Solar Wall Design Pattern Optimization Approach Using Light Energy

Mohammad Rezaei Afkham

M. A., Department of Architecture and Urban Planning, Zabol University, Zabol, Iran

ABSTRACT

Energy critics is one the most important subject that the first world countries which is guiding to apply sustainable sun energy though in Iran this affair has become important by increasing the price of energy such gas and electricity. The goal of this survey is designing the sun wall in the south plan of apartment considering by this we can apply the best of brightness in day and a mixture of heat in night and also as a obstacle in summer we can use two – layer windows for having better heat and brightness we can decrease from the disadvantages of sun light inside the apartment. The result of this survey which is on plan and form of apartments and applying the same sun wall by application of unqualified materials by using poly styrene units we can point to the stability and getting brightness for increasing the quality and qualification, we can offer usage of a rural of official apartment. The mentioned planning is by software, making the same model and saving energy counted in summer and winter.

INTRODUCTION

The critics of energy and ending fossil sources and on the other hand the problems on the other hand cause countries to decrease and saving energy sources. Applying rechargeable energies and even giving solutions in better usage of energy especially in apartment stage which it have a big share of energy usage. Perhaps of the reasons which cause high usage of energy is being cheap and they cause lack of attention in saving and one the best solutions is applying a mixture of modern and old architecture which leads to better usage of energy, for near future if the needs are provide better we are not limited in and we can overcome all problem and certainly we will have better future. The official apartments are in lack of providing desirable heat for them and this may lead to their dissatisfaction and no well working. Also not applying a proper a specific heating territory in theses apartment cause, making unsuitable heating conditions which it lead to applying lots of fossil energy. Though in Tehran the sunshine is suitable it is better in big apartment which their fossil energy is higher so it is better to apply rechargeable energy sources especially sun. The goal of this article, is making a better view in planning which the southern side and a study on decreasing energy supply is just by making southern plan in Tehran. The result of this survey which is depending on mobile planning (Planning the parts of an official apartment from the elements of apartment planning) or it can lead to better providing brightness and sun shine.

Requisite of paying attention to official apartments:

The official apartments in Tehran are ill apartments in planning. Most of these apartments are made of glass which they do not pay attention to energy supply. The glass is a king of element which because of high rank of transferring heat so it has the most waste of energy, the brightness which has not controlled can lead to different problems such: leaving the view and heat health. By a simple survey in seven official apartments in Tehran an in 12 kind of official states with different arrangement we reach to considerable results. Due to the result which are gained the majority of these clerks of these seven official apartments especially the people whose desks were aside the window they were not satisfied of view and heat. The effects of these affairs were measured for the 3 of Mehr to 15 and in the mentioning apartments in that period of the time the mechanical system was not working. In the selected apartments in that period the mechanical system was not working and people replied the questionnaire depending on the information they had in that period. The kind of clothing was not very impotent that all women wearing fall Mantua and men were wearing shirt with sleeves.
During the above tables 143 clerks of these apartments with the average of working 8 hours a day were studied and half of them and 71 people of these were passing beside a poster and their desk were situated beside the window. Although the people expressed their satisfaction but none of them has got the proper heating.

![Fig. 1: Wasting of shining energy cause heat dissatisfaction.](image1)

Meanwhile some hours of the day would change the angle of sun shining, depending on the arrangement of desk day sun shine because using some obstacles against brightness like curtain and it does not let using out site view.

As the statistics show most of these areas use artificial brightness and in most of the hours of day the windows are covered. Between the people on this survey just 38 % of them have heat satisfaction and this rate about view satisfaction by applying artificial brightness is totally higher how 60% of people were satisfied.

**Wall:**

The wall is a vertical and solid material as using for protecting. The wall defines the territory of a building and protects of it, divide the apartment id different squares and make parts in open areas. There are three kinds of walls: Apartment walls, Corridor walls and protecting walls. In this article we use different kinds of walls in apartment and just we study this proper one.

