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JOURNAL OF CIVIL ENGINEERING RESEARCHERS

Investigating the implementation and performance of architecture in zero energy buildings in order to producing passive energy

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Article History: Received date: 2023.02.03; revised date: 2023.03.16; accepted date: 2023.03.20

Abstract

Challenges in recent decades for humans and the rapidly changing planet. The increase in pollution and difficult access to energy despite the problems of war and political and economic disputes between countries and the rapid decrease in the amount of energy in the world, which with this growth rate, is a tangible danger for the whole world. It prompted scientists to look for new methods of energy production and consumption. In this article, we are looking for a topic of such projects, which are called zero energy buildings. As it is understood from the name of this project, the result of all energy consumption and production in these buildings must be zero or the energy production of the building should be more than its consumption, which is the concept of energy related to all the energy in the building such as thermal, electrical and ... which should be considered in the initial calculations and construction. For this purpose, this research, which is a descriptive analytical research, was conducted using library resources and electronic books and articles. We will review the execution and performance of architecture in zero energy building and concepts related to passive energy and building orientation for energy production, architectural components and materials of zero energy building, review the economic approach and leading challenges, construction and operation in connection with zero energy building. The results obtained from this research, zero energy buildings are faced with upcoming challenges such as technical knowledge, efficient and trained staff, and existing laws and regulations. Accordingly, the need to reduce energy consumption and optimize it is felt more and more. Zero energy buildings are the best solution to moderate energy consumption in housing. But reaching this goal has basic and fundamental needs that must be met. (DOI:**https//doi.org/10.52547/JCER.5.1.19**)

Keywords: Architecture; zero energy building; energy

1. Introduction

Today, the correct way of using the available energies in the world has been affected for various reasons, including the relationship between energy security and the economy of governments and societies, and the national and transnational environment of countries. In these few years, with the tangible changes in weather and climates in different parts of the earth, its importance has become concretely clear for the people of different societies,

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it is necessary to pay more attention than in the past and to take immediate measures. [1]

One of the points of intersection of all sciences in the world is the field of electrical energy from production to consumption, every step of which needs to be reviewed. Maybe from the construction phase, for example; A power plant that has a direct impact on the regional climate of the construction site and the many losses it has for us due to the high inefficiency of the systems, than the transmission of energy by traveling very long distances and incurring a lot of costs during implementation and operation, as well as The stage of distribution of this energy can lead to many problems for us and should be considered. By using new and low-error methods in the stages of production, transfer and consumption, we can face the lowest cost and increase productivity. [2]

Keeping these things in mind, as well as other considerations and necessities related to optimization in energy production, transmission and consumption, one of the ways to increase productivity is to bring these steps closer to the point of consumption, such as designing and building a zero-emission building. By applying modern engineering sciences in fields related to the goal, such as civil engineering, architecture, electricity, etc., we can lead to increasing energy security and reducing losses in the stages of production, transmission and consumption. In the present research, the method of passive energy production with the implementation and performance of the architectural type in the zero energy building is investigated with the aim of optimizing energy and increasing productivity and production under the title of creating zero energy in buildings. [3]

2. Statement of the problem and necessity of research

Old buildings consume 40% of the total fossil fuel energy in the country and are important producers of greenhouse gases. The principle of net zero energy consumption is considered as a tool to reduce carbon emissions and dependence on fossil fuels. Although zero energy buildings are uncommon even in developed countries, they are gaining importance and popularity day by day. Before producing clean energy, the zero energy building optimizes the energy consumption in different parts of the building and balances energy production and consumption with the smart use of renewable technology. The importance of the research and use of such buildings can be the protection of the owners of these buildings from the increase in energy prices, greater comfort due to the design and regulation of the environment temperature in a uniform and isothermal manner, the need for less energy, and lower maintenance costs due to high energy efficiency. , reduction of net monthly living costs, high reliability, for example, photovoltaic systems have a 25-year warranty and rarely suffer from problems caused by climate changes, reduction of costs due to the reconstruction of the building if you decide to convert it He called the zero energy building in the future, increasing the value of zero energy buildings compared to traditional buildings with the increase in the cost of fossil fuels.

