

Passive defense in Tehran earthquake management using relief towns

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Abstract: This study is about the passive defense in Tehran earthquake management using relief towns. Managing the rescuing survivors from Tehran earthquake and even other cities as well as small and big villages by housing them in the of smart fast building shelter towns instead of using a camping tent and fix common problems of these camps and create an appropriate and acceptable welfare to avoid becoming a disaster in each situations including very difficult situation in terms of climatic, economic, health and etc., save foreign exchange and Rials, improving the quality and quantity of services and aid to people affected by are affairs for being able to handle the most difficult crises and passive defense of the country are considered in this study. Relief town is a collection of prefabricated modular homes, using a new type of polymer composite panel that designed to fit this type of construction. Among its features are absence of using cement and sand mortar and concrete and iron bar and truss. Design and construction of this towns is not affiliated in any foreign things; they are too light and portable with quick and easy installation and the possibility of collecting and mounting for several times at very reasonable prices that can be a replacement for relief tents for passive and direct defense and in the service of committees and disaster management centers of the country. These structural models are suitable for various types of residential uses, office, service providers, health centers, cultural uses, business, sports, military, multi-purpose, general uses required by refugees that had crisis with the ability to be converted into permanent homes. After making, all parts of these towns are kept in stock to use in the shortest time at the crisis at the site where is considered from the past with the original arrangements. Size and number of these locations and site area of these towns are different according to the urban population and the number of shelter seeker in times of crisis.

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Introduction

1. Crisis management

Crisis management is a new science in the country, province and city that can be in a variety of shapes. In crisis management, potential and existing resources are evaluated and emphasize to balance the available resources and capabilities with professional planning to control the crisis with the available resources. Any types of crisis will have a significant impact on the society. Crisis has different severity and nature but all of them impose consequences that could disrupt the performance capabilities of the involved organizations. In most crisis, common situations can be found as below:

There is a need for rapid decision-making.

Solutions are largely limited.

Wrong decisions can have serious consequences.

Actually crisis management is a difficult task and can be disheartening. The biggest mistake is to think that our society will be immune from crisis and always remember that no crisis is exactly like other crises. However there is a remarkable similarity between them that discovery and understanding of the key similarities will be good to plan for dealing with the crisis and mitigate its adverse effects.

2. Crisis Management in unexpected events and natural disasters

Unexpected events and natural disasters, according to the above definition, is an action of a nature with such intensity that cause catastrophic situation that snap the current lives of the people and people suffering and failure to provide food, clothing, shelter and health care, and other necessities of life. Therefore, to prevent or mitigate the effects of natural disasters and to manage rescue and temporary housing and reconstruction of damaged areas, all communities need crisis management. So the crisis management with regard to the role and function of disasters and natural disasters includes the professional application of knowledge and technology, planning and management to deal with accidents and disasters, and preventing or reducing the effects of natural disasters. Natural disasters and crisis management system is a closed circuit that so-called the crisis management cycle consisting of 4 stages as follows:

2-1 Preparation stage before the crisis including:

Prediction, prevention, vulnerability, harm reduction and preparedness

2-2 The onset of the crisis including:

Alarm immunity, elementary education, early mobilization of energy and possibilities

2-3 During the crisis including:

Crisis management, the establishment of order in society of temporary housing, evaluation and revision of plans, programming, studies and research

2-4 After the crisis including:

Rehabilitation, reconstruction, development, deployment the normal situation, evaluation and review of programs, study and research the function

3. Required action on the crisis

Although at this stage, unlike the onset of the crisis, there is little opportunity for reflection and planning but the measures in force at this stage must be anticipatory and planning. This activity should be done within 2 to 6 days after the onset of a crisis. These activities are as follows:

- Activating the camp construction committee, construction of health centers, housing, food, water, clothing and fuel, waste disposal, health, social, search and identification
- Holding camps housing in appropriate predetermined locations
- Transfer survivors to camps
- Allocation of Temporary Accommodation for those in need
- Supplying food with regular services
- Providing the needs for regular garbage disposal and sewage with regular services
- Providing therapeutic needs
- Supplying drinking water
- Toilet and utility supply
- Psychological and social performance
- Providing lighting
- Providing fuel
- Providing clothing
- Supply networks of telecommunications, water, gas and electricity

Finally after a lot of effort and perseverance, a set as smart aid towns has been designed and built while providing all needs and actions of the crisis and then people can live in these towns as before the crisis especially if the reconstruction of the city or affected area needs a few months or a few years to finish.

