

Securing of elderly houses in term of Elderly's vision disorders

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Abstract—

Research Necessity: While people grow old, specific mental and physical changes of this period start. Vision disorders can be mentioned as one of the aging consequences and it is necessary to consider this fact for designing a secure elderly's house.

Methodology: In this research, after analysing specific vision diseases of elderlies, symptoms of these diseases and their harmful effects on elderly's lives is introduced.

Data: finally after giving solution for designing elderly's house based on these four categories: 1.lighting 2.colors and signs 3.architectural elements 4.materials, the unit "Narvan2" of Kahrizak elderly's house of Tehran, which is specifically for old women who have vision problems is analysed.

Conclusion: At the end of this paper a table which contains design solutions based on above four categories in order to securing elderly's houses has been given.

Keywords— Interior architecture, Elderly house, Vision disorders, Securing

I. INTRODUCTION

Nowadays, the combination of the world's population is going to getting old and this process is faster in developing countries (Gelder, 2005:215).

One of the most common of the aging effects is loss of vision and increasing risk of different kind of vision disorder. More than 35 million of people over 45 years suffer from eye and vision disorder problems and more than two-third of adults with vision disorder consist of the elderly over 65 years. Eye is brain gate and sense of sight is the most important way of communication with around the world. The acquired information in compare of another sense is better interpreted using vision (eyesight). It may be said that in the lack of vision, information connection will be problem among another sense. The balance maintains depended on health of different senses of individuals and is one of the major reasons for elderly's back falling. Back falling is one the major problem of threatening the health in elderly which is cause dependency (Lowlor, 2008:33), loss of quality of life and increasing of care cost. So during the secure designing for elderly, it is necessary to consider the changes and vision disorder age-related. Some of the eye diseases such as cataracts almost specific for elderly and another is more common with increasing age. Each one of eye disease of elderly affected negatively on individual's performance and life. His adoption with environmental condition is jeopardized and its limit their lives and the interior designer is responsible so that it can provide a secure environment for elderly with accurate understanding of these impacts.

Although, family is the best place to take care of elderly, a group of elderly excluded from the basic requirement for independent life or from sympathetic family they live in elderly houses inevitably. These people often weaker than the middle elderly and are more vulnerable. So the elderly houses can be done the most sensitive spaces for them which considering to the security of elderly is important in terms of vision disorder while designing. earlier ,some solution has present in secure design of elderly house related to vision disorder but it seem that in our society, it still does not get enough attention. So the authors of this study tried to present some solution in terms of lighting, color and signs, materials and architectural elements toward achieving to secure designing of elderly houses with focusing on architecture based on understanding of vision disorders depending age and its impacts on elderly performance and finally one of the elderly houses were examined.

II. RESEARCH METHODOLOGY

This study has been created based on library studies related to signs and impacts of common eye disorder in elderly on their quality of life and analyze the adverse condition leading to presenting solution of architecture design toward improving the situation. The case study of elderly house inside and outside of the country proposed with analyze looking of current situation of two set of the debate view related to level of success of environment responsive in terms of vision disorder and also its consist of presenting the design suggestion, analytical-field part of study.

III. REVIEW LITERATURE

Based on authors findings, the studies which is done in identification field of certain eyes diseases of elderly is limited to medical source and the direct use of this findings hasn't done in presenting the design solution toward securing s the elder house. The studies which is done inside the country is not covered the elderly's visions related to presenting the solution and secure standard design for elderly and it needs comprehensive research in this field.

3.1 Vision disorders depend on increasing the age

Vision decreasing is known as one of the persistent insufficiency of elderly period in all around the world (Binstock, 2011:81). Change in eye adoption system, decreasing the visual function, increasing the sensitivity to light and other effective changes in visions such as being dull of eye lens, macular degeneration and Glaucoma are the consequences of the impact of aging on vision systems (Mary, 2010.15). In the following, we take quick look to some characteristic of these disorders from in terms of interior design.

