

Design of Interior Space Environment of the Residential Construction for the Elderly

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Abstract—With the growing of the aging in our country and the current situation of the residential environment for the elderly, residential constructions suitable for the behavior characteristics of the elderly have gradually been the key to improve and solve the residential environment problem for the elderly. Based on analysis of the physiological, psychological and behavior characteristics and through analysis of the suitable special environment and equipment for the elderly, this paper proposes the suitable interior space environment for the elderly.

Keywords—the elderly; residential construction; design principle; residential environment

The residential environment of the elderly refers to the long-term living site for the elderly, including residence, apartment, sanatorium for retired cadres, geracomium and nursing home as well as the space for the elderly within a common residence.

Design of the residential construction for the elderly should be conducted according to the change process of the elderly, including the facilities of taking care of or helping the elderly and also the nursing room and equipment for looking after their daily life.

I. DESIGN PRINCIPLE OF THE PHYSIOLOGICAL AND PSYCHOLOGICAL PRINCIPLE OF THE ELDERLY

A. Weakening of the Adaptability

With the growing of the age, the physiological functions of the organism of the elderly weaken and further various functional obstacles are caused. Different health conditions have different degree of obstacles such as dim eyesight and weak hearing. Therefore, within the residential construction design, light, color and sound should be paid attention to. Bedrooms, living rooms and activity room of the elderly should have enough natural and artificial lighting.

B. Weakening of Resistance

With the decline and disorder of the physiological function, especially the immune function, the resistance will reduce sharply and they easily suffer from all kinds of contagious diseases, metabolic disorder and malignant tumor. Especially for the sudden disease and accident, monitor, rescue and delivery should be considered in the residential construction design.

C. Weakening of Capacity

The regression of the organic organs and physiological functions causes the weakening of their capacity. For the elderly, once the environment changes or accident occurs, they will become tense and their organism cannot do so that other normal physiological functions will be affected. In the meantime, the flexibility and power of muscles will gradually weaken; activities will be restricted and the risks of fracture will increase; capability of walking and mastering will reduce. According to the special physiological characteristics of the elderly, handrails should be installed in the corridor so that the elderly can rely or relax at any time. If the corridor is overlong, rest chairs should be fixed in appropriate places.

D. Weakening of Self-caring Ability

With the aging of the organism, their energy reduces gradually so that the elderly usually act slow and react slow. Aiming at the disabled old people, the valid width of passage should be calculated and the actual width between the fingers and elbow when they hold the hand wheels should more than 80cm.

E. Fluctuation of Psychological Emotion

With their aging and the change of physiological organism, their social role and economic status change accordingly, which will bring the psychological pressure and emotional fluctuation and further cause the sense of humbleness, loneliness, frustration and depression. To solve the negative senses, the residential construction design should create comfortable, practical and warm living environment for them.

II. DESIGN OF INTERIOR SPATIAL ENVIRONMENT

A. Design of Entrance, Exit and Lobby

(1) Design of Entrance and Exit

The entrance and exit of the residential construction should consider the needs of helping the elderly; there should leave at the circling area of wheels for at least 1500mm×1500mm inside and outside the entrance and exit. The minimal width of the platform at the entrance should be no less than 1500mm and that of the middle or tall construction should be no less than 2000mm. Meanwhile, the gap between the front of the entrance and exit and the outdoor floor should be within 400mm and gentle slope flight and ramp should be adopted for

transition. The height of the tread of the gentle slope flight should be no more than 120mm and the width should be no less than 380mm. The slope of the ramp should be no more than 1/12. Handrails should be set between the flight and the ramp.

Solid, durable and anti-skidding materials should be used in the platform of the entrance and exit, flight and also ramp. Meanwhile, considering that the elderly are weak, the entrance and exit of the residential construction should open the door at the sunny side so as to avoid the cold monsoon.

(2) Design of the Lobby

At the entrance of the residential construction for the northern old people, foyer should be installed; in winter, it can prevent the warm air from letting out and cold air from permeating inside; in summer, it can prevent the cold air from letting out and warm air from permeating inside. The width of the foyer should at least satisfy the dimension of rotation of the wheels. In the meantime, the entrance had better adopt automatic inductive door, which can compensate the walking difficulty of the elderly due to decline of physiological organism.

Lobby is the concentrating site of the transportation and dispersion of people and is the space where the elderly communicate the most. When they enter the lobby, it should be guaranteed that elevators and stairs should be found quickly, which can help the elderly to distinguish their site and to go to the destination as quickly as possible. Meanwhile, areas of the lobby should be enlarged accordingly and comfortable chairs should be installed so that the elderly can communicate more easily.

B. Design of Vertical Transportation

(1) Design of Stairs

Whether the design of stairs in the residential construction is reasonable has the direct bearing on the convenience and safety of the elderly. The stair space used by the elderly should be no less than 1200mm; the width of the tread in the gentle slope should be no less than 300mm; the height of the tread should be no more than 150mm. In the front of the tread should set up a colored anti-skidding reminder with its height no more than 3mm. Each part of the stair, such as the bench, the flier dimension, position of the handrails and the material making method should adopt the same standard and principle and should be kept the same. Choosing suitable slope and the suitable flier dimension should satisfy the safe passage of the stretcher. If the stair is overlong, rest space can be set up in the platform; without influencing others passage, provisional rest space can be provided for the elderly.