3. Research purposes

The idea of these zero energy buildings is to reduce the consumption of a building that actually offers zero energy living and working facilities in a space without fossil fuels, without a doubt, the construction of zero energy buildings will be a need for future thinking. For the future success of these buildings, creativity, precise timing and collective cooperation between different groups are required. In fact, zero energy offers the possibility of living and working in a space without fossil fuels. These buildings produce energy throughout the year based on their energy consumption needs. Proper physics and structure and the use of renewable resources in these buildings make it possible to achieve the above goal to a great extent, which can be attractive to engineers and designers.

4. research background

Esadi and his colleagues [4]. In an article titled design, construction supervision of buildings with net zero energy with the aim of sustainability in energy sources were investigated. In part of their article, they

have investigated passive energy and have come to the conclusion that such buildings can be used in addition to integrating optimization of passive-active strategies in the initial phase of a building's life cycle, timely monitoring of energy consumption in The time of use of the building during its lifetime also did. At the end of their work, they have mentioned the general implementation strategies for the realization of zero net energy buildings. Abbasi and his colleagues [5]. In an article entitled "A step towards the implementation of the principles of sustainable architecture" (ZEB), they gave solutions for realizing the idea of zero energy buildings. In their article, they presented the solutions to realize this idea of zero energy buildings in two parts: 1) theoretical discussions of the design of these buildings and 2) implementation and construction methods. Based on the results of their research, it is possible to help realize the idea of these buildings with active and passive design methods.

5. Definition of the general concept of zero energy building

A zero energy building is generally referred to as a building whose energy consumption can be reduced to a large extent by using different methods and its energy production is compensated by the use of clean sources and renewable energies. At the heart of the concept and general idea of zero energy building is the idea that buildings can meet all their energy needs in a low-cost way, with local access, without pollution and with renewable resources. It is very difficult to find a building that can be called the first zero energy building. Because zero energy is just a new name for the progress of reducing energy consumption in buildings [6].

In a zero energy building, no fossil fuel is consumed and its annual energy consumption is equal to its annual production. A zero energy building may or may not be connected to existing city networks. A zero energy building that is not connected to the grid has equipment for storing large amounts of energy, which is usually of the battery type. In a zero energy building that is not connected to the grid, due to the shape and type of battery storage, a part of the circuit may remain unused, while in a zero energy building connected to the grid, no circuit is unused and is not isolated. A zero energy building connected to the grid may generate more electricity than it needs. During the period when the building does not need production energy, i.e. when we are using the energy stored in the batteries, a zero energy building produces the energy it needs, as well as providing the owner with reassurance about the security of the storage. Surplus energy gives off its own needs [7].

6. Passive energies

The use of latent energies has been the focus of mankind since the distant past, and even today it is considered as one of the facilities to be considered in choosing a good building. Now, with these interpretations, we can point to the vital role of latent energies in building construction [8].

The term buildings facing the sun or wind has always represented the quality of the property, which had special uses in different hot and dry, cold and humid, mountainous or desert areas.

Architectural engineering has a fundamental role in using hidden energy mechanisms, such as:

- Selection and optimal use of sunlight in the building according to the geographical location and seasons
- Use of daylight concepts
- Using the prevailing wind direction continuously and seasonally
- Separation of building spaces and zoning based on usage (bedroom, kitchen, etc.) and different cooling, heating and lighting needs.
- Using underground spaces and returning cold air in summer and hot air in winter

7. Elongation and orientation of the building and placement of internal spaces

The length of the building as well as its orientation has a significant impact on the acquisition of thermal energy from the sun and also the use of natural lighting of the building. In zero energy buildings, they try to build the building in one or at most two floors, and on the other hand, they spread the building on the ground. In addition to making more

space available on the roof for the implementation of facilities, this causes more spaces to be placed on the south side of the building and increases the possibility of using the sun's energy during the day [9]. The location of these spaces on the south side makes it possible to make maximum use of the light and heat of the sun in these spaces. In addition, due to the higher traffic that takes place in these spaces, their placement on the ground floor makes it easier to access these spaces and prevent energy loss in other low-traffic spaces. Spaces with less use are also considered on the north side of the building and on the first floor. Considering that these spaces require less energy, their location on the north side allows them to access the energy they need only through the utility system of the building and when in use, as well as their location on the first floor of the building and Staying away from high traffic places makes them waste less energy.4- Review and compare the results