3.2 Presbyopia

Many buildings which are involved in adoption action changes by increasing the age (samii.35:1391) and the adoption weakness which is happen with aging in all individuals called presbyopia (Vougan, 487:1388). As a result, the patients can't read the capital word or recognized the small and fine thing from each other. This status intensified in weak light.

3.3 Cataracts

Lens transparency is changed in elderly and it turns to Amber color then gradually turns to dull color (Samii,49:1391). Dust or lace curtains is found in front of sight due to cataracts which is lead to severe reduction of sight and its necessary to consider that while designing. Also light phobia ,intense glare and blurred vision are symptom of cataracts.(the same :65) blurring of sight caused loss of visual acuity and sore eye due to glare and reducing the power of control (Vougan 510:1388)

3.4 D.M.L.A

This disease has direct connection to age and is barrier for active life. Yellow spot has begun with decreasing in sight and the patients need more light to read .sometimes the lines and the words appears to be broken, the appearance of dark spot suffered them in their view. To see the elegant objects is problem or impossible (Samii.142:1391). The gradually deceasing of close sight and far sight, to see from the beyond of the lace curtains, need to have an intense light for studying or having problem with recognition of distant objects, disorder in viewing a straight line and finding a dark area in distance sight in vision center, are another impacts of this disease on elderly performance. Also due to this disease, the things seem smaller than its real size (same, 157).

3.5 Other common eye diseases in elderly

In addition to eye disorder for elderly, there is another category which is common based on increasing age including central retinal vein occlusion ,carotid occlusion and Giant cell arthritis which is lead to loss of vision(Vaughan ,1388,389-415) this issue cause attention to securing s of spaces used of elderly appear more important than before in terms of vision disorder.

IV. DESIGN GUIDELINES

4.1 Lighting

The areas, which is used more, it should be lighting to help to edge definition and prevent to create intense shades (Nozari, 1383,134). Using hidden lighting due to hidden light source and recommended preventing from gazing.

In traffic paths, the lights should be used which is lighting to down ward instead to lighting to upside and out. In this case, it prevents to create stunning light (same:134).

Due to elderly's poor vision in lack of adequate lighting condition, it is necessary using adequate local lights during studying and conducted accurate work.

In lighting ,the combination of color lights with unreasonable variation should be avoided because it leads to visual ambiguity space and it can make difficult the understanding the intervals and proportions things for elderly and finally it leads to disturbed the vision process. creating the contrast above light during entry and exit of light-filled space to low light and vice versa should be avoid because by increasing the age, the eye capability will be decreased to comply with different levels and it make difficult a quick view from dark place to bright and vice versa (pile,1997:342). The uniform and gentle light and of course sufficient recommended for public spaces. For covering the windows, the uniform light filters can be used (pic No 1,2) so that it can prevent of making glazing. The network attached to frame work or light filters especially for windows included an option right. Also it should be avoided using curtain with intense color because it disturbed the vision process in interior environment.

The stairs edge should be distinguished from the other stair components which can achieved it with suitable lighting (Rafizade, 1382:119). For securing the elderly during walking, it is better to use the hidden light in stair edge and other fractures which is needs to be seen so that the elderly is able to diagnosis the right path.

One of the simple and obvious solutions to helping the elderly vision is we give the different domain of amount of watt for lamp .for instance 60 or 75 watt for information.(pile,1997,342).



FIG.1 : LIGHT FILTER, A HOUSE FOR ELDERLY, ARCHITECTURE WILL ARTS (NETHERLAND), PHOTO BY KIMZARTS.



FIG. 2 : ELDERLY HOUSE (GERMANY), PHOTO BY PETER BANFIG

4.2 Color and signs:

Using the colors can attract elderly's attention to see the certain target (Wijk, 2003). It is better to use the large signs more than the small ones and the capital letters were used in writing the signs of course the letters shouldn't compressed too much, because in this case, reading them will be more difficult.

