



Public shelters: Towards secure urban planning and designing in terms of passive defense

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Abstract

Recent wars show that enemies in war situations did not always observe international laws or conventions such that cities and their inhabitants were under threats of demolition and destruction. Today, countries which experienced such demolition and destruction would have to pay special attention to passive defense strategies in order to maintain their national capital and vital recourses. Passive defense considerations in urban planning and design may help in reducing damages of cities and the loss of life and property while at the same time enhancing the thresholds of citizen resistance in attack situations and facilitating city crisis management. Urban shelters thus have an important role to play in protecting people against enemy aggressions and should thus be considered as an effective security measure. This article examines some passive defense strategic considerations in the designing and planning of urban shelters, in particular, for countries which have critically strategic and sensitive locations and are prone to threats by covetous expansionist powers.

Keywords: city vulnerability, passive defense, public shelters, urban design, urban planning, urban security

Introduction

Experiences obtained from past wars especially the eight-year Iran-Iraq war, the 43-day Gulf War against Iraq in 1991 (the first Persian Gulf War), the 11-week NATO war against Yugoslavia in 1999, the US and Britain war against Iraq in 2003, the 33-day war between Israel and Lebanon in 2006, the US war in Iraq and other conflicts around the world have confirmed this view that the attacker tries to break the will of the people and the political, economic, and military power of the target country via undertaking strategies to destroy important centers and places especially those in cities. This is usually done by bombardment (Movahedi Nia, 2008).

During the eight-year Iraqi Imposed War on Iran, six major Iranian strategic cities including Khorramshahr, Soomar, Mehran, Naft Shahr, and Hoveize were razed to the ground. In addition, 17 other cities were damaged between 15 to 85 percent as a result of the Iraqi army force's artillery attacks, air raids, and missiles. During this war, 61 Iranian cities were damaged by military attacks. These attacks were not confined to urban areas. During the eight years of war, 1138 villages in the country were destroyed completely and 2344 villages incurred heavy damage (Abbaszadeh Fard, 1999).

Today, the countries which experienced the demolition and destroyed caused by war, have an especial attention to passive defense, for maintaining of their national capital and vital recourses, and take high level considerations in defense strategies. It is obvious the passive defense considerations in urban planning and design, has a large effect in reducing damage of cities. It also can reduce loss of life and property, while leading to increase threshold of citizen resistance in attack situations and facilitate city crisis management.

At this time, urban shelters have an important role in people protection against enemy attack and consider as an effective security measure. In fact, contemplating appropriate considerations about urban shelters is essential for safe living during the military and nonmilitary threats (unexpected phenomenon). This is so serious for countries which have an important strategic and sensitive location and also be covetous of expansionist powers.

So, it is really important to research and finally make scientific resources about urban shelters as an essential part of passive defense system and also consider this issue in regular urban planning and design plans. In the following the paper investigates the importance of passive defense, and definitions of key related concepts. Then, we will discuss about following passive defense considerations in urban shelters designing and planning, also tries to reduce damaging these sorts of urban uses against enemy threats by engineering and surveying strategies.

Passive defense, a forgotten concept in the urban planning and design

Before addressing safe urban design based on passive defense, "passive defense" should first be defined in order to specify important points in available definitions. According to various sources and published literature by the United States Department of Defense, "passive defense" is defined as "a set of non-military measures taken to reduce vulnerability and to minimize the potential damages caused by invading forces" (Chairman of the Joint Chiefs of Staff, 2006; AIPD, 2008). Different measures taken by veterans and military forces in passive defense include early warning; security operations; dispersion policy; protection of important persons and the general public; medical assistance, especially to counter the deadly effects of nuclear, biological and chemical Weapons of Mass Destruction (WMDs); recovery of forces; disseminating news and information; staff training; and other techniques, tactics and processes effective in reducing damages caused by attacks.

In Iranian military and strategic texts, "passive defense" is defined as "a series of nonviolent actions with the purpose of increasing resistance against the enemy's attacks on living areas, improving maintenance of essential activities in cities and villages, improving national resistance, and facilitating crisis management against the enemy's military threats and actions" (Movahedi Nia, 2008; Asghryan Jeedi, 1996; Ziari, 2001). The use of passive defense measures reduces casualties and the levels of vulnerability and damage to critical military and civilian buildings, facilities, and equipment, and protects arteries of the country against enemy attacks. It could be helpful in reducing the risks of unnatural incidents.

In some sources, the term "civil defense" is used as equivalent for "passive defense" and is defined as follows:

"Civil defense is an effort to protect the citizens of a state (generally non-combatants) from military attacks via using the principles of emergency operations, prevention, mitigation, preparation, response, emergency evacuation, and recovery. Programs of this kind were initially discussed at least as early as the 1920s, but only became widespread in the USA after the threat of nuclear weapons was realized" (Baker, 1978).

