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ORIGINAL ARTICLE

Recreation of field hospitals with requirements of defense air passive and energy supply from renewable solar resources to the crisis management and cost

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Iran has vast sunshiny zones in most of the days of year, especially in the border areas of country that have always been threatened have potential of energy supply from endless source of sun due to geographical position. Therefore, the most important measures that should be considered to prepare and deal with the crisis in these areas is to provide the requirements of energy supply of renewable solar energy by considering geographical capabilities of these areas, in order to the life cycle and service in these areas, especially in times of crisis not faced with interruption. Accordingly, the importance and necessity of research for the study of overall map of site and spatial structure of recreation architecture of the existing field hospital and the introduction of mechanism solar energy supply and energy management and crisis become evident more than ever. This study is conducted to investigate and introduce the spatial structure of field hospitals and their recreation by renewable solar energy supply and providing requirements of defense air passive to provide a useful framework of mechanical, architectural requirements and environmental attitudes and urban environment as well as environmental and defensive issues for the design of such buildings in accordance with new threats and pure energy topics in order to provide for use in time of crisis as uninterrupted energy supply and be able to reduce financial and body losses by using it and reduce the costs by crisis management and maximize the advantage.
Keywords: Solar energy supply; renewable solar energy; defense air passive; environmental attitudes

Introduction

There is interest in life and survival in every human being instinctively. Therefore, during history, human beings has expanded and developed the rangelands and agricultural lands and mines in order to achieve vital requirements, including food and energy, or forsaken many wars to ward off the rape of enemies. The weapons that human societies used in the wars before the industrial era were hand-crafted and very simple, there was a close relationship between the knowledge and technology processes and the type of weapons devised and used by human societies to exploit them in war. Our land has always been exposed to various natural hazards (earthquake and flood) and human-made threats such as war, due to special geographical and political situation, and faced with human casualties and heavy financial losses (Haji Ebrahim Zargar, 2015). The role of relief and rescue and the status of hospitals as an institution in this field are to maintain, return and promote physical and mental health of the community. Considering that hospitals play a key role in the treatment, care and reduction of injuries, the necessity of its survival during accidents and disasters is obvious. Definitely, if field hospitals were not built during the holy defense, according to transportation constraints, more than 50% of the wounded people that in these hospitals were undergoing surgery before reaching the next medical centers became martyr or severe complications remained for them (Verderber, 2010). At the moment, by considering defense air passive can minimize physical and financial losses and did health care without interruption. These principles include: proper location, use of the principle of dispersion, considering the principle of minimization, use of camouflage techniques, concealment and deception. Defensive elements in camouflage and concealment of field hospitals are more effective at the identification stage (in the phases of assessment and interpretation). In the phase of measurement of camouflage and concealment techniques should be able to minimize the ability to identify and measure enemy information systems. In the phase of interpreting the use of camouflage and concealment techniques in order to disturb the proper interpretation of threat agent from its position itself must be planned (Ghajavand, 2010).

Statement of problem

One of the issues that the need to attention and anticipate placing in crisis is important in it is the attention to energy issue and possibility of damage in the energy supply network for field hospitals to the recovery cycle of injured people due to the crisis not to be stopped.

It should be noted that in our country there is history and proper experience for designing and building field hospitals, but designing records and construction of sustainable field hospitals with capability of using solar energy resources are little due to the design of specific mechanism during the crisis and are not appropriate with modern threats and advanced means of identification and modern technologies and most of the existing hospitals are dependent on energy supply from the outside and energy transmission lines, which during the crisis of a hostile country can stop these areas by cutting off the flow of energy transmission of services. In order to cope with this threat, the need to identify aspects, crises, accurate knowledge from climate conditions and determining the potentials and climate locations, the location of hospitals and design of the energy supply mechanism is in accordance with the disposal of the most recent threats and conditions of the day to prevent possible damages. Accordingly, the importance and necessity of research for the study of overall map of site and spatial structure of recreation architecture of the existing field hospital and the introduction of mechanism solar energy supply and energy management and crisis become evident more than ever. This study is conducted to investigate and introduce the spatial structure of field hospitals and their recreation by renewable solar energy supply and providing requirements of defense air passive to provide a useful framework of mechanical, architectural requirements and environmental attitudes and urban environment as well as environmental and defensive issues for the design of such buildings in accordance with new threats and pure energy topics in order to provide for use in time of crisis as uninterrupted energy supply and be able to reduce financial and body losses by using it and reduce the cost by crisis management and maximize the advantage.