The bright colors in the life environment of elderly are more sufficient than the dark colors because this people usually gets vision disorder (karimi.1385). to easily see the things ,the colors such as red and yellow can be used to prevent instead of using blue and green colors for the things which is needs to be seen because the elderly eye some time have trouble in accurate diagnosis of this category of colors. Tactile and visual clues can be used to help finding a path (Nozari,1383,135). Since in some elderly vision disorder ,the spot in elderly eyesight making the disorder ,it is better to conduct the path and showing the fracture and changing the height ,instead of using spot elements from light strip or color so that the elderly can see perfectly. Shortage of signs and symptoms of routing and identifying the source of risk is troublesome for every one particularly blindness and low vision making difficulties (Saeedirezvani, 1390:22).

Among the letter to reading them easily, the appropriate distance would be considered. To be seen, the letter with white color on dark or black has been used. If the dark letters were used, the neutral and gray background should be used. If the colored letters were used, the warm colors instead of blue and green colors have been used (nozari, 1383,136).

Making sufficient contrast is one the designing tools to facilitate the vision process. Using of bold colors, speed ups the contrast perception and caused the continuity time of body perception (wijk,2003). Always during using the signs, the most contrast has provided for the things need to be seen (pic No.3).

The background of letter should be simple and without design and the letter with high thickness was used. The black printed large letter provided the required contrast (Vougan, 1388:511). this ability is exist in elderly who can recognized well the dark and bright things from each other and using this aspects ,we can detect some special objects in environment and others can be hidden using darkness or the same brightness of vision.(wijk,2003).



FIG. 3: THE COLORED CONTRAST, THE RETIREMENT HOUSE (FRANCE), PHOTO BY MARY MOTIRES

Due to some eye disease ,some elderly have trouble with seeing blue ,green ,pink colors so using too much of this color in interior space should be prevent. Instead the colors like yellow can be used limited because the solar nature of yellow color induces a sense of warmth and joy undeniably (Linch, 1385:14) and preventing the depression incident in elderly. It should be noted that, a significant percent of elderly suffer from depression and its related signs (Gelder, 2005, 226). The signs and guide or warning symptoms from categories which needs to take serious .to helping the elderly who has vision problems, it is better to use the signs and symptoms with bold letters. To easily recognition the signs at night, the reflective surfaces can be used .the signs definitely should be clear and easy to read and write .if possible the symbolic forms and signs with informal nature along with letter can be used (nozari, 1383,134). The boards, which need attention, should be large and lighting for easy identification at night. also ,the writings should be write by white ,capital letters and suitable distances of each other for easy reading on them (Rafi Zade,1382,131).

Falling on the ground at nights due to the shortage of sufficient light counted as one of the risky main factor for securing elderly. It is better to use the rag or carpet which has a visual charm and preventing the elderly's slipping (lowlor, 2008:61).

The non-slip surface with a little reflection (pic No.4) is very important for ramp and stairs. the surface with the color other than white which doesn't have reflection can decrease the brilliance (nozari,1383,138).the covering of sidewalks should be of hard ,stable, non-slip and flat (Saeedi rezvani,1390,138). In the places which the unexpected change such as stair or fracture happens, the tactile textured signs should be used (Basirimozhdi,1388.42) so that if the guideline signs hasn't seen, the elderly should be aware of the symptoms of danger existence by touching .using of materials such as wood can be used for elderly house appropriately because of not having slippery and preventing from intense reflections.

The sudden change in height is one the reason to incident the problem in elderly's movement (pic No.5). It is better the floor of space will be in one level in terms of height (lowlor, 2008, 61). Before the start of stair or any fracture in places with traffic, it is recommended that, some actions such as texture change can lead to understanding the barriers by elderly w in terms of both vision and touching senses. For covering the walls with reflections of intense light, such as the walls in front of

windows, the materials with little reflection should be used to prevent of glazing and irritating the elderly. Using materials such as ceramic or polished stones in this kind of walls should be avoided.



