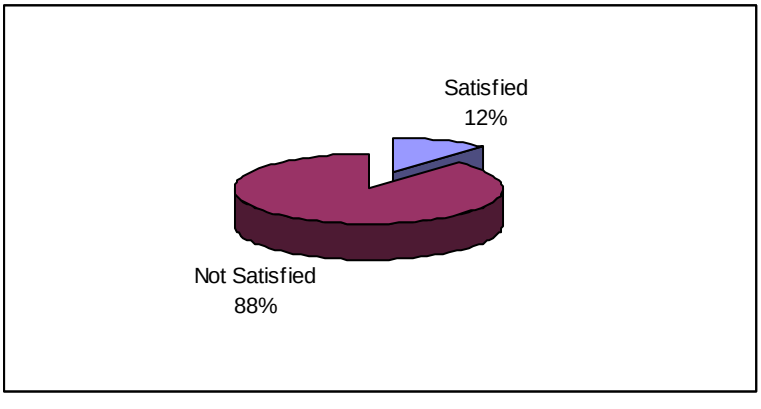
Table 3. Satisfaction on the quality of work.

Union Council / Sources	Total No.	Satisfaction on Work Quality			
		Yes	%	No	%
Garlat Balakot	90	10	11.11	80	88.89
Balakot	30	4	13.33	26	86.67
All	120	14	11.67	106	88.33

Source: Field Survey

4.4.1. Reasons of dissatisfaction on quality of work

Fig. 2 indicates the sample respondents reporting reasons of dissatisfaction on the quality of the work of installing companies. According to them, the companies used low quality and substandard material in construction and installation of prefabricated houses. About 47% of the total respondents had a complaint of low quality material used in them. Doors were not strengthened and windows lost the rotating mechanism. Installing companies used low quality of electrical items like switches, tube lights and boards; they were out of order soon.



Source: Field Survey

Fig. 1. Sample respondents showing satisfaction on the quality of working of installing companies.

Another 23% respondents were of the view that companies hired unskilled, non-professional, and cheap workforce, which had no previous experience and skill for installation of prefabricated houses; resultantly the job was not done properly by them. Some 21% unsatisfied respondents complained of the technically poor designing of the prefabs, resulting in trickling of water from the roofs during the rainy season.

5. Security perspectives of prefabricated houses

Fig. 3 shows the respondents' satisfaction situation on the security perspectives of prefabricated houses. Majority of the respondents (86%) were not satisfied with the security perspectives, but 14% of the respondents were satisfied in both the union councils.

5.1. Distribution on security perspectives

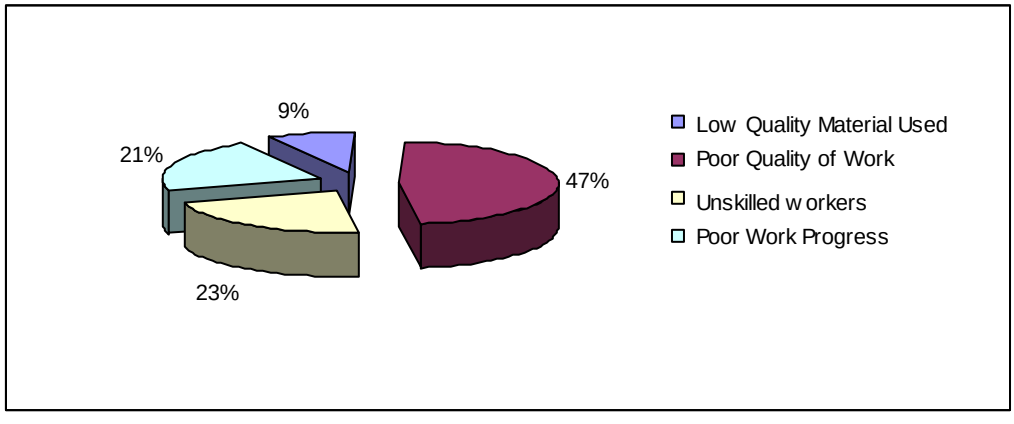
Table 4 shows the union council-wise distribution of sample respondents showing satisfaction on the security perspectives of the prefabricated houses. Majority of the respondents (87%) belong to the UC Garlat Balakot were not satisfied and 13% were satisfied with the security perspectives of these prefabricated.

Table 4. Security Perspectives of Prefabricated Houses.