8. How to place spaces in the building

Placement of spaces with high heat demand on the south side of the building

Placement of spaces with low thermal requirements on the north side of the building

Placement of spaces with high traffic on the ground floor and near the entrance of the building

Placement of spaces with low traffic in parts far from the entrance door or the first floor of the building

Due to the fact that the angle of the sun's radiation in different parts of the globe is different depending on the geographical coordinates of that point, therefore the orientation of the building in each part of the globe is also different to absorb the maximum solar energy [10] . Then, according to the conditions of the building and the priorities considered for it, the best orientation for the building is chosen.

9. Use of shade on the facade of the building

The use of shade in tropical regions reduces the cooling load of the building during its cooling period. But in areas with a colder climate, this can have a negative effect on the heating process of the building in the cold seasons of the year. Therefore, it is necessary to optimize the size of the shades that are chosen for the building, according to their effect on the amount of solar energy received during the heating period of the building [11]. Types of shades may have different effects such as direct sunlight control, light control, landscape and natural ventilation. The importance of these effects depends on the location and type of building. Figure 1 shows the effect of using sunshades with different positions on the amount of solar energy absorption.

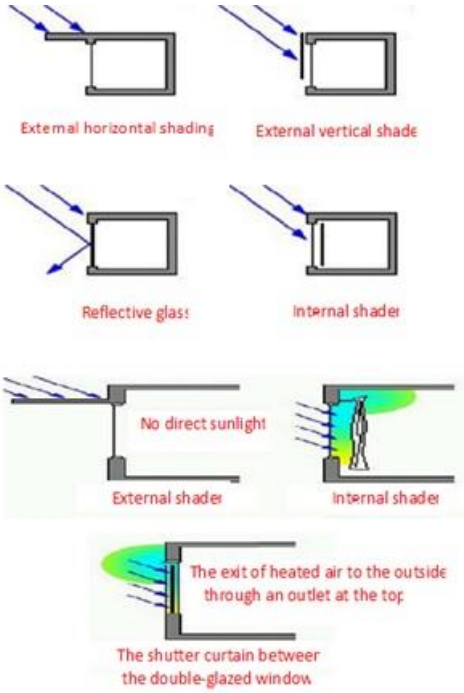


Fig 1: Comparison of the types of shades according to the installation positions

10. Use of wind deflector in zero energy building

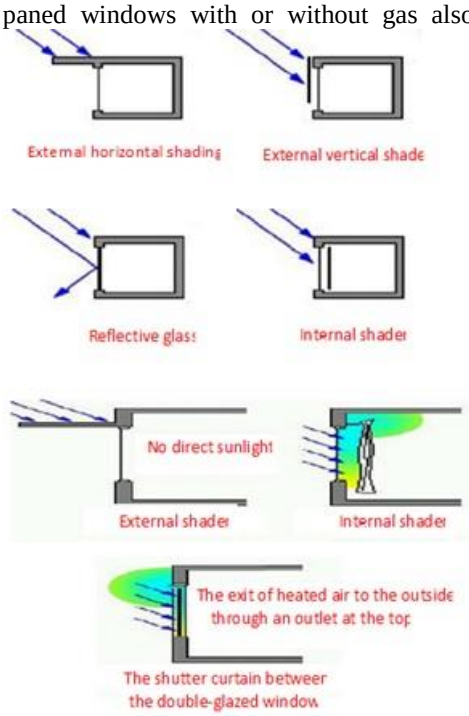
The use of wind turbines has been common in Iran since ancient times. Wind deflectors with different shapes have been built in the central and southern cities of Iran, each of which has been designed and implemented according to the desired height and direction of the wind. He observed the hot and humid south in cities such as Bandar Abbas, Bandarlange, Qeshm, Bushehr and the hot and dry climate of the

central regions such as Kerman, Nayin, Yazd, Tabas, Kashan, Semnan, Isfahan and even the southern areas of Tehran city [12] .

Since in the building, one wind deflector is used as an inlet and another as an air outlet, therefore, for its design, the winds of the area are examined and the inlet tower openings are open towards the prevailing wind and the outlet tower openings are closed in this direction. Also, the height of the towers and the opening level of the openings are designed according to the amount of air flow required.