FIG. 4: NON-SLIP SURFACE.
THE CENTER OF ELDERLY CARE
DANT ARCHITECTURE GROUP,
PHOTO FROM ELDERLY HOUSES BOOK



FIG. 5: THE SMALL REFLECTION OF MATERIALS,
A HOUSE FOR ELDERLY (FRANCE),
PHOTO BY PATRICK TORENBORG

4.3 Architecture elements

Since the bright things can be seen easier than darker things (Karimi 1385). It is better the stairs and ramps be cleared and bright especially the stair edge be marked (nozari, 1383, 138). As mentioned before, for making visual clarity the topical lighting or the colors such as red and yellow can be used.

The vulnerability of elderly during using the stairs is because of 2 main reason, one of them is disorder in vision which is distort individual from stair and another is the eye error caused by how to design the stairs (Rafi Zade 1382:118). The handle and ramp should be installed in ramp places or stair (nozari, 1383, 138). It is recommended to install the handles in all corridors for securing the elderly. Because the elderly have problem with movement also can't walk for a long time (Binstock, 2011, 59).

Since the elderly who is suffered by vision disorder, can't identify and distinguish the subtle objects, there it is recommended the handles, the stair rails and other parts which needs to be seen, has the sufficient thickness. Also for securing during using of stair, the stair floor which is suitable for elderly should have a width enough (pic No.6). Making suitable contrast in designing the stair part is recommended.

The signs which are needs to be seen should have an enough size and also install in a height that, it can be seen by the elderly who is setting on wheelchair.

During designing and using the architecture elements especially in interior space, preventing the intense reflection by these parts sound necessary, because it leads to elderly's irritating eyes and difficulties in vision.



FIG. 6: WALL HANDLE,ELDERLY HOUSE(FRANCE),PHOTO BY JIN MARY MOTIRES

V. REVIEW OF CASE STUDIES

5.1 Hospital de Maison Blanche, Paris

This medical center is built in order to elderly accommodation in a ground with area of 5500 m² and capacity 120 beds .the designer of this collection are Patrick Magendie, Francis Fauconnet, Karin leopold(1992).providing a warm place alone with medical facilities was the purposes of construction .this collection consist of 3 main building which is connected with one wide interior corridor (pic No.7). The south side of glass corridor and the north side which is the place of services spaces locations (pic No.8). The location of common performance spaces in south side with glass facades caused a suitable relation collection with surroundings (Mostaedi, 1999:66).

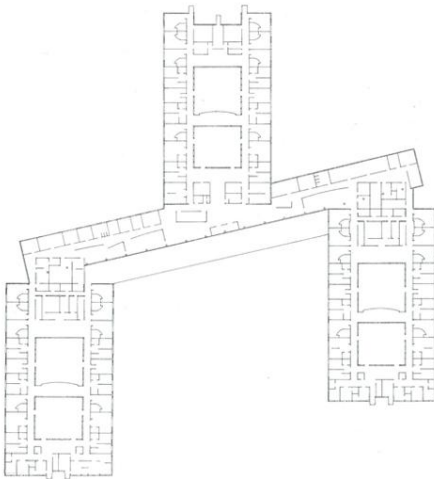


FIG. 7: PLAN, INCLUDING CORRIDOR AND 3 MAIN BUILDING.