Reviewing the resources:

Studies show that 95% of the country of Iran is on active faults from the view of Seismology like children cradle and as the record shows, every few years earthquake happens in one area. Unfortunately metropolis of Tehran is not an exception from this rule and always is at the risk of a severe earthquake. Worn tissues and non-standard and non-seismic densities against the earthquake in the city increase the probability of a severe. It is unfortunate in this case is about the public locations and with high degree of importance, such as hospitals, schools, office buildings and etc. that either in terms of the structure age has

high life (old) or have been implemented with very low quality. Unfortunately, in some cases, these two defects are observed simultaneously. It is noteworthy that the above matters will not cause any problems in normal everyday lives of the people, and this matter causes weakness in buildings retrofitting. However, in the event of the first earthquake, certainly a major irreversible damage will happen and public places and buildings such as hospitals, schools, fire stations and etc. that should be safe places to accommodate people, who have damaged, are the first destroyed buildings and this increase the number of refugees and deaths. Based on the foregoing, that is only a part of the chaos created by the earthquake in Tehran, the necessity of implementation of modern retrofitting systems can be understand since prevention is always better than cure and before planning to provide asylum seekers, prevention must be a priority. Fortunately, advances in technology and retrofitting of buildings in the world and offer interesting solutions from the world's experts in this field, now retrofitting become an independent discipline, which are equipped with the relevant tools and with the use of these devices, all measures of resistance skeleton of the structure to be calculated without degradation of the main components of structures such as beams, columns and foundation. The raw data is available to the users and the user will reveal the weaknesses of a structure by giving these data to the PC and receiving the output. These tools are known as non-destructive testing instruments such as: a tool for determining the thickness of the concrete on the reinforcing steel, a device for observing the cavity on the concrete and earth, a device to determine the diameter of the reinforcement in the concrete and determine the network of the reinforcement. A device to determine the withdrawal include: determination of Poisson's ratio and modulus of elasticity, determination of the corrosion potential at the present and in the future, electrical conductivity and determining the permeability of concrete, the device for determination the temperature and moisture in concrete, a device to determine the armature, a device to determine the compressive strength - tensile and hardness of concrete and etc.

As mentioned above, it is obvious that all of the experiments from the detection of structural weaknesses to the process of hardening of the structural elements can be done without damage. It is hoped that with the cooperation and assistance of the authorities, this important affair will be done all over the country as a mass and widely applied and cured prior to the event. But the situation of refugees after the earthquake should not be underestimated, especially when based on figures and calculations; their number is not a few. Naturally, tents and relief camps are not enough for the

large number of refugees. Therefore we provide a new plan more deliberate measures.

What is relief town?

Production, design and implementation of modular homes is with the industrial method that after natural and abnormal disasters and wars that led to the destruction and homeless people in the city and village, in a prior place is designated for emergency in less time. Location and environment, transport, services and systems and etc. has already been investigated before and all necessary arrangements are provided so that according to the beauty and ease of use, parameters such as ergonomics, innovation, manufacturing, rapid entry into force, technique of assembly, selection of

construction materials, strength, maintenance, economics, marketing, sales, national and cultural identity, added value, recycling, environmental and compatible with the climate are considered. These towns are a systematic process that has determined sequence and a regular relationship are between them. Design process begins with investigation and after proving check list and overall ideas, according to the number of refugees of each city and village, while evaluating the information on the requirements of the design, the best ideas will be selected and its details will be designed. It is necessary in this trend to consider the multiply interactions between human, product and environment with a systematic view.