11. Isolation

It is necessary to isolate the external walls, floors, ceilings, etc. in such a way that the exchange of energy with the outside space is as minimal as possible and practically the whole building is considered as an isolated component. For this purpose, it is necessary to comply with building insulation optimization standards both in terms of applied materials and the way of implementation for different geographical areas. Also, the use of 2- or 3-paned windows with or without gas also prevents



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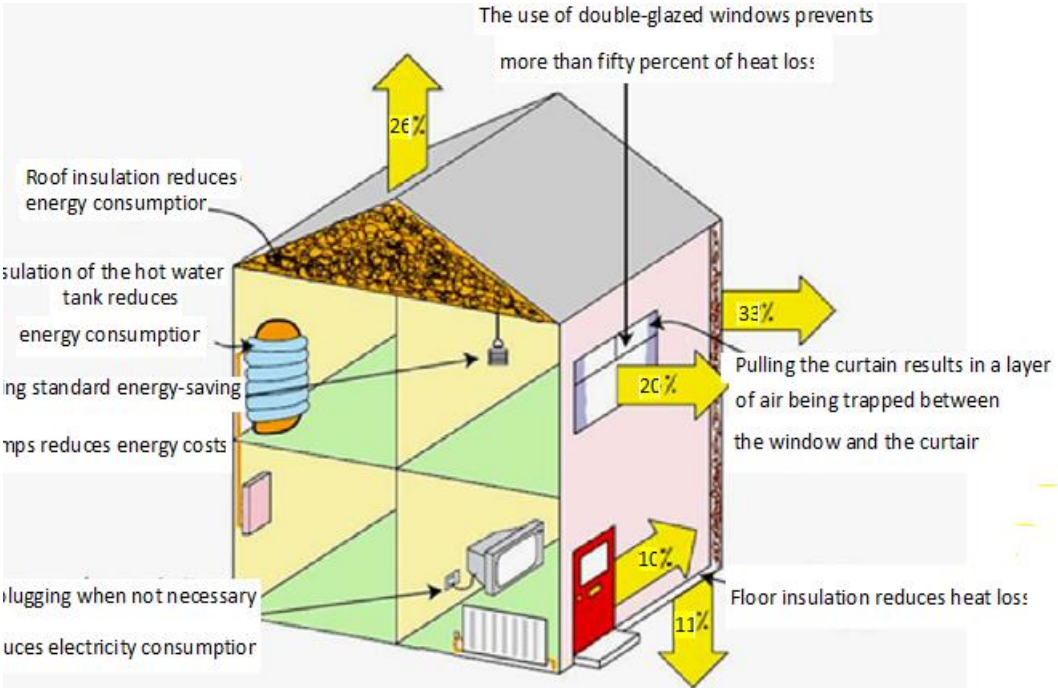

Fig 2: The role of insulation in reducing thermal load

13. Static approach in architecture

With the large expansion of air conditioning systems and available sources of cheap energy in the 20th century, architecture no longer had to respond to climatic limitations. By using artificial facilities to control environmental conditions, the interior space of any building can be adapted to environmental comfort standards. Therefore, the use of emerging architectural materials and forms became possible. This argument also led to the forgetting of knowledge and skills in the field of energy and static design in the architectural profession. In addition, with the increasing expectations of the audience in the field of controlling the conditions of the indoor environment, people are used to constant temperature and light conditions throughout the year.

The most general definition of a passive solar heating and cooling system is that thermal energy flows in it in natural ways such as radiation, conduction and natural displacement. Basically, the structure of the building itself or some of its elements constitute the system itself. Static design is defined as the use of architecture and climate to provide heating, cooling, ventilation and light. It is also possible to change the static design by using architecture in order to harvest the free energy of the environment. Utilizing static design in parallel with equipment with low energy consumption will lead to the creation of an interior space with optimal quality.

Static design is not only an opportunity in the field of energy but also an opportunity in the field of architecture. In static design, the relationship between energy and space is defined in a beautiful, functional and meaningful way. The most successful buildings today are the buildings that have correctly followed static strategies, and the most progressive architectural offices are those that have invested in advancing these methods. It can be said that the history of architecture is closely related to static design because static design techniques for dams (if not millennia) have been very common in the history of architecture.