Importance and necessity

One of the issues that the need to attention and anticipate placing in crisis is important in it is the attention to energy issue and possibility of damage in the energy supply network for field hospitals to the recovery cycle of injured people due to the crisis not to be stopped. In order to cope with this threat, the need to identify aspects, crises, accurate knowledge from climate conditions and determining the potentials and climate locations, the location of buildings and designing them is in accordance with the disposal of the most recent threats and conditions of the day to prevent possible damages. In sustainable field hospitals should be provided proper bio-conditions and defense air passive principles for medical treatment and energy supply of building through renewable resources. Accordingly, the importance and necessity of research for the study of overall map of site and spatial structure of recreation architecture of the existing field hospital and the introduction of mechanism solar energy supply and energy management and crisis become evident more than ever.

Research questions

A) Can the implementation of this project provide a functional model for exploitation in crisis situations and deployment in special circumstances?

B) Can sustainability in building energy supply lead to an explanation of a functional and independent model during a crisis?

C) Can requirements of defense air passive in designing and explaining the functional model reduce the injuries and vulnerabilities?

D) How the use of functional model of field hospitals with solar energy can help to increase service productivity after crisis?

Research Methodology

The type of research is applied-developmental. The method of collecting information has been through documentary review, studying texts, articles and books related to crisis management, engineering, and architecture and urban planning. The method of collecting information of this paper is collected in the following ways: studying library resources, Internet and documents and existing documents.

Concepts and definitions

The concept of defense air passive:

It is referred to a set of actions that not required the use of weapons and by implementing it can prevent financial damage to critical military and civilian equipment and facilities and human casualties, or reduce the amount of damage and casualties caused by enemy's air missile attacks and bombardments to a minimum. Expediency Council in line with developing general policy of defense air passive of country defines defense air passive as follows: a set of non-military actions that increase deterrence, reduce vulnerability, sustain the necessary activities, promote national sustainability and facilitate crisis management against the enemy's military threats and actions.

The importance of defense air passive:

Experiences and evidences recorded in the wars of ages and past accidents of human history and the present century are model and undeniable examples that reveal the importance of the phenomenon of defense air passive. And the following examples are obvious examples of this issue.

1. It causes to survive and preservation of survival human resources, which is the most valuable capital and national entity of country.

2. It causes macro- economic and currency saving in the maintenance of very expensive military equipment and facilities.

3. It preserves critical and sensitive centers of economic, political, military, communication, and major scientific and cultural centers, and ... against enemy air strikes and bombardments and makes possible to continue activity in conditions of crisis and war.

4. It imposes a significant cost to enemy.
5. It causes to create positive emotional and psychological effects on citizens and warriors.
6. It causes to preserve forces to hit in the right time and place and get the freedom and initiative from enemy.
7. The inevitability of future wars and the need for defense readiness.
8. Achieving defense air passive is easier and more convenient than defense active, and more agreeable with the policy of self-sufficiency and independence of country (Asgari et al., 2012).

Definition of Camouflage, Concealment and Deception (CCD)

CCD is abbreviation of camouflage, concealment and deception. Its meaning is the use and exploitation of items, equipment and methods for concealing, assimilating, transforming and simulating, creating deceptive targets, and eliminating regular geometric shape of objectives to prevent the discovery and identification of forces, equipment, installations and insider activities by detector systems and enemy sensors (Kheirabadi, 2013).

Concealment: Concealment refers to all actions that prevent the placing of facilities and equipment for enemy or it makes it impossible or difficult for him to detect facilities and equipment as well as carrying out certain activities. Enemy always tries to detect and mark the important, sensitive, and critical points of country or to be informed of important activities, in order to eliminate the facilities and equipment at the right time with precise targeting and disrupt the activities (Kheirabadi, 2013).