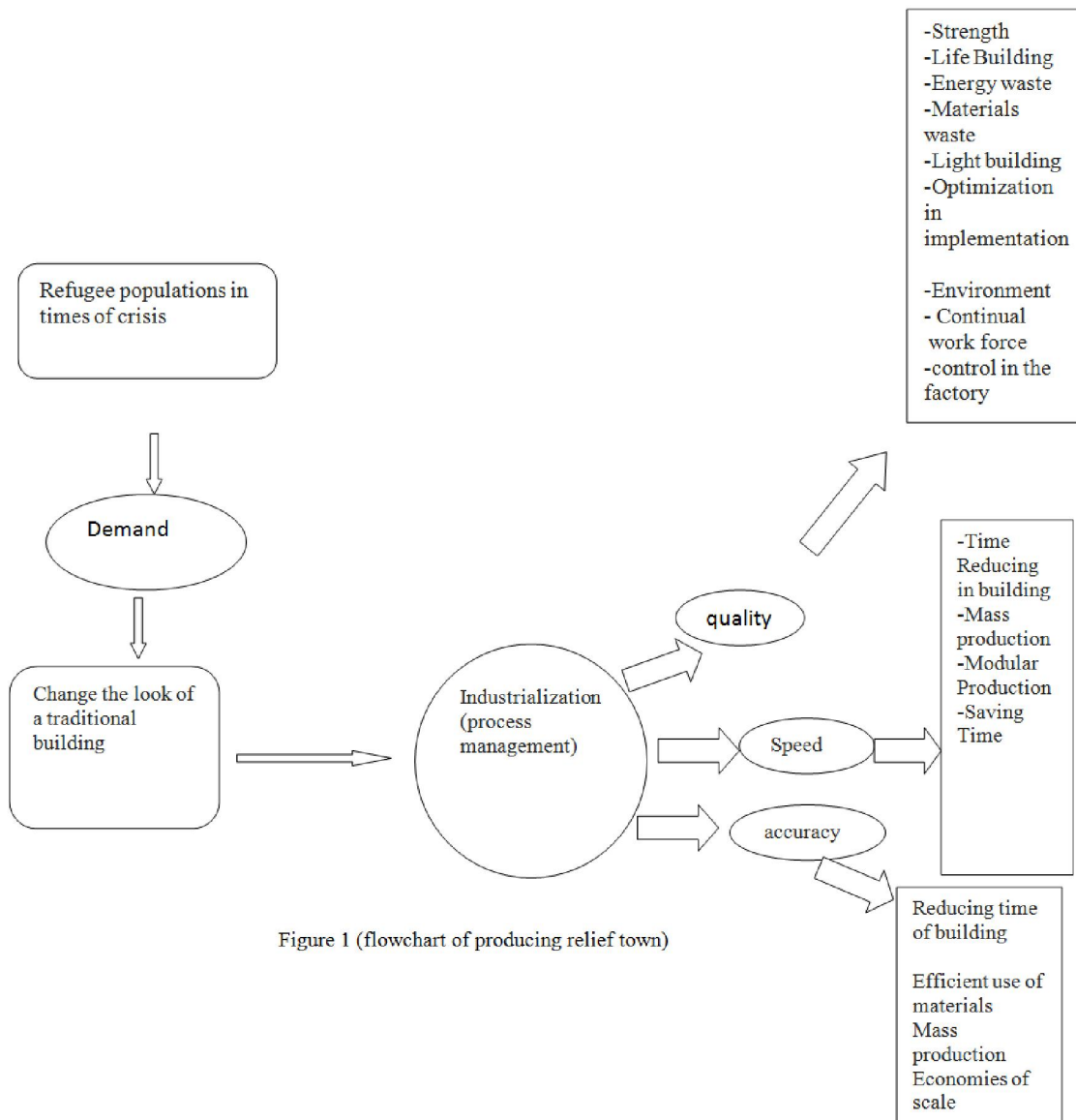


Figure 1 (flowchart of producing relief town)

Some of the capabilities of this system are repeated consumption and recollecting it. It also has the possibility of becoming a permanent settlement. Also for use in non-crisis situations residential homes, they can be used for the organization. This town has some places place like number of residential units ranging from suites to one and two bedroom, mosques, schools, clinics, hospitals, helicopter band, office space, warehouses, barracks, fruit and vegetable markets, commercial centers, multipurpose halls, police centers, gas stations, waste collection centers, parks, green spaces and squares and streets, installation center with underground utilities including electricity, water and sewer pipes that are designed to be in compliance with the principles and criteria for urban development. And

this design fits the characteristics of the materials used and its prefabricated architectural is from Urban architecture approach of four Iranian garden from original Iranian architecture.

Format of designing analysis of relief towns include:

Requirements analysis, analysis of related products, analysis of cultural factors, environmental factors analysis, analysis of temporal evolution, production analysis, data storage and distribution analysis, maintenance and repairmen analysis, sales analysis, systematic correlation analysis, performance analysis, ergonomics analysis, interaction analysis, analysis of structures and components, data recovery and aesthetics analysis.

Table 1. The estimated cost of a suite of 40 m in the Relief town dated in 14January 2014

Topic	Amount	Price (m/Rials)	Weight (m/Kg)	Total Weight (kg)	Total Price (Rials)
Wall panels (including installation ducts, form-fitting)	70m ²	000/400	880/8	6/621	000/000/28
The floor panels (including infrastructure, panels, cover the bottom)	40m ²	000/275/1	600/12	504	000/000/51
Ceiling includes (panels, joints, coatings, insulation on the roof)	60m ²	000/500	10.220	2/613	000/000/30
UPVS window with double glass	3	000/000/4	43	129	000/000/12
Doors	2	000/500/1	18	36	000/000/3
Kitchen cabinets	6	000/000/2	16	76	000/000/12
Kitchen sink	1	000/000/2	8	8	000/000/2
Oven	1	000/000/2	6	6	000/000/2
Ken Hood	1	000/000/2	7	7	000/000/2
European WC with paraphernalia	1	000/000/3	18	18	000/000/3
Hand washing with paraphernalia	1	000/000/1	13	13	000/000/1
Valves	3	000/670	2	6	000/010/2
False ceiling of the service	6	000/167	5/1	9	000/000/1
Piping system	6	000/500	4	24	000/000/3
20-fins radiator	20	000/150	8	160	000/000/3
Wiring with switch	7	000/700	5/0	5/3	000/900/4
Transport, labor and construction 20%					000/382/34
Total				7/1612Kg	000/292/206
End price per square meter of the structure					300/157/5