14. Static strategies

The ease of designing 100% active buildings is definitely one of the most important obstacles to the expansion of static or double buildings. But by passing these obstacles, there is a valuable opportunity to improve the quality and productivity of buildings. Static strategies usually do not completely replace active building systems, but in most times of the year they come to the aid of active systems or replace them. This double combination of active and passive solutions leads to the present combined buildings. In fact, a successful zero energy building benefits from an integral combination of active Vista systems. Static solutions are usually used to provide one or several of the 4 basic building services, namely heating, cooling, ventilation and lighting. The techniques related to static cooling and heating are given below.

14.1. Construction shell

The shell of the building is the front line of the building's exposure to the outside environment and climate. Therefore, it plays a key role in the application of static systems and should be investigated along with the issues related to orientation and building mass, as well as the design of electrical-mechanical systems. The building shell is a key element in the energy performance of any building, but it plays a vital role in the performance of zero-energy buildings. Orientation, building mass and proper design of the city make it easier to overcome thermal loads. These issues, along with a building shell with appropriate design and details, are considered the key to successful neutralization of the shell. The concept of neutralizing the building shell means neutralizing the thermal loads of the shell. The neutralization of the shell leads to the reduction of the surrounding cooling and heating loads. Shell parts should be designed with a minimum thermal transfer coefficient and insulating materials with a maximum thermal resistance coefficient.

14.2. Duplex view

The use of two skins is a solution for neutralizing large glass surfaces. The ease of controlling the heat of the sun and the improvement of thermal resistance

due to the cavity between the two transparent layers are known as the advantages of this method. With the advancement of surfaces with glasses with a reflective coefficient, the possibility of controlling the energy received from the sun increases. Figure 3 The function of these glasses is that they limit the transmission of ultraviolet and infrared waves in the sunlight spectrum and at the same time they absorb the waves of the visible light spectrum. Also, the solar heat transfer coefficient and the glass resistance coefficient have been optimized.

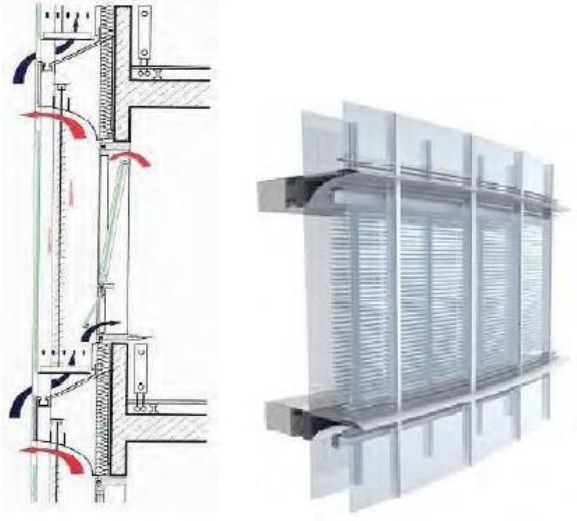

Fig 3: double-glazed facade - controlling the heat received from the sun's rays due to the use of glasses with a low diffusion coefficient - creating air flow with appropriate details

14.3. The ratio of the opening to the walls

This ratio is a critical factor in creating a balance between thermal capabilities and performance benefits such as daylight and visibility. However, window design is influenced by the orientation, climate and functional program of the building. The ratio of the opening to the low window is suitable for climates with many cold or hot days and for climates with a lot of sunlight. It also moderates the weak thermal performance of the window. In addition, a lower opening-to-wall ratio is synonymous with a lower glass surface and, as a result, a lower cost. This saved cost can be used to improve the thermal performance of the window.