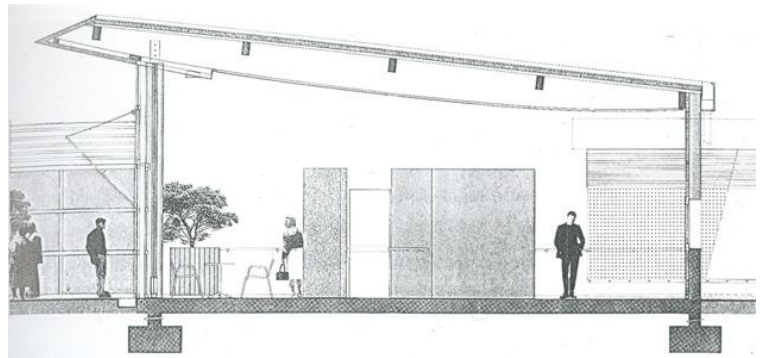


FIG. 8: CUTTING GLASS CORRIDOR, VIEW FROM THE WEST

Along with the glass corridor, existence of numerous adjustable canopies (pic No.9) in south side of corridor, provide a suitable utilization of sunlight .also we observe that in interior collection space, the sufficient light without incident glaze (pic No.10) create to increase the elderly's visibility and a suitable contrast among interior space (pic No.11) has helped to this process.

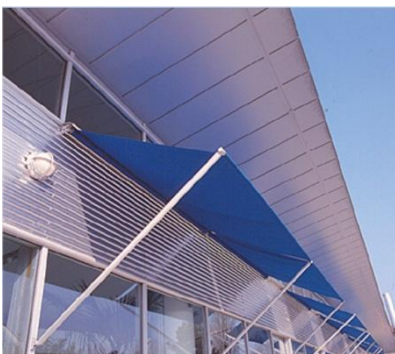


FIG. 9: THE SOUTH SIDE CANOPIES OF GLASS CORRIDOR



FIG. 10: SUFFICIENT AND NON-GLAZING LIGHT IN INTERIOR SPACES



FIG. 11: SUITABLE CONTRAST

The crossing handles along with corridor (pic No.12) provide the elderly safety during walking-in bed rooms also with light control, it prevents from irritating glaze by lights (pic No.13) and at the same time it has provided the required light for elderly.



FIG. 12: THE CROSSING HANDLES IN THE RIGHT SIDE OF PICTURE

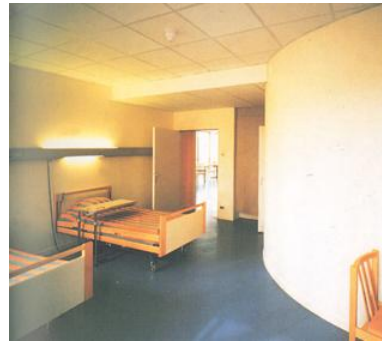


FIG. 13: LIGHT CONTROL IN INTERIOR AND PREVENTING FROM GLAZING INCIDENT

VI. 2.3 KAHRIZAK CHARITY FOUNDATION, TEHRAN

The Tehran Kahrizak charity foundation including the parts of such as department ,services ,sanitation and health ,culture ,sports, etc. dormitories consist of 6 collection and 21 parts which 2 of Narvan collection by area like 5430 and Banafshe by area like 6912 Sq.M which is devoted to elderly. One the positive aspect of this collection such as farm, park, gym and most importantly, allocation of 2 parts of Narvan collection and one part of Banafesh collection belongs to elderly's with vision problems. For investigating the sample in this collection, the unit Narvan2 was selected, because it is a unit for take caring of blinded and low vision elderly and also the notably action has done in the interior design of this unit.as you can see in pic.14, the main corridor of this unit has no unnecessary extensions which this problem helps a lot to user's security during traffic. The existence of unnecessary, materials such as closet or pot can lead to making risk for elderly's traffic. another notable point which is observable in this picture is using of a strip of dark materials in both side of corridor and on the ground which improves the accuracy of visual perception and also the lights which is used has a filter for spreading the light in corridor roof and preventing from too much glazing in user.

The corners of corridor wall has covered by a piece of metal plates to decrease the elderly's injury during falling on the ground (pic No.15) which it was better to use non-rigid materials instead of metal ones to minimize the elderly's injury to the least.

It should be noted that the corridor brightness is always true in order to helping the navigation elderly especially at nights and the connection window of each room with corridor covers with curtain so that the corridor brightness won't make trouble for user. In this case, it is recommended that by embedding SMD strip lamp, along the corridor and close to handles, the required brightness for orientation and handle identification has done so that there is no need for lighting at night's hours.