Union Council / Sources	Total No.	Satisfaction on Security Perspectives			
		Yes	%	No	%
Garlat Balakot	90	12	13.33	78	86.67
Balakot	30	5	16.67	25	83.33
All	120	17	14.17	103	85.83

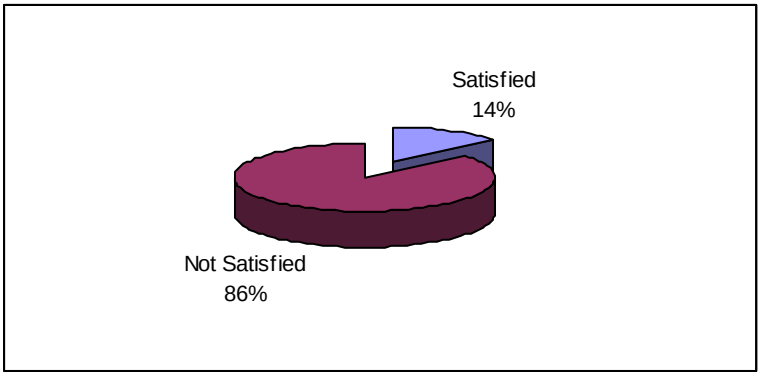
Sources: Field Survey

Similarly majority of the respondents 83% of UC Balakot were not satisfied and 17% were satisfied with the security of the prefabricated houses in the study area.



Source: Field Survey

Fig. 2. Sample responding reasons of dissatisfaction on the quality of work of installing companies.



Source: Field Survey

Fig. 3. Sample respondents showing satisfaction on the security perspectives of Prefab.

5.1.1. Reasons of dissatisfaction on security

Fig. 4 indicates respondents reporting reasons of dissatisfaction on security. Majority of the (49%) respondents were dissatisfied because of low quality locks which have no assurance of safety. Some times, the same key is applicable to more than one prefabricated houses. It results in loss of cash and kind in houses, which further instigated social conflicts.

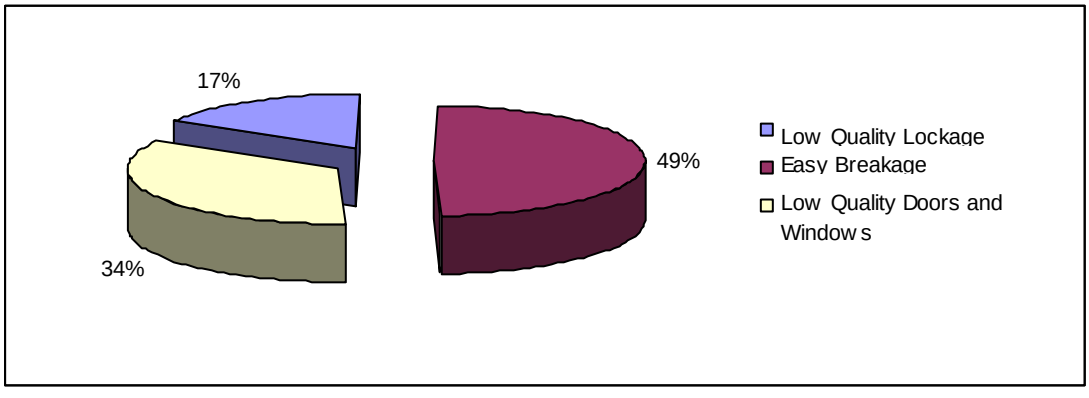
About 34% of the respondents were dissatisfied due to low quality doors and windows. Door locking system was not satisfactory and windows are open without having any grills, and, therefore, unsafe for the residents.

6. Cultural suitability of prefabricated houses

Fig. 5 shows the sample respondents reporting on the Suitability of prefabricated houses in terms of local cultural and ethical values. Majority of the respondents (92%) rejected them in terms of suitability to local culture and ethical values. whereas 8% of the total respondents were satisfied because of their location and scattering of the population as well as area of close relative or same caste in both the UCs of Balakot.