According to this definition, civil defense guarantees the safety of the civilian population in wartime (Cristy, 1974). Thus, civil defense aims at the following objectives systematically:

- Minimizing the effects of military attacks on civilian populations;
- Dealing promptly with emergencies resulting from such attacks; and
- Retrieving and restoring damaged facilities and services as a result of such attacks (Kummer & Kummer, 1973).

According to this definition, the term "civil defense" is equivalent to the term "passive defense". However, it should also be mentioned that since the end of the Cold War, some countries shifted their focus of "civil defense" from military crises to encompass all hazards and crises in general. Thus, a gap

has emerged between passive defense and civil defense in current academic sources (Shakibamanesh & Fesharaki, 2011).

The main factors affecting attacks on cities

Cities are big and stationary targets in physical terms; they are easily targeted from a huge distance. Other factors motivating the choice of cities as military targets are as follows:

- Cities include aggregation of humans and major political, administrative and military decision-making centers;
- Attacks on cities puts politicians and officials under pressure;
- Attacks on cities disrupt social order and create dissatisfaction in the community;
- Attacks on cities break the unity of people and force them to leave the cities;
- Attacks on cities concerns soldiers about the situation behind the front;
- Attacks on cities break the resistance of support-management forces stationed in cities;
- Having welfare and livelihood facilities and services, cities play a very effective supportive role in guiding and managing wars;
- A significant proportion of physical and cultural investments are done in cities. Therefore, demolition or elimination of access to these assets will strengthen financial incentives in the invading forces;
- Because cities are considered models of stability, taking hold of them plays an important strategic role and is considered as an index to prove the military position and operational authority of the invading forces;
- Cities work as transportation links, and centers of regional integration for their rural areas. The government status depends on resistance or fall of these cities (Shakibamanesh & Fesharaki, 2011; APA, 2006).

Besides the above-mentioned factors, the role of psychological factors and the effects of attack on people's morale in cities are important. The social life in cities, and the alignment and proximity of constructions, make cities an indispensable target for destroying people's morale. For example, during World War II, the cities of heavily bombed London, Paris, and Berlin were heavily bombed to weaken their social and military morale. The most striking example of this type of targeting is the atomic bombing of the cities Hiroshima and Nagasaki by the U.S. that caused Japan to surrender. In addition, in recent wars - the Kosovo War, First Persian Gulf War, Iraq-Iran War, and the U.S. War on Terror - examples of threats and bombings against cities are conspicuous.



Source: B. Glaser, 2011.

Figure 1. *Cities destroyed during World War II*

Public shelter as a strategic urban land use

Some urban uses can be considered as the main targets of enemies' attacks. Thus, they have bilateral importance: on the one hand, the destruction of such uses may have vast negative effects in national-regional or urban levels, depending on their importance. In fact, demolition of such uses can lead to large economical losses and paralyses the industrial or productive structures of the city, region, or country wherein they are operating. On the other hand, in many cases improper locating and positioning of these uses will result in huge losses and tolls over the neighboring divisions and a decrease in national resistance threshold in crises. Such uses include: 1) urban infrastructures; 2) industries, power stations, and refineries; 3) airports, railways, subways, etc. and 4) public shelters.

This article investigates the importance of passive defense considerations in urban shelters designing and planning, and thus tries to reduce damaging these sorts of urban uses against enemy threats.

Urban shelters

An urban shelter is an enclosed space which provides a suitable safety for its residents and equipments against different arms. This space has its own characteristics and entailments and requires specific structural and architectural considerations. Shelters have the highest level of safety against air raids in comparison with other places. They are multipurpose and can be used for economical or welfare purposes in time of peace.

1. The Importance and Incumbency of Shelters

The danger of war has always existed and thus having a safe shelter is a prerequisite of living in the age of destructive and long-distance weapons. This is so important for our country which has a strategic and sensitive situation and has always been a target for imperialist powers. Therefore establishing shelters based on due studies and research reports have significant importance and should be considered as an essential part of the passive defense system.

2. Different Types of Shelters

The purpose of establishing shelters is to decrease or eliminate the negative effects of classic or atomic bombardments on human beings. In case of passive defense, safety against these dangers is provided through avoiding direct clashes. Buried or semi-buried shelters are used for this purpose. Therefore, shelters are widely used in passive defense.

Shelters are classified to different types based on different weapons such as classic, heat weapons, radioactive, atomic, chemical, etc. as stated below:

A. First Class Shelters

These kinds of shelters have a high level of resistance against different weapons and can tolerate different quiver and burst waves. They are also resistant against heat and radiance of atomic weapons and are designed in such a way that do not allow chemical gases in these spaces needs very strong structures buried under earth, and also advanced facilities required for its important and highly sensitive operations. The degree of materials' resistance depends on their thickness and substances they are made of. Therefore each shelter has its own safety coefficient depending on its materials. For example, shelters against radioactive weapons must be designed and built so that they can accommodate people for a certain period of time with enough safety and a required supply of sanitary food and water. This period of time varies between seven hours to fourteen days. In first class shelters the building must have a high resistance against chemical effects. This can be done using specific doors and putting filters in air channels to refine the incoming air.