Camouflage: The overall concept of camouflage is the coherence of formation of facilities and equipment with the surrounding environment. Industrial facilities built inside the desert, in agricultural environment or in the vicinity of residential areas, are easily visible, detected and identified unless they are camouflaged (Kheirabadi, 2013).

Camouflage methods include:

Hiding: in which an object is completely hidden by physical covers such as the "camouflage tour".

Assimilation: In assimilation, devices around and above the object is used so that to be a minor purpose. The typical example of assimilation is the use of foliage of trees.

Counterfeit: it is the change of purpose and using false and deceptive equipment in a reasonable distance from the target, for example, the transformation of one person into a residential building is an example of counterfeit (Kheirabadi, 2013).

Camouflage techniques

A) Camouflage painting;
B) Camouflage tours;
C) Thermal camouflage;
D) Radar camouflage;
E) Multi-spectrum camouflage;
F) And smoke (Asgari et al., 2012).

Deception

It disturbs the detection and differentiation of real forms from unrealistic forms. In deception, using virtual forms and designs, we remove observer attention from real goals.

Sustainability

Origin of sustainability

The term sustainability has been used with its current meaning i.e. "what can be sustainable in the future". In fact, sustainability is provided when a set of social sustainability, economic sustainability and environmental sustainability is created.

Sustainability principles

The use of natural solutions 2. Adaptation with environment instead of environmental change 3. Coexistence of artificial environment with natural 4. Unity in general and autonomy in components 5. Non-renewable energy storage 6. Recycling of buildings and materials 7. Respect for scheme 8. Applying all of the above principles simultaneously.

Three fundamental principles of sustainability

Principle 1: Saving in resources. Principle 2: Designing based on life cycle. Principle 3 Human design

Principles of sustainable architecture

Green architecture has had significant successes in recent years. These successes include the diffusion of new structural techniques and the sale of materials appropriate with green architectural thinking. Generally, green architecture is based on four principles: 1. Protecting the energy of water, wind and other natural resources. 2. Providing our environmental health. 3. Growing economy in country. 4. Providing high quality of life for citizens. These principles are a subset of three structural and effective factors in sustainable architecture, i.e. geography-2-culture 3-native architecture. There are many solutions about sustainable architecture. Here, we will only analyze and investigate the sustainable architecture from two general views of Rezana Hart who also reside in green buildings, and Brenda and Robert Will view. Some buildings have the features that place them in the field of sustainable buildings. The definition and principle that should be considered from the general view of Rezana Hart till a building to be classified as an example of a sustainable architecture include: 1. Think small. 2) Building heating with sun. 3) Keep your comfort and convenient 4) Use of renewable energy. 5) Save water. 6) Use of native materials. 7) Use of natural materials. 8) Preserve natural forests. 9) Use of recyclable materials 10) Build durable. 11) Generate your food. 12) Keep and produce your food.

Principles that from the perspective of English architects, Brenda and Robert Weil in their book titled Green Architecture: Design for a future informed of energy) have raised one of the simplest and most explicit frameworks for green architecture. They have shown these principles using various examples from building design in Europe and United Kingdom and United

State. They emphasized on learning from native architecture, architecture that lies in the experience of many generations living in a particular region and climate.

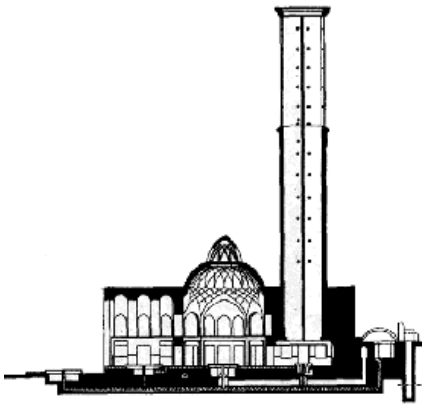
Energy conservation

Each building should be designed and constructed in a way that its requirement for fossil fuel reaches to the minimum.