![Fig. 2: Wall against sun shine.](image2)

That aspect which is more important in this survey, the point of heating obstacle and preventing of transferring the heat to outside and vice versa. Before the walls played a roll as gathering the hest and they provide heat satisfaction by this. In these kinds of wall the heat absorbed of sun were saved and would pass the wall after some moments. This proper time was usually more than six hours which it was the different time of day and night. It means that during noon time most of heat was absorbed, this energy was transfer inside with a delay which it helps a lot by night decreasing heat but today the length of walls have an essential affect and the architectures are trying to make slim walls but transferring the least of heat for saving energy. And make the apartment isolated in front of transferring cold and warm heat. (Picture2)

**Wall Drivel:**

Dry wall is a kind of wall which call in Persian not wet wall. Because in this kink no apply subject of wet does not use like Sand, Cement... This kind of wall is made of vertical and horizontal water corridor on roof and base are used. Because of punches of axe cells this wall is quake resist. After that it is the cover turn which is made of chalk or usually they are cement in measurements of 240 x 120x 1.5 and they punched on the vertical subject. Different kinds of Drivel systems: Separated walls, covering walls, unstable roofs, anti – firing systems of apartment.
Separator walls:
The separator walls are not carrying wall which divide the spaces in side an apartment. This contraction comprised of steel light frames which they have layer of chalk that they screwed to them. The empty space of inside the wall can situate acoustic and heat resist and can have the electricity and mechanical construction.

Fig. 3: Procedure of action: making steel frame, setting up first layer of chalk panel, setting up resist, setting up chalk panel.

Covering walls, suitable constructions for making the walls which they are anti-heating or the walls for the apartments they are going to use, in addition in these constructions we can set up chalk walls though by overcoming its problems of architecture we can put electrical and mechanical instrument so easier.

Generalization of applying Drivel systems:
Drivel systems are much better than the traditional form and off course setting up Drivel systems cause more savings in designing and less statistics also by setting up it we can save energy and costs. Applying light walls instead of traditional walls lead to decrease the weight of construction 36% and decrease the quake to 59% and the drivel systems are better for designing for kitchens and services and bath by the reportage of Kenzbang this kind of resistance is cause less layer in oil product applying. Drivel systems are better for designing for kitchens and services and bath by the reportage of Kenzbang this kind of resistance is cause less layer in oil product applying. It makes possible to produce one layer in damp places.

Better applying energy by Drivel:
Apartments are the places energy is using and wasting now the energy which is using in apartments is about 40% of the total energy of country which it has the biggest share between the other parts share and this is in the position it can be saved by applying this form in buildings.

Unclear Sun wall:
Introduction and History:
The glass system unclear wall is a kind of heating which conserve the heat of sun in construction. This technology is about 20 years which is provided by Kansoval Canadian Company. When for first time this technology has been applied in Iran, it was informed as the best system by the libratory of energy in Iran and it has been appreciated already. From that time it has been applied in different buildings in different weather positions and its well application has been proved. The advantages of applying unclear sun wall are the following by Kansoval Canadian Company:
- The sun wall unclear can prevent the heat of sun at least for 30 years in the wall and make it current in the building freely.
- This system can join to any building which uses anti heating system and there is no need of being in designing term.
- The Sun wall unclear system makes it free of providing de oxide Carbon gas.
- The low cost prevention helps air conditioning the weather inside the buildings.
- It helps cooling the building in summer just by adding a layer
- This system can assemble behind the panels of photo volcanic from the heat produced by these system make a hybrid energy supplier.

Limitations:
The fresh weather. Because of this these systems can just complete the apartment heating systems and they can not replace of it. The panels of sun walls can just assemble in the wall which they are anti fire.
Confirmed standards:
The sun wall is a kind of product invented in green buildings and has been experimented. From the application point of NSTF by the heat GI/m² each sun system can produce 1.5-3.5 energy and the rate of absorbing sun rate increase till 80 and decrease the dioxide carbon gas. The element can be also recycled in the nature again.

Adding up the advantages of sun wall:
- Decreasing the wastes of heat:
  In the wall to direction south the wasting heat and the gap and the weather absorbed in interred the building again. And even in the night the sun wall decrease the waste of energy.
- Helping the coolness in summer
  The sun wall by preventing the shining sun to the Southern wall helps to coolness in summer.
- Improvement of inside weather
  According to the negative effect of uncontrolled weather cause increasing the heat, the sun wall by warming the coming weather solve this problem.

Better weather contribution:
The external fans work better for cleaning the inside weather and decrease the windings of weather too.

Designing the window with portable obstacle:
As an official apartment is applying during the day, using the southern part is possible as the building apply all the day from the sun shining. This affair is not possible otherwise applying a portable obstacle in southern clear sides. Paying attention to this point cause searching on it that how can we make a window during the day absorb energy and save or the night. Certainly applying two-layer windows filled with gases could decrease the transition of energy but during the surveys in this article and simulate the computer forms we reach to this result that two-layer windows with decreasing transition of heat and the use of shine and energy of sun would decrease during the day. This means that these glasses are more useful in night than during day. All the surveys for investigating the best obstacle case this search to applying poly Styrene seeds.