B. Second Class Shelters (Public Shelters)

These shelters are resistant against ordinary weapons, but not against atomic or chemical ones. The

cheapest kind of these shelters are lower floors and basements of tall buildings with resistant walls. Based on the experiences from Iraq's imposed war against Iran, spaces with four horizontal shields (concrete roofs or joist-block) such as basement of four-floor buildings can provide the safety conditions of these kinds of shelters. Hills inside or around cities are also places suitable for establishment of second class floors. Parts of cultural, religious, or educational centers built underneath can also be used as shelters in emergency cases.

C. Third Class Shelters (Family Shelters)

These shelters are only relatively resistant against burst waves and quivers from ordinary weapons. Ground floors can be changed into such shelters through increasing the resistance of their walls using materials which are anti-wave and tolerant against quivers. Third class shelters can be used in yellow alerts (Mashhadizade Dehaghani, 1994).

3. Different Shelter Materials

Generally shelter materials are divided into three categories:

- Reinforced Concrete. Concrete is used in place or joist-blocks produced before are utilized in the structure.
- Steel. Here the shelter is built faster than concrete ones are, but it has a lower resistance in comparison with the latter.
- Mixed structures. In these structures a combination of concrete and steel is used.

4. The Location of Shelters

Shelters either can be parts of buildings or can be separate structures on or underground as simple buildings or complexes. The location of shelters should allow for secondary used in time of peace and easy access in time of wars.

Considering their locations shelters are classified as follow:

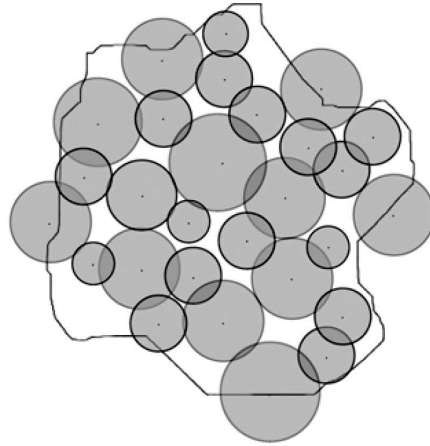
a) Shelters under buildings, b) shelters out of buildings, c) surface shelters (built on the ground and covered by earth), d) semi-buried shelters (half of which is underground and the latter half is covered by earth), and e) buried shelter (completely underground).

Public shelters planning and design considerations

City shelters play an important role in securing people against enemies' attacks and form an effective operation in passive defense. Bellow, some important points that should be considered regarding locating city shelters are enumerated (Shakibamanesh & Fesharaki, 2011).

- City shelters should be designed based on their situation of use and the population using them. Thus, in crowded city centers and in administrative and business districts different shelters are needed from those in local areas. Nevertheless, the distance of access for these shelters should be estimated in such a way that, in emergency situations, they can accommodate large numbers of people. The best locations for shelters include the centers of city subdivisions. For example, in a neighborhood a shelter within 300 to 375 meters radius of access (3 to 4 minutes distance) provides easy access for residents. This radius of access should be 500 meters or a 5-minutes distance from the center of the division (neighborhood units, areas, regions) at most, so that in emergency cases people have access to them in shortest time possible.
- The distribution of shelters across cities should be in such a way that allows overlaps and common use for neighboring areas (Figure 2). Proper design and positioning of shelters in this way makes it possible for people to go to the nearest shelter possible within at least 4 minutes (300 to 375 meters distance) and at most 5 minutes (500 meters distance). In planning and

designing new cities, establishing shelters with overlapping areas of control, which pertains to city security, should be among the requirements and be applied by related organizations. In this way making decisions about other complementary defensive plans for cities with the purpose of protecting vulnerable areas and decreasing tolls in time of war and crises is rendered easier.



Source: Shakibamanesh & Fesharaki, 2011.