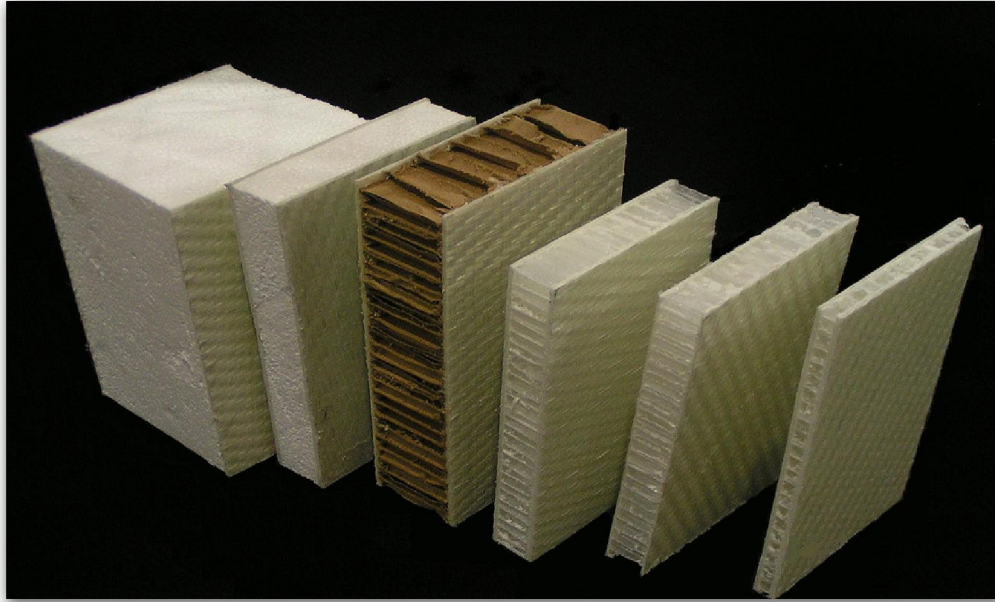


Figure 2. Examples of structural sections relief town

Table 2. The cost of producing and installing of one square meter of a composite structure in the relief town as non-industrial by estimated date of 14 January 2014

Structural elements	Amount	Price (Rials)
2 sides coated polymer composite panel production with volume cover of polystyrene, thickness 8cm	1m ²	000//270
Structure of galvanized cold rolled 2mm	1m ²	000/160
The total cost of the openings of UPVC	1m ²	000/300
The roof structure and roof insulation consists of PVC	1m ²	000/500
Flooring including reglet concrete, glosbe, panels, joints, upper cover	1m ²	000/275/1
End price per square meter of the structure	000/505/2	
Performance speed and montage by an 8-hour workday Squad of 100 people in 6 weeks is 40,000 square meters.		

Table 3.- Finished cost of implementation one square meter of masonry structures

Structural elements	Amount	Price (Rials)
Implementation of the brick wall with internal and external maintenance with thickness of 20cm	1m ²	000/930
Implementation of the roof pillars and coil	1m ²	000/150/1
The total cost of the openings of UPVC	1m ²	000/300
The cost of packing, including Iranian truss, false ceiling	1m ²	000/900/3
Flooring including reglet concrete, foundations, seats, insulation, mixed Planning	1m ²	000/850/4
End price per square meter of the structure	000/130/11	
Performance speed of this structure by an 8-hour workday Squad of 100 people in 8 weeks is 216 square meters.		

Site designing of relief town

It is afforded in site design of this town to consider the Iranian culture approach and avoid any luxury-oriented and western model. Therefore, the

study of history and culture of Iran urban development, a model of four Persian gardens was selected to design the site.



Relief town model



Residents of the relief town

Table 4. Occupied level of the relief town

Table for occupied level of the relief town					
	Subject	Area (m2)	Number	Occupation percentage	Totam area (m2)
1	Quad suites	189	72	2.2	13608
2	Quad single room	232	80	3.1	18560
3	Quad double rooms	336.60	72	4.1	24235.20
4	Commercial places	1300	8	1.8	10400
5	Public places and services	2777	33	15.2	91667
6	Local streets	40199.12		6.8	40199.12
7	Local avenues	24960.12		4	24960.12
8	Main avenues	30714.68		5.1	30 714.68
9	Green spaces	282295.88		47.8	282295.88
10	Pavements	63360		10.5	63.360
	Sum			100%	600.000 m ²

Conclusion

As you can see, these towns were considered as the most complete and economical and practical option in crisis management potential crises, especially those that have larger dimensions that they have already planned to produce and act.

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