The acting of window by Poly Styrene obstacle:
This system act in this way that a repertoire should be situated in any possible part of building, when its engine turn on and it begin to work it sucks the poly Styrene seeds and transfer them to parts of window. When it works vice versa it gives the weather of window and transfer to the gap between two layers.

By making well divisions on windows or filling or emptying of down part, this position is made that participant can feel the widow of sun shine and they can apply the other advantages of sun shine. If the poly styrene seeds did not feel the gap between the windows you can turn off the engine and you can have the same brightness and view of the room also.

Making times to apply suitable of portable obstacle in window:
According to the results which gained of computer forms the results are as the following: The best time of applying the obstacle window is in winter nights that it can cover the entire window and it increases the power and with attention to gaining the power during the day they save energy in the repertoire. In cool summer nights of Tehran the transition of weather is for inside is desirable and applying the obstacle is not offered. This process was used in computer model.

Glass walls and their current problems:
In Iran most of the glass building has got the syndrome of ill building and this can be more understand that it make glass building in one layer and the transition of energy becomes easier. In the best form that designer's design the glass building with one layer obstacle the excess to the external layer is impossible. In addition two layer buildings there is no portable part and these all objects make better position for the kind of wall in all of the buildings or they cancel using of it or do not put it in suitable part.

The course is used in computer simulator:
For designing 2 they applied the software of auto cad in this designing. Because of this the designing was on the southern part and the goal of this survey is measuring the application in the official apartment (as using the glass building or windows in southern part) on the other hand this system is thermodynamically isolated that it does not transfer any heat to its around. The surface of without transition is telling to the surface which does not transfer heat. This surface in expression told it is isolated. The other suppose about the apartment is that it has got three zones of official an lobby parts and they were not control in designing instead of official and mechanical parts in the measures of 3.80 x 2 that it has got 72 numbers and they were made of glass wall.
In designing the official part some windows with the measurement of 7.6 meter of square were designed. The systems of portable obstacles were used so by this some repertoire was supposed in above and down side of windows. The gap between these two windows were supposed 6 cm which in the moments it is necessary to use the poly styrene seeds breathed between them so this portable obstacle help us when in winter days we need to catch more sun energy, this energy by the un obstacle widows enter inside and in times we do not have sun energy and it should preserve the heat it absorb during day and the obstacle windows with the rate of transition \((46.7\, \text{W/m}^2\cdot\text{K})\) in the summer also the sun bother by its heat but we can fill some parts of poly styrene seeds in windows we can decrease the bright side of window and use the sun shine. By stimulating the model of this software in the buildings and the mean of one layer glasses are the glasses before designing. The meaning of un obstacle windows is the windows with new designing that the poly styrene seeds are in repertoire and the un obstacle windows is used for when the poly styrene seeds are used between the layers. For comparison first the models of windows were gathered and then the data of that apartment were used for it. The aim of this simultaneous is just about comparing the models in wasting energy for each part there is a specific program. In the official part there is a need of a room which all the parts in southern part it cover and it multiply in number 72 and the lobby part and these programs were about adiabatic programs which is concerning about the change of whether in a week.

**Sun path diagram:**

In the above picture the diagram of movement of a building is designed by the software. The movement of diagram is about the southern semi-circle of the earth (Like the mentioning building) so it is like this that in summer rise from the south eastern part. In winter the sun rises and falls from the mentioned directions just in the first of Farvardin and Mehr the sun raise completely from the sides we told and the direction of shining is about last of sun and to the north side. The differences of these angels depend on the season that in Tehran with geography degree of 35/7 and long geography of 4/1 degree the angles of the sun movement depend on the scales which they are showing in the diagram. even the results they were gained from the auto cad and the coolest day of the year 14th of January and these two days designed for the diagram. The difference of angles is observable and they were shown well in two pictures.

By applying the auto cad software we can find the building welfare. The meaning of the navigation of the building is that the sun shines in all cool days in reach to maximum point. In the designed building as it is pretended the navigation is on the eastern side or better in the other word the length of the building is during east and west.