14.4. Advanced technologies of transparent surfaces

Chromogenic glass or smart glass can change its characteristics based on environmental stimuli. Chromogenic glass includes gas-reactive, electricity-reactive, light-reactive, and heat-reactive types.
Airgel: Airgel is a new generation of insulating materials that creates a high thermal resistance while allowing light to pass through. Airgel is used in the air chamber between the glasses and as a result the transparency of the glass piece is maintained.
Thermal mass: transparent phase change materials are added to glass parts to play the role of thermal mass.
Movable shading: self-made or manual shading is installed inside the glass parts, their internal or external facades, and they provide the possibility of complete shading or unobstructed vision (when shading is not needed).
Prism glasses: Glass or plastic glasses are used to direct sunlight. The use of this type of transparent material in order to direct light to the depth of space has a historical background. Its other use is the reflection of wide-angle rays and at the same time the passage of low-angle rays, which improves the control of solar absorption during summer.
Built-in photovoltaics: Some photovoltaic technologies are embedded inside transparent glass parts and generate electricity. Depending on the need for shade or visibility, variable values of glass transparency or opacity can be achieved.

14.5. Thermal mass

Heavy thermal mass materials have high density and thermal capacity. Materials such as concrete, stone, masonry and water have the ability to store heat and return it to the environment when the ambient temperature drops. This short-term thermal storage has many cooling and static heating applications. One of the benefits of the thermal mass is the adjustment of daily temperature fluctuations in the indoor space. It is better for the thermal mass to be exposed in the inner space to be more effective in regulating the temperature.

14.6. Insulation

The outer shell design has a great effect on reducing heat exchange through the building shell. The main

approach in insulation is to use parts with high thermal resistance coefficient. The integrity of the external shell forming elements is a factor that causes the integrity of the building shell, the reduction of thermal bridges is another very important factor, insulation of the shell is very necessary in cold climates that require considerable energy. In more moderate climates, insulation is important to control the heat exchange with the environment and to reach the equilibrium temperature point.

14.7. Connection with the earth

The ground is a mass thermal mass that can be used as a tool to achieve an almost constant internal temperature throughout the year. In fact, the temperature of the earth is cooler in summer and warmer in winter than the surrounding air. In some places, the temperature of the depth of the earth is constant throughout the year and is almost equivalent to the average temperature of the air in the region. At critical times of the year, the outside temperature affects the temperature of the earth. Also, the characteristics of the soil and the surface of the earth's crust are also effective on this temperature. This solution has been manifested in traditional architecture in an element called "Shavadan". Figure 4 shows the relationship between the air and the internal temperature of the earth.

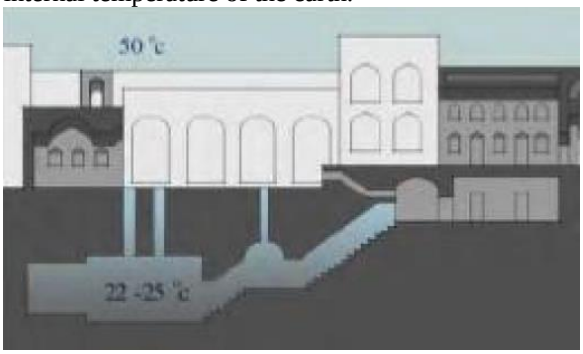

Fig 4: Connection with the ground

Connecting with the ground or sheltering in the heart of the ground by digging and penetrating into the ground causes the temperature outside and inside the building to have more balanced differences. This reduces the heat exchange inside the building. Connecting with the earth from a distance by drilling long pipes in the heart of the earth is a method to provide cool air and transfer it to the interior space. be viewed with caution.

14.8. Shading

Shading is one of the primary cooling strategies that has been tested over time. Avoiding heat should always be the first priority for cooling. Shading is highly dependent on climate and building characteristics. This means that the design of the shade should meet the needs of seasonal cooling, the orientation of the building and the path of the sun throughout the building. Since glass surfaces are the main way of receiving the sun's rays, shades are usually designed in relation to glass surfaces. But the shading should be in such a way that it does not interfere with the lighting due to daylight.

14.9. air conditioning

Natural ventilation is a simple and effective tool that provides cooling and fresh outside air for the residents of the building. Opening windows used to be used in commercial buildings, but nowadays they are very rare. Today, commercial buildings usually have a highly engineered environment, and opening windows interfere with the proper functioning of many common air conditioning systems. However, natural ventilation can be used along with many low-energy air conditioning systems such as evaporative cooling and radiant cooling.
Whenever the building needs cooling and the outside air is cool enough, natural ventilation will be an effective cooling strategy. The movement of air in the building and the resulting cooling phenomenon make the residents comfortable and absorb the excess heat of the building during the night. For this purpose, suitable ventilation paths for lateral ventilation and chimney ventilation should be carefully considered in the design of the building. These techniques rely on the differences in air temperature and wind pressure to move the air. Opening windows are the most common method, but other solutions such as ventilators, wind towers and solar fireplaces can also be used.