Working with climate

Buildings should be designed in such a way that climate and local energy resources to be used. The shape and manner of deployment of building and location of its internal spaces can be such that improves the level of comfort within the building and at the same time reduces the consumption of fossil fuel through proper insulation of structure. The two processes inevitably have overlapping and common points. Before the comprehensive spread of using fossil fuel, wood was considered the main resource of energy, which still supplies about 15% of today's energy. When it was scarce, it was natural for many people to help the heat of sun in order to reduce the need for wood. The design tradition was not limited to rules of heating considering the climate in order to create comfort within the building, but in many climates, architects required to design a cool space to create favorable conditions within the building. The usual solution in the present day i.e. the use of air-conditioning systems, is the only inefficient process in contrast with climate, while it is accompanied with high energy consumption, which even it is considered a wrong issue when cheapness and frequency of energy due to contamination (Figure 1).

(a)



(b)

Figure 1: (a) Work with climate, (b) Work with climate.

Reducing the use of new resources

Each building should be designed in such a way that minimize the use of new resources and, at the end of its useful life, create a resource for the creation of other structures. Although the orientation of this principle, like other principles referred is towards the new buildings, it should be noted that most of the world's existing resources are used in the current environment, and the restoration and upgrading of the current position of buildings to reduce environmental impacts is an issue that has an equal importance equal to the creation of new structures.

Respect the users

Green architecture respects everyone who uses the building. This principle seems to have little relation with pollution caused by global climate change and the degradation of ozone layer. But the green process of architecture, which includes respect for all common resources in building a complete building, does not exclude human from this collection.

Respect the site

Each building should touch the earth in a calm and light way. Australian architect Glenn Moorcate states this strange statement: building should touch the earth in a calm and light way. This statement has a feature of the interaction between the building and its site, which is essential for the green process and, of course, has more extensive features.

Holism

All the green principles need to the partnership in a holism process for building an artificial environment. Finding buildings that have all the principles of green architecture is not easy because the green architecture is still not fully known (Figure 2).

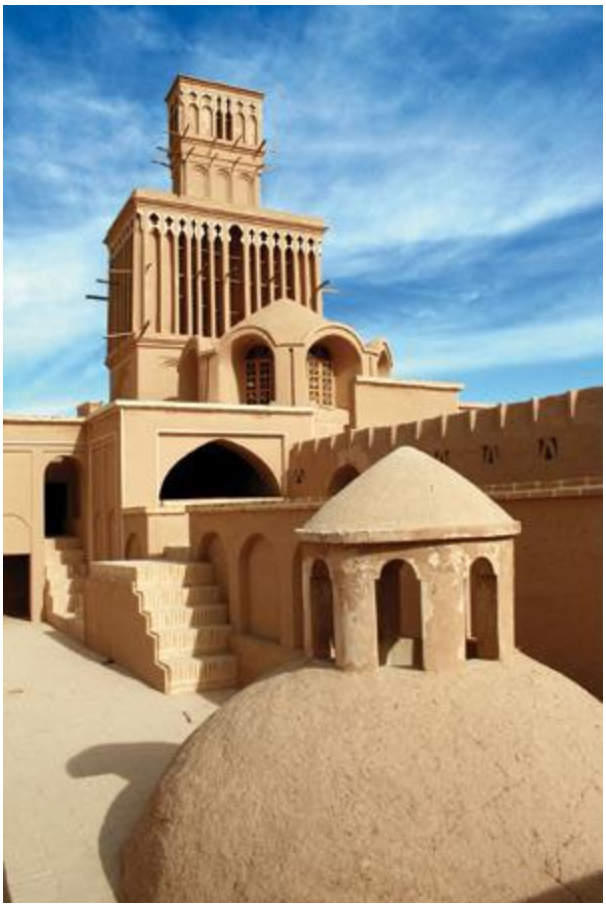


Figure 2. Attention to indigenous elements.

Safe hospital

A hospital that can continue to accepting and treating injured patients in critical situations, without damaging or destroying due to all types of threats. In fact, a safe hospital is a health shelter that allows hospitalization and treatment away from external threats during a crisis (Asgari, et al., 2012).