Using the crossing handles along with main corridor and the entrance corridor of bathroom is considered as conducted a positive action in this unit .but it should be noted that today handle, design in such a way that in case of collision, no harm would be found to user, therefore it is better, the rigid, fixed and metal handle replaced with the handle which is made of soft and playback capabilities of impact force materials.

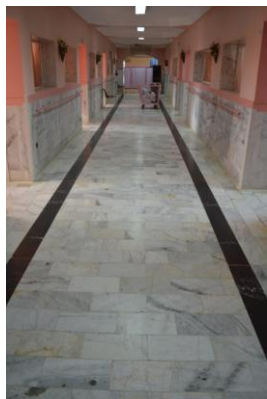


FIG. 14: THE MAIN CORRIDOR OF UNIT NARVAN2, NEGARANDE



FIG. 15: THE DETAIL OF WALL CORNER OF UNIT NARVAN2,NEGARANDE

In addition to, for elderly's security , non –rigid materials with curved surfaces has been used for some ,the furniture is embedded in corridor which is recommended to use this factor for all furniture and available elements in corridor (pic No.16).



FIG. 16: THE FURNITURE OF MAIN CORRIDOR OF UNIT NARVAN2, NEGARANDE

In design, this has been tried which the beds in each room (pic No.17) has no sharp corners to provide the elderly security where using wooden materials or soft cover such as cloud and plastic on the metal rods of beds caused improving the level of security. Also the beds has protection in the corners to prevent elderly's falling during the night. The color, which is used on the walls of rooms, minimizes the light reflection which caused the preventing from unfavorable glazing by light. Also the stone was used in the floor as a material which may to hurt them if the elderly fell. Apparently, the reasons for using stone materials are lack of bladder control and the dirty of the floor room which in this case, stone is more washable than the other materials. So it is recommended to use fiber washable cover and moveable in the mid of rooms so that the level change shouldn't cause disorder in elderly's movement and Making risks. To do this, the interchange connection of flooring material and fiber cover can prevent creating ramping in the floor of room prior to completion the joinery step.



FIG. 17: THE DETAIL OF ROOMS OF UNIT NARVAN2,NEGARANDE

As mentioned before, in Narvan unit the lights are turned off at nights and just the corridor lights is turned left. Therefore, in every room, one wall light or a ceiling for night (picture No.18) is embedded which is provide the elderly required light .it should be mentioned that just the lights of 2 room is available from all rooms now which is recommended this possibility can be included for all rooms.

As you can see in picture No .19, by using wooden materials, the light filter behind the window created to help the decreasing of glazing and entry the unfavorable light, but it is better to use more updated light filters for all windows with opening and closing capability.



FIG. 18: WALL LIGHTS OF ROOMS OF UNIT NARVAN2, NEGARANDE



FIG. 19: LIGHT FILTER OF THE WINDOWS OF ROOMS OF UNIT NARVAN2, NEGARANDE

Another positive aspect of unit2 of Narvan is using wall handles (picture No.20) in suits of bathrooms, which help elderly's a lot during sitting and standing up. In this part also ,it is recommended to use safer materials instead of iron bar.



FIG. 20: HANDLE INSIDE OF BATHROOM OF UNIT 2 OF NARVAN, NEGARANDE

Generally using of all available facility and improvement of elderly's living space, significantly affected on elderly's mental health. In addition, if the elderly's life environment has enough services and equipment, after a while elderly will have a sense of belonging and affiliation (Binstock, 2011, 216).

VII. CONCLUSION

Elderly, is an inseparable period in natural process of human life. Elderly people as a part of society which spend along time of his life and now spending his own old age and disability ,asking for a safe and favorable place to live which is adopted with his physical and emotional needs .just with review and identification of elderly period needs and its reflection in designing ,this can be achieved which in this study it refers to this issue in terms of the elderly 's vision disorder. Finally, we arrived to some solution for designing the elderly's house by sign identification and the impact of elderly's vision problems with an emphasis on interior design .using and attention to this guidelines during designing, the effective step in line with achieving to design according to elderly's needs .given that, the elderly's needs during design, can be helpful to be more favorable of life quality in elderly's houses.