14.10. The solar collector protrudes

Protruding solar collectors are an economical technique for static heating of outside air for use in ventilation or heating systems. Figure 5. The protruding solar collector consists of a corrugated metal panel with a dark color that has tiny holes.

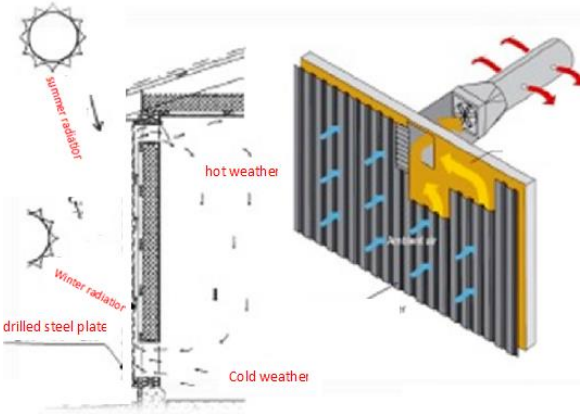

Fig 5: Protruding solar collector

In order to receive optimal solar energy, the panels are installed on the south face with a distance from the wall so that air flows in this gap. The air enters through the small holes on the sheet and is heated by receiving the sun's rays. Then the preheated air can be used for heating the ventilation air. Since the warm air rises under the collector, usually the air is collected at the top of the building. It is also common to use an electric fan to direct the air inside the collector. During the cooling periods, the air inside the collector is discharged from the top.

14.11. Receiving internal heat

Every building absorbs internal heat from people, lighting equipment and other equipment. When the building is in heating mode, receiving internal heat is a useful static solution, especially when it is done in parallel with complete insulation and air sealing of the building openings. This technique is more efficient by recovering heat from the exhaust air of the ventilation system.

14.12. Evaporative cooling

Evaporative cooling is widely used in hot and dry climates. In this system, water is placed in the vicinity of hot air, then the heat of the air is absorbed by the water and the resulting steam is absorbed in the air. With the continuation of this process, the air temperature decreases and its humidity increases. Evaporative cooling may be done with an electromechanical device with low energy consumption. This technique can also be used statically by using a tool such as wind tower.

14.13. Static dehumidification

In climates with high humidity, high humidity reduces thermal comfort and requires a lot of energy to overcome it. Just as hot dry air can be statically cooled by evaporating water and adding to the amount of air humidity, it is also possible to statically dehumidify the air using a dehumidifier. By removing moisture from the air and changing its phase to liquid, the heat of the air is added. Silica gel is a common dehumidifier that is used in many dehumidifiers. After each dehumidification cycle, the dehumidifier must be dried. Static dehumidification is still not very popular.

15. Economic approach

The construction of buildings that can provide all of their energy needs around the clock with renewable energy sources requires a detailed economic evaluation, therefore, depending on the area where such buildings are constructed, the economic efficiency of these buildings is very important, because the return of capital costs Construction in the shortest possible time is of particular importance, there are many differences of opinion regarding the issue of how the investment return should be, whether the said building can be called economic or not, which is considered a research vacuum. The use of energy in the world is growing rapidly, and there is concern about the supply, exhaustion and loss of fossil energy sources, as well as their environmental effects (ozone layer hole, global warming, climate change, etc.) and the global share. Residential and commercial buildings in energy consumption have continuously increased, and for this reason, energy efficiency is the main goal in today's buildings, and therefore, the construction of zero energy buildings is a necessity.

15.1. Effective conditions in economic analysis

In designing on a specific piece of land, the following factors are recommended to prevent heat and cold waste:

- Choosing the land, the land that has good access to the winter sun is the right land.
- The orientation of the shape of the building, the optimal orientation of a building to collect heat from the sun in winter is considered. Studies show that the optimal economic state is the highest level in the direction of 5 to 15 degrees southeast.
- The use of solar systems, solar windows, solar wall, solar roofs, horizontal and vertical canopies, shade trees, wind deflectors, ground heat, underground and...
- It is possible to reduce the ratio of the surface of the outer shell of the building to the useful volume, the ratio of the roof surface to the useful surface of the building, and the ratio of the surface of the openings in the outer shell (doors and windows) to the useful surface of the building.