(2) Design of Slope

For those constructions without elevators and with no more than three floors, slope should be installed. Slope can eliminate the sense of fear when the elderly look down and therefore safety is improved. The net width of the slope should be no less than 1500mm; the length of the slope should be no more than 12000mm; the slope should be no more than 1/12. At the turn of the slope, rest

platform should be set up, with the net depth being no less than 1500mm. At the beginning and the end of the slope, it should set up a wheel buffer zone with the depth no less than 1500mm. Meanwhile, consecutive handrails and rails should be set up above the floor for 900mm and 650mm at the two sides of the elevator and the slope; the handrail at the side of the wall should be extended horizontally.

(3) Design of Elevator

For those constructions with elevators, the dimension of the elevator hall should guarantee that the wheels and rescue sketcher can be moved forth and back conveniently. Above the floor for 900mm and 650mm and around the hall should set up safe handrails. Speed of elevator should use slow speed and the door should choose slow close; monitoring system should also be installed. The depth of the elevator hall should be no less than 1800mm; the net width of the gateway should be no less than 900mm. The depth of the hall should be no less than 2100mm; the width should be no less than 1100mm, of which the button height should be between 900mm and 1100mm. Meanwhile, when the elevator arrives, it should be shown clearly and the voice box should be installed.

C. Design of the Living Room

The living room show respect for people and is the key in the design of interior residential space.

The living room of the elderly is divided into one-bed and double bed. The dimension should satisfy the requirements of install basic furniture and necessary transportation area,. The room of common bedroom should be no less than 10m²; the short dimension of the rectangle bedroom should be no less than 3000mm.

The bedroom of the elderly should face south; if it faces west and east, summer will be too hot for them to live in. Natural lighting and ventilation can help them distinguish things more easily. Breathing fresh air is good for health and can delay the aging. Meanwhile, outdoor should have broad views and beautiful scenery.

Due to the special physiological characteristics, the sunny corner of the wall should be made circular bead or corner cut; and under the height of 1800mm, angle bead should be made that has the equal height of the wall. Within the room, cupboards that are above the head or below the knee should be avoided and storage cupboard that are tied to the wall should be installed. Glass materials should be avoided because they can cause visual mislead; the floor should use hard materials or elastic plastic materials.

D. Design of Bathroom

Bathroom for the elderly can be divided into independent bathroom and public bathroom. In the independent bathroom, the height of the nearest, bathtub and the shower chair should be no more than 400mm; alongside the bathtub should install a seat stand with the width no less than 300mm. Considering the elderly's going in and out by wheels, the area of the independent bathroom should be no less than 5m².

In the elderly apartment, within the public bathroom

should establish a front room that facilitates the wheels to rotate, both men's room and lady's room should set up a toilet room where wheels can move and nurses should be taken into consideration, therefore the space should be no less than 1200mm×2000mm.

The bathroom should be equipped with horizontally-opened door; the door leaf is opened outward; observation hole should be set up and slotting that can be opened both inside and outside should be installed. Spring door is not suitable for its power. Under the condition that wheel can pass, the width of horizontally-opened door should be no less than 800mm.

In the bathroom, white sanitary tools are chosen so as to facilitate the elderly to observe. Anti-skidding shallow bathtub should be used so as to avoid that the elderly fall to the ground. Cold and warm water tap should use the rail-style or press button.

Bathroom is the place where accidents happen very often, therefore it is very important to set up the safety handrail of suitable dimension and solid installation. Before installing safety handrails, foundation site should be installed in the wall or under the ground in advance. In the bathroom, the wall close to the nearest should be installed with L-style safety handrail whose horizontal height is 700mm.

E. Design of the Balcony

The elderly attach great importance to their outdoor space. The balcony of the apartment and the court are the favorite outdoor space of the elderly, which can help them keep in touch with the outside world. Balcony, as the private outdoor space, can allow the elderly to observe the activities of others and is the site of communication. Each balcony or court should face public grass or the frequent public space, which forms the site of secret and public.

The net depth of the balcony should be no less than 1500mm; the height of the handrail should be no less than 1100mm. Within the rails, flower bed can be set up to improve the safety. The floor the balcony should have good draining function and use anti-skidding materials. The cold northern areas should establish closed balcony.

III. FACILITIES IN THE RESIDENTIAL CONSTRUCTION OF THE ELDERLY

A. Monitoring Facilities

Most old people have emergent diseases and artificial monitoring always has errors. Therefore within the residential construction, besides the emergent button set up by their bed, calling button or video monitoring should be set up in the places where the elderly may act alone and encounter difficulties, which include bathroom, toilet, stairs, corridor and outdoor sites.

Calling installations are mainly buttons and lines may be put along the bed. For the paralyzed people, the automatic alarm equipment should be installed to test their heart rate and blood pressure.

B. Fire Facilities

Because of the weak behavior capability of the old people and the weak reaction capability of the emergency, especially in the night, the requirements of the fire facilities are higher of the common constructions.

The main fuels in modern kitchen are pipe coal gas. The special kitchen for the elderly should set up alarm installation of fuel leakage and the general controlling valve. In the meantime, the fire automatic alarm installation, the hydrant and other fire extinguishers. Middle sized residential construction should be equipped with automatic shower system.

Both the construction materials and the decoration materials should use incombustible materials. The dispersal passage should set up recognizable emergency lighting system and logo; the dispersal stairs should set up handrails of both sides so as to ensure that the elderly move smoothly.

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