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REFERENCES

- [1] BasiriMozhdi, Reza(1388),planning and designing for pedestrians, Tehran: tahal
- [2] SaeediRezvani,Navid,daneshpor,Hamid Reza(1390), making appropriate the urban environment for blind people and low vision ,first publishing ,Tehran ,Ayandegan.
- [3] Samiie,fereydoon(1391),eye and elderly ,first publishing ,Tehran, the end.

- [4] Rafi Zade ,Neda and et al,(1382),the design guidelines architecture of elderly's house ,second publishing ,Tehran: building and housing of research center.
- [5] karimi,victoria,(1385),art therapy: color ,form and environment ,honarrahapoye journal ,second period, first number, pages 40 to 45
- [6] Linch,sara,abedinishirazi translate ,farid ,(1385),modern color ,Tehran :art and century architecture.
- [7] Vougan,dential,asboori,tiller,(1388),overview of Vougan ophthalmology–Asboori,keshtkarjafari translation ,Ali reza and et al, Tehran : Arjmand.
- [8] Nozari,sholle and et al(1383),design foundations of open spaces of residential neighborhoods fits to elderly's situation ,first publishing ,Tehran, building and housing research center.
- [9] Binstock, Robert H. George, Linda K (2011). Aging and the social sciences, 7th Edition, Rando, T. A, United State
- [10] Gelder, Michael G., Mayou, Richard, Geddes, John (2005). Psychiatry, Third Edition, Oxford University
- [11] Lawlor, Drue, Michael A. Thomas (2008). Residential design for aging in place, United States, Wiley
- [12] Mary. K, Rose (2010). Comfort touch-massage for the elderly and the ill, The point, Lippincott. W
- [13] Mostaedi, Arian (1999). Residences for the elderly, Originaly from University of Michigan, Barcelona.CarlesBroto
- [14] Pile, John F. Interior Design, Fourth Edition, London. Laurence King.1997
- [15] Wijk, Helle (2003). Color perception in old age.With implications in the caring enviroment, Design and Health. pp. 167-173
- [16] Dvorsky, Tamara. Pettipas, Josef. Elder-friendly design interventions, Newsletter By www.informedesign.umn.edu (12.19.2013), University of Minnesota

DESIGN SUGGESTIONS

At the end, it is recommended that designer consider: during the making secure elderly's residential space in terms of eye disorder, which are following here:

TABLE NO.1

Architecture elements	Materials	Color and signs	Lighting
Stairs and light should be visible easily.	Using of soft materials for safety of flooring.	Applying signs and appropriate dimensions and avoid from creating congestion of letters.	Edge definition specially edges and stairs fractures
Install bump for warning in at the beginning of stair and ramp	Avoiding of using slippery materials for flooring	Applying a balance of bright colors in spaces	Avoiding of creating glazing during lighting
Install handle in all corridors ,stair and ramp	Avoiding using of material which has the high reflection	Using of tactile signs in require spaces.	Providing enough light and avoiding of using weak lights.
Suitable size and thickness for interior elements which needs to be seen	Using signs of touch in surfaces ,for warning	Create control of suitable color in signs and writings	Avoiding of creating highlight contrast in adjacent spaces.
Providing appropriate width for flooring and stair for safety	Create smooth surfaces without additional bumps in flooring.	Using of symbolic forms or informal nature in signs.	Avoiding of high utilization of color light
Avoiding of using elements which has the intense reflection.		Avoiding of using colors like blue, green and pink in signs.	Utilization of light filters for windows and openings
		Avoiding of using the colors which cause intense reflection.	Avoiding of utilization of windows curtain or intense color