Types of health centers in operational areas

The relief and health centers in the operational areas are defined and categorized into five categories: relief post, field emergency, field hospital, urban hospital and hospital. The "relief post" is the first and first point of group relief to injured people. The "filed hospital" is the third center for dealing with wounded and injured people in operational areas. It is considered the most equipped and complete medical center located in the front and has various medical sections medical with clinical and preclinical facilities, as well as a medical department and a support department. The main tendency of hospital is emergency procedures and urgent surgical procedures. The last category is "hospital", which has a large health space that extensively operates in both the outpatient wounded people and the chemical injured people (Tofiqi et al., 2010).

The goals of defense air passive in the field of field hospitals:

1. Strengthening the hospital against all kinds of threats;
2. Facilitating crisis management against all kinds of threats;
3. Reducing the impact of enemy actions;
4. Granting virtual function to the building for deception;
5. Locating the building in a space far from risk;
6. Maintaining function of the infrastructures of hospital;
7. Ability to maintain hospital for a critical period;
8. Converting hospital to a safe place, shelter;
9. Dual function for field hospitals (Asgari, et al., 2012).

Requirements of defense air passive in designing stages and construction of field hospitals:

1. Proper location by using statistical methods and related software;
2. Using camouflage and concealment and deception techniques (Ghajavand, 2010).

Field hospitals of zero energy

In the design of zero energy buildings, it is tried to be eliminated utilizing fossil and non-renewable energies and instead of it used renewable energy that can be absorbed by the building. The design of zero energy health camps is very important because it can continue to its activity in critical conditions without the need for energy and providing the necessary energy with capabilities of building. These buildings can use solar, wind, geothermal, biomass, and modern energies to supply their energy needs. Techniques and methods of utilizing types of energies are different and require comprehensive research and collaborating with other applied sciences. For example, in an interdisciplinary collaboration, in Germany, the energy supply of building has been provided using seaweed and energy storage for the needed conditions of building. It is very important in

human and natural crises that service and medical users can provide services to referrals without interruption. In order to do this, buildings must be able to receive energy with their architectural capabilities. In terms of architecture, buildings and their design requires specific changes and features such as building stretch, orientation, shell of building, shading, shadow design, openings, native architecture techniques, materials, type of construction, placement of spaces, etc. that designers according to the type of energy and building capabilities design it to attract more.

In designing facilities of these buildings should also be used modern and clean systems, according to the type of energy used. These systems can also help to reduce energy consumption in line with the intelligent management system of building. The use of high-efficiency electrical equipment, the use of low-consumption equipment such as LED lamps in designing building lighting, the use of building management system (BMS) to monitor and control their equipment and energy consumption reduce energy consumption in building.

Solar energy

Filed hospitals with renewable solar energy

Solar energy is available freely and without any restrictions in all over the world. The clearest and easiest way to use solar energy is to convert it into thermal energy through solar thermal collectors. Therefore it is understandable that the primary development of solar energy systems was focused on energy supply needed to heat the building space and providing hot water needed. By addition of a system known as absorption refrigeration system to solar systems can be used these systems in warm seasons for cooling the building in addition to providing hot water and heating from these systems (Mahdizadeh, et al., 2015). Buildings are able to supply their heat demand from sun in two ways: passive and active quality, how the architecture of building depends on the reception and storage of solar energy in the passive mode. If solar heating as activate requires the use of solar collectors and another source of energy to supply and heat transfer to the building, signs of designing and constructing buildings that used passive solar energy turned back about 2500 years ago, but for a while, these factors have been considered by architects and engineers, and plans have been provided with changes and improvements for temperate and cold regions. In the United States alone, in 1980s, about ten to twenty thousand solar homes have been seen. The passive heating system is a system in which the building is heated naturally and using natural factors such as the sun. This means that such a system makes it possible that building to be operated without the need to external fossil or artificial energy and with very little energy consumption, in other words, some several elements and components have multiple functions, for example, walls in addition to forming external building walls undertakes heat absorption, storage and distribution of heat. Attention to the southern walls and the use of solar energy to provide heat in the building is the basis of buildings that so-called solar buildings. Research and study on this type of building has expanded in recent years, and many such buildings have been built in western countries. The way of these buildings is so that heat energy is acquired from radiation during the day. This energy is stored in substances or liquids such as water that have heat absorption capacity and gradually return heat, to store heat in general, barrels of water is used or building materials used to build the building (Mahdizadeh, et al., 2015). However, the direct conversion of sunlight to electricity stimulated the opinion of many scientists, not only because this technology could effectively reduce the focus of power generation systems, but also the production of electricity from solar energy with low cost and high efficiency has always been the demands of mankind. Simultaneous production of electricity and heat and distributed generation can be considered as a key strategy for reducing energy consumption and avoiding environmental pollution. Given these facts, Thermo-photovoltaic technology can be very effective. Thermo-photovoltaic is a system that can directly convert radiation from a source of heat (eg flame from fossil fuels) using photovoltaic cells to electrical energy. Based on this technology, a domestic gas burner will have the capability to provide all the thermal and electrical energy needed for a residential home (Shahriari & Seif Ali, 2017). The goal of solar Thermo-photovoltaic technology is to provide a high-efficiency solar energy converter and with the possibility of energy storage and the possibility of alternative fuel (hydrocarbon or hydrogen) (Shahriari & Seif Ali, 2017). Applying items such as roof skylights, greenhouses and windward are other factors that can be considered in building design. The use of ceiling lightings will provide part of the lighting required by the building and reduce energy consumption in this area.