Figure 2. *Need for hierarchical layout taking into account the ease of access to shelter, the spatial area in question (neighborhood, district, regional and municipal centers,), the users of space, and overlaps with each other at different service providing levels in the whole city;*

- The best and most appropriate shelters from the point of view of usability and capacity of satisfy emergency needs are those established in regions. As neighborhoods are formative cells of the urban structures and cities are the results of combination of different neighborhood units, establishing shelters in neighborhood centers can provide service to a huge number of people (Figure 3). Local centers can be the best location for regional shelters, because these centers have always attracted different uses needed for their residents (which have conformed to the spatial-geometric center of the neighborhood as well) and have provided the best situation of use for residents. Mosques, open spaces, local parks, etc. are among the public uses in city centers. Clearly establishment of shelters which are of no use in time of peace and in ordinary situations is not socially and economically proper. Thus using public uses in city centers and creating shelters therein in a way that allow for other uses in ordinary situations can satisfy the need of neighborhood centers to such places. Mosques in the neighborhood units are among the first priorities for establishing shelters. Basements can be built in these mosques which can be used as a local library, sport center, a place for cultural activities, etc. in ordinary situations and as shelters in time of crises or wars. Similarly, open spaces and parks in the centers of urban neighborhoods can have positive ecological effects and may become a recreational place for residents' leisure time in time of peace and a shelter fulfilling the purposes of passive defense in time of crises and wars. These open spaces among other structures can be used for temporary dwellings and providing services to people in need. Therefore creating these open spaces in urban neighborhoods is deemed essential.



Source: Shakibamanesh & Fesharaki, 2011.

Fig 3. Old Esfahan city neighborhoods, as the city cells. Esfahan, Iran;

- Residents of cities should be informed of the exact location of urban first- or second-class shelters so that they can go to their nearest shelter in case of attacks (chemical or atomic).
- As shelters are generally used in time of crises (wars and other catastrophes like tornado, etc.), they should be established economically to decrease the building costs. Moreover they should not be left evacuated. From this point of view, shelters can be divided into two groups (Ziari, 2006), as follow.
 - Public shelters across cities and residential areas
 - Special bi-purpose shelters which have specific uses in time of peace and war.
- Considering these classifications the requirements for establishing shelters are as follow.
 - In high-density residential areas (with tall buildings), shelters should be built beneath the building and be used as store or parking in ordinary situations. In residential areas with moderate or low density, shelters can be located in residential buildings and they might be built with residents' cooperation. In places with natural terrains underground tunnels can replace shelters.
 - Shelters should provide the possibility of other uses in ordinary conditions. Therefore, the use of bi-purpose structures should be encouraged. Subway is an example of these kinds of structures. In many countries like Russia (the former Soviet Union) subways are built and equipped in such a way that can be used as shelters in time of crises (Figure 4). The facilities in these subways have been provided with the purpose of satisfying people's needs in time of crises.



Source: Vk, 2002.

Figure 4. Using the Russia subway as a shelter during World War II

In fact through establishing secure multi-purpose structures like subways, underground stores, libraries, and document centers, and common tunnels costs of building public shelters are reduced and these shelters are not left unused in ordinary conditions.

Different countries across the globe have paid attention to defense and security considerations when designing subway structures to protect people's life in time of crises. An example of this is the subway of Pung Yang, North Korea with 95 to 105 meters depth and 34 kilometers length which can protect the urban population against conventional and unconventional weapons. In cultural and religious sectors some uses should be as basements which can be used as shelters in crises times. The entrances and exits should be provided for these places based on the population using them in emergency cases.

In administrative and educational sectors, some buildings and structures like lecture halls, libraries, gyms, laboratories, amphitheatres, archives, buffets, and canteens can be built underground in a way that they can be used as shelters in emergency cases.

In clinics and hospitals underground or inter-building corridors should be built which can be used as stores or self services in ordinary conditions and as shelters in crises times. These structures should be built in such a way that allows possibility of normal activities in time of war through creating surgery, radiology, laboratory, etc. in these places.

- Shelters should have direct connection to the building.
- The access routes to the shelter should be short and safe and the emergency exits should be placed where it may be buried under debris.
- If possible, the shelter should be placed underground and its walls should have the highest level of connections with earth.
- Shelters should be built in the lowest floor on the ground.
- In designing shelters psychological factors like lighting, color, air conditioning, kind of materials, acoustics, dimensions, and congruence of space should be considered.
- Economical and security factors should be considered in designing shelters and the tendency should be toward the least space. From a cultural point of view, internal space of shelters should be dividable to different sections for different families.
- Shelters should provide facilities like power, telephone, TV antenna, radio, water, food, and other services like independent sources of power (chargeable batteries, etc.).

Conclusion

This paper begins with the question of how we can improve the city resistance in war. In this regard the necessity of implementing passive defense measures is stressed. Passive defense is defined as a set of

non-military measures taken to reduce vulnerability and potential damages caused by invading forces, increase resistance of living areas in wars, maintain essential activities in cities and villages, and finally facilitate crisis management against military threats and actions. Actually passive defense is an effort to protect the non-combatant citizens of a state from military attacks using the principles of emergency operations, prevention, mitigation, preparation, response, emergency evacuation, and recovery.

This paper reiterates the importance and imperative of passive defense in urban planning and designing with special reference to strategic urban land use and public shelters. Rather than a military strategy, public shelters are critical and valuable urban land uses in times of crisis and war as they can reduce city casualties and vulnerability.

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