16. Challenges of zero energy architecture in I.R Iran

Iran, as a part of the world, is not exempt from international crises. Including the increase in earth's heat and greenhouse gases, and in some directions, even more severe effects can be observed. Including air pollution in big cities, which is caused by the production of gases caused by the improper burning of energy in the housing and transportation industries. Iran, as one of the largest producers of fossil energy, may not have to worry about its shortage in the future, but considering that oil and natural gas account for about 31% of Iran's total energy consumption.The slightest problem in energy supply puts the country in irreversible crises.

The intensity of energy consumption in Iran has increased by an average of 1 percent annually in the last decade, which has reached 5 percent. The reasons for the increase in energy can be considered the increase in population, urbanization, the lack of comprehensive environmental laws, the wrong consumption pattern and allocation of government subsidies. The share of the housing sector in the country's energy consumption is 15% and it is the largest producer of greenhouse gases, and due to the growth of the construction industry, it is increasing day by day.

Another problem in contemporary Iranian architecture is moving away from traditional architectural methods and principles, which unknowingly caused many problems in terms of energy consumption due to being influenced by modern architectural methods and technology that are used in large numbers. For example, we can mention the problems of new buildings in hot and humid and hot and dry areas. For this reason, achieving principles in the direction of sustainable architecture can be a bit useful to return to architecture compatible with nature in the style of the past.

Accordingly, the need to reduce energy consumption and optimize it is felt more and more. Zero energy buildings are the best solution to moderate energy consumption in housing. But reaching this goal has basic and basic needs that must be met. A review of contemporary architecture in Iran and contemporary architecture of developing countries shows that these countries, like many developed countries, move towards the concept of sustainability and sustainable architecture on the agenda. have placed The challenges facing the design and implementation of zero energy buildings in Iran's contemporary architecture can be analyzed in the following three axes, which are:

- Technical knowledge: the necessity of reproducing local technical knowledge in the field of contemporary architecture, especially the design and

implementation of zero energy buildings.

- Efficient trained force: Efficient trained force is the basis of achieving optimal patterns in the field of design and implementation of zero energy buildings, which is why they have mentioned it as the basic pillar of realizing the concept of sustainability and sustainable architecture.
- Laws and regulations: Laws, regulations and regulations derived from the principles of the concept of sustainability and sustainable architecture are considered an important and essential step in this field. Laws, regulations and ordinances that directly or indirectly interact constructively with the construction industry and housing production.

17. conclusion

In this research, choosing the type of architectural system that fits the climatic, economic and technical conditions of Iran in order to achieve the concept of zero energy buildings in a practical and practical way is of particular importance. For this purpose, the use of modern equipment and efficient technology

Above should be in such a way that it meets the needs of energy, economy, repairs and maintenance in this type of buildings, and in this research, common static solutions in the field of cooling and heating of zero energy buildings such as insulation, ground connection, air sealing, shade Endai, building shell, thermal mass, natural ventilation, protruding solar collector, receiving internal heat, evaporative cooling and dehumidification have been discussed. The economic approach and existing architectural challenges in zero energy buildings are stated.

The idea of these zero energy buildings is to reduce the energy consumption of the building, which actually offers zero energy living and working facilities in a space without fossil fuels. Without a doubt, the construction of zero energy buildings is the need of the next century for the future success of these buildings, creativity, Accurate timing and collective cooperation between different groups. In fact, "zero energy" offers the possibilities of living and working in a space without fossil fuels. These buildings produce energy throughout the year based on their energy consumption needs. Proper physics and structure and the use of architecture in these buildings make it possible to achieve the above goal to a great extent. Zero energy buildings face challenges such as technical knowledge, efficient and trained staff, and existing laws and regulations. Accordingly, the need to reduce energy consumption and optimize it is felt more and more. Zero energy buildings are the best solution to moderate energy consumption in housing. But reaching this goal has basic and fundamental needs that must be met.

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