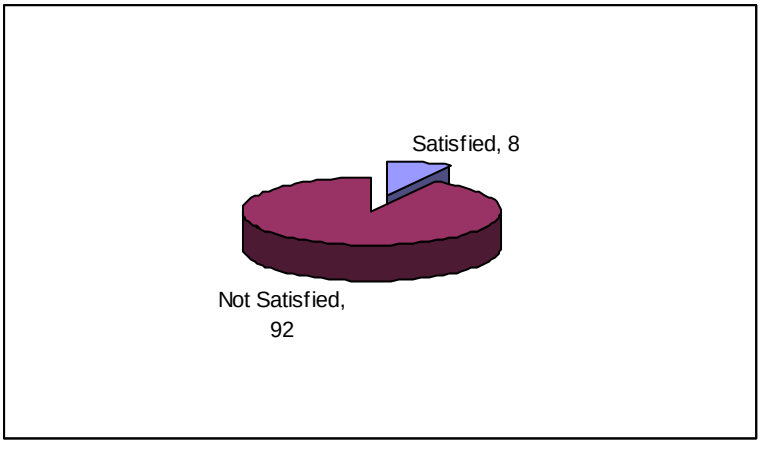
6.1. Reasons of unsuitability of prefabricated houses

Fig. 6 indicates respondents reporting the reasons of unsuitability of prefabricated houses in terms of local culture and ethical values. About half (50%) of the total respondents declared them unsuitable in terms of local culture and ethical values because there was no boundary wall; yard of prefabricated house is open.



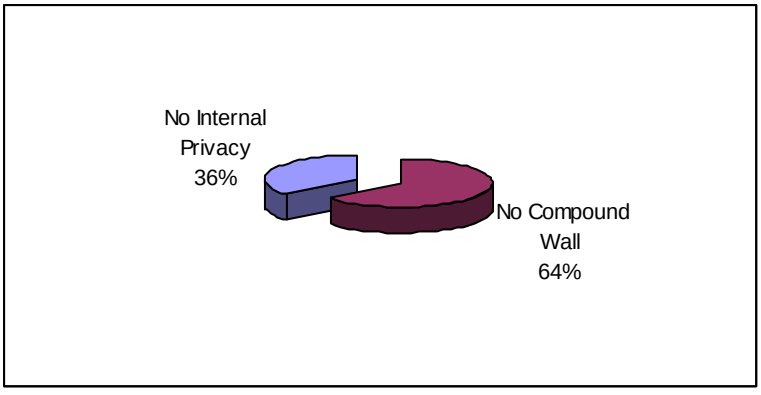
Source: Field Survey

Fig. 4. Sample respondents reporting reasons of dissatisfaction on security perspective.



Source: Field Survey

Fig. 5. Sample respondents showing satisfaction on the suitability of Prefab houses in terms of local culture and ethic values.



Source: Field Survey

Fig. 6. Sample respondents reporting the reasons of non suitability of prefabricated houses in terms of local culture and ethical values.

The structure of the houses does not maintain veil (*Paradh)* which is considered very important in the study area. The remaining 50% respondents were not satisfied due to the lack of internal privacy. According to them, it is not ethically possible to live with adult offsprings in the same prefabricated house. It is threatening the individual privacy.

7. Conclusions

The earthquake of October 2005 completely ravaged the Balakot town and later declared Red Zone by prohibiting all types of construction. Four organizations announced to provide Prefabs; SPAPEV is one of them which completed project of 18.5 million US dollars for 4000 prefabs. The results of the study show that prefabricated houses installation project in the earthquake affected areas ignored the various aspects of living of the affected people.

The affected people were not satisfied because of complex grant mechanism, delaying installation process, low quality material used, poor quality of work, non-professionalism, non suitability for large family, unsuitable to climatic conditions, no sanitation, lack of security perspectives, and existent social and cultural values.

8. Recommendations

Based on the findings of the study some recommendations are offered for future policy formulation.

1. Appointment of a special committee consisting of all stakeholders to probe the matters of concerns.
2. Special team of skilled and professional engineering should be sent to the project area.
3. Roof leakages and water trickling during the rainy season were severe problems of residents of installed prefabricated houses. Installing companies should be accountable in respect of poor quality material, work and delay.
4. Formulation of a policy to clearly define prefabricated provision criterion and maintain proper check and balance system.
5. Maximize the community role by establishing local committees and organizations.
6. Build compound wall as early as possible for providing external privacy.
7. Complete the work of washroom or toilet as early as possible so that people could settle in them.
8. Future prefabricated houses project should deeply study the physical, social, cultural and meterological aspects for building and installation of the houses.

References

UNDP, 2007. District Abbbottabad, Disaster Risk Management Plan, Isamabad, Pakistan.

Munir, A., 2006. Balakot to Bkearal, Daily Aaj Abbottabad, January 06, 2006.

NESPAK, 2009. Master Plan of New Balakot City, nespak.com.pk. visited on May 13.