Solar pumping system

The system of photovoltaic pumps has the capability to extract water from wells, qanats, springs, rivers, etc. for public uses.

Solar fridges

Solar fridges can be used to service and provide health and nutrition services in field hospitals. The proper function of the solar fridges has been to some extent that over past five years, more than 10,000 solar fridges have been launched for health and treatment applications throughout Africa.

Conclusion

At present, the hospitals built in our country, which are operating, specific requirements for the energy supply and hospital safety in crisis and during energy constraints not has been considered, and after the occurrence of various disasters, the health cycle of patients and injuries will be disturbed by the slightest damage to energy resources and cutting their relation with building of urban hospitals. Therefore, the use of hospitals during the crisis and after the crisis is essential. Examining the different parts of hospital and their direct or indirect relationship with each other, how their internal and external relations have significant importance. Considering the requirements defense air passive in designing and locating health camps and reducing their injuries in times of crisis should be considered by designers. Simultaneous production of electricity and heat and distributed generation can be considered as a key strategy for reducing energy consumption and avoiding

environmental pollution. The use of photovoltaic cells to provide lighting for direct conversion of sunlight to electricity can cause generating electricity from solar energy with low cost and high efficiency in hospital. In addition, by using solar energy and converting it to solar energy by heating solar collectors to heat the hospital space and provide needed hot water, it can be helped to reduce fossil fuels and setting up hospitals in critical situations.

References

Haji Ebrahim Zargar, A. (2015). Analyzing rural architecture of Iran. Tehran: Shahid Beheshti University Publications. pp. 35-54.
Verderber, S. (2010). *Innovations in hospital architecture*. Routledge.
Ghajavand, E. (2010). Application of Biological Fertilizers in Producing Healthy Products for Sustainable Agricultural Systems: Challenges and Opportunities, The first national conference on sustainable agriculture and clean products, Isfahan, pp. 11-12.
Asgari, M., Mirzaei, M., & Savadkoohifar, S. (2012). Examination of Field Hospitals in terms of Defense Air Passive. Scientific Journal of Defense Air Passive, 1(2), 35-21.
Kheirabadi, S.A.N. (2013). Requirements of defense air passive in the design and construction stages of field hospitals, with emphasis on camouflage, concealment, and deception. The Congress of defense air passive in science and engineering, Iran, pp. 10-15.
Tofiqi, S.H., Fathian, N., Mirza'i, A., & Teimurzadeh, E. (2010). Factors Affecting the Choice of the Right Place. Journal of Military Medicine, 4(2), 10-15.
Mahdizadeh, B., Dadras, H., Saeedi, S. M., Zafari, F., & Goodarzipour, M. (2015). New energies in architecture. Civil and Architecture Journal, 4(2), 4-8.
Shahriari, B., Seif Ali, E. (2017). Thermo-Polytechnic Technology and Its Application in Supply Heat Needs and Electricity Energy. Scientific Journal of the Renewable and New Energy, 4(1), 22-26.

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