**The amount of sun energy given direct:**

<table>
<thead>
<tr>
<th>Month</th>
<th>The glass one layer (Wh)</th>
<th>Always designed without obstacle (WH)</th>
<th>Always designed by obstacle (WH)</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>660823</td>
<td>509010</td>
<td>207747</td>
</tr>
<tr>
<td>February</td>
<td>694133</td>
<td>537564</td>
<td>219504</td>
</tr>
<tr>
<td>Mars</td>
<td>601680</td>
<td>477471</td>
<td>197874</td>
</tr>
<tr>
<td>Avril</td>
<td>540633</td>
<td>444425</td>
<td>181312</td>
</tr>
<tr>
<td>May</td>
<td>443430</td>
<td>365671</td>
<td>149256</td>
</tr>
<tr>
<td>June</td>
<td>379774</td>
<td>330154</td>
<td>134739</td>
</tr>
<tr>
<td>July</td>
<td>414055</td>
<td>357883</td>
<td>146046</td>
</tr>
<tr>
<td>August</td>
<td>515195</td>
<td>446390</td>
<td>182188</td>
</tr>
<tr>
<td>September</td>
<td>747863</td>
<td>616272</td>
<td>251525</td>
</tr>
<tr>
<td>October</td>
<td>837894</td>
<td>664599</td>
<td>269347</td>
</tr>
<tr>
<td>November</td>
<td>709111</td>
<td>546780</td>
<td>233162</td>
</tr>
<tr>
<td>December</td>
<td>664835</td>
<td>511165</td>
<td>208625</td>
</tr>
<tr>
<td>Sum</td>
<td>7210400</td>
<td>5802729</td>
<td>2368315</td>
</tr>
</tbody>
</table>

As the data was shown in the chart from theoretical it is expecting that the one layer window transfer more energy from it and this cause in the cool days of winter the heat decrease and in hot days goes up the coolness and without having the heating obstacle by getting 5802729 wat hour of energy in one layer windows and at last the windows obstacle with poly styrene put in the last ranking and with 2368325 wat hour energy we can say obviously that 33% they passed the energy of one layer window.

**The Difference of external and internal heat:**

**Applying the sources (The consume of per month energy):**

For stimulating the official part this software suppose all the stages without obstacle. Two parts of official and lobby are departing. For modeling the official part we consider the best positions. From the theoretical point of view we do not need windows with obstacle or this energy for the warm season is not desirable. So with paying attention to these conditions in the repertoire could be saved during day and night. Considering half of
the windows is obstacle or in the other hand from the brightness of building was decreased. By applying the auto cad soft ware we can find the building welfare. The meaning of the navigation of the building is that the sun shines in all cool days in reach to maximum point. In the designed building as it is pretended the navigation is on the eastern side or better in the other word the length of the building is during east and west. In Iran most of the glass building has got the syndrome of ill building and this can be more understand that it make glass building in one layer and the transition of energy becomes easier. In the best form that designer's design the glass building with one layer obstacle the excess to the external layer is impossible. In addition two layer buildings there is no portable part and these all objects make better position for the kind of wall in all of the buildings or they cancel using of it or do not put it in suitable part. According to the results which gained of computer forms the results are as the following: The best time of applying the obstacle window is in winter nights that it can cover the entire window and it increases the power and with attention to gaining the power during the day they save energy in the repertoires. In cool summer nights of Tehran the transition of weather is for inside is desirable and applying the obstacle is not offered. This process was used in computer model.

Now for analyzing the rate of coolness and warmness we make obstacle for the wall but for the windows like before with the same specification. The wall chosen for this project, weight W/(m2k) which the rate of its transition is about 35 with 8 cm with the mineral fabrics. Just for analyzing the rate of coolness and warmness we make obstacle for the wall but for the windows like before with the same specification. The wall chosen for this project, weight W/(m2k) which the rate of its transition is about 35 with 8 cm with the mineral fabrics. In the last position we analyze two kind of heat obstacle and it increase from the drivel substance (Light wall) with that specification we count them fourth times different and we should count the coolness and warmness of each one. Searching and analyzing the above subjects the rate of warmness 76/97 and the rate of coolness 2/42 would decrease in a year and this shows that making obstacle for the walls have more effect on the warmness though coolness. Also we can observe that by assembling the portable obstacle on windows we can save more energy.

Conclusion:

Designing the sun wall at first sound a little vague but this article shows that that the parts of a building from the sun energy can show the designing the sun wall. In fact the general designing of building leads to from complex to the details. Designing the southern plan we had lots attention and we should reach to the deed of country architectures.

In summery assembling a sun wall system helps to the quality of internal weather and by spreading gas help to environment perseverence too.

It is clear each of the details mentioned in this survey can be a searching exactly. Although some subjects like obstacle and wall have a lot to search but the portable obstacle is another point to investigate about it.

REFERENCES

[23] work performance in buildings with moderately drifting operative temperatures; Energy and Buildings journal, 43.