

Pedestrian System Analysis of Riverside Residential Community in Mountainous Regions

Siqi Liu^{1,2,3,4,5,a}

¹Shaanxi Provincial Land Engineering Construction Group Co., Ltd. Xi'an 710075, China;

²Institute of Land Engineering and Technology, Shaanxi Provincial Land Engineering Construction Group Co., Ltd. Xi'an 710075, China;

³Key Laboratory of Degraded and Unused Land Consolidation Engineering, the Ministry of Natural Resources. Xi'an 710075, China;

⁴Shaanxi Provincial Land Consolidation Engineering Technology Research Center. Xi'an 710075, China;

⁵Land Engineering Technology Innovation Center, Ministry of Natural Resources. Xi'an 710075, China.

^a4102090209@chd.edu.cn

Abstract

The fragile natural environment, unique mountain and river landscape, complex and changeable outdoor space conditions constitute the unique regional characteristics of Chongqing. Pedestrian system is an important way of transportation for residents in mountainous cities, and the pedestrian system space in residential areas is a significant space for residents to travel and activities. Based on the field investigation of Yongjiangyuan (YJY) and Junyi World (JY) residential communities in Chongqing, this research explores the design and practice of pedestrian system in mountainous waterfront residential areas by means of analysis and comparison, combined with the characteristics of residential areas in southwest China, the design and planning strategies of pedestrian system in mountain waterfront residential areas will be further considered.

Keywords

Residential Community; Pedestrian System; Human-oriented.

1. Introduction

Walking is one of the most important travel ways for urban residents in mountainous areas. The intrinsic value of waterfront residence is to live in the center of the city and enjoy the beauty of nature. In urban life, it has become a dream of many urban people to have hydrophilic river view residence. Especially in Chongqing, the residential construction along the Yangtze river and Jialing river is a typical representative of the characteristic architectural features of mountain city and river city in Chongqing. Therefore, in the process of planning and design, it is necessary to pay more attention to the improvement of the quality of human settlements environment, emphasizing that the walking system should correspond with the mountain environment, and enrich the visual feeling in the walking process. The complex and changeable terrain conditions of mountainous cities constitute the environment for residents to walk. These landscape elements are different from the residential areas of plain cities, which form the characteristics and value of pedestrian system in Chongqing mountainous city residential areas [1]. The residential area and its surrounding environment can reflect the regional characteristics of Chongqing in a comprehensive way [2].

Residential areas with similar scale are relatively mature development and high occupancy rate. However, different mountain settlements deal with complex terrain conditions differently. The function and effect of walking system in residential area are different through different planning

methods. Through the investigation of typical Junyi world (JY) and Yongjiangyuan (YJY) residential area in Chongqing, we will have a deeper understanding and understanding of the pedestrian system of waterfront mountain residential area.

2. Research Object

JY located in Nanping Danlong road, Nanan district, which was built in 2005. The community has 12 houses in total, which are surrounded by two 12-storey small high-rise buildings and ten 32-storey high-rise houses (Fig. 1a). The land area is 5.17 ha and the plot rate is about 3.15. Besides, the greening rate is 41%. It is backed by Nanshan and sits on the Yangtze river. The terrain inside the community is high in northeast and low in southwest, forming a three-dimensional view of three-level platform. YJY located in Hualongqiao, Yuzhong District. It was built in 2008, with 12 houses, which are enclosed by 31-storey high-rise residential tower and 14-storey high-rise residential buildings (Fig. 1b). The land area is 6.08 ha, and the plot rate is 2.3. The greening rate is approximately 40%. The residential area is adjacent to Pingding mountain green scenic spot in the west, and it is surrounded by Jialing river scenery, and the terrace natural theme courtyard is formed by retaining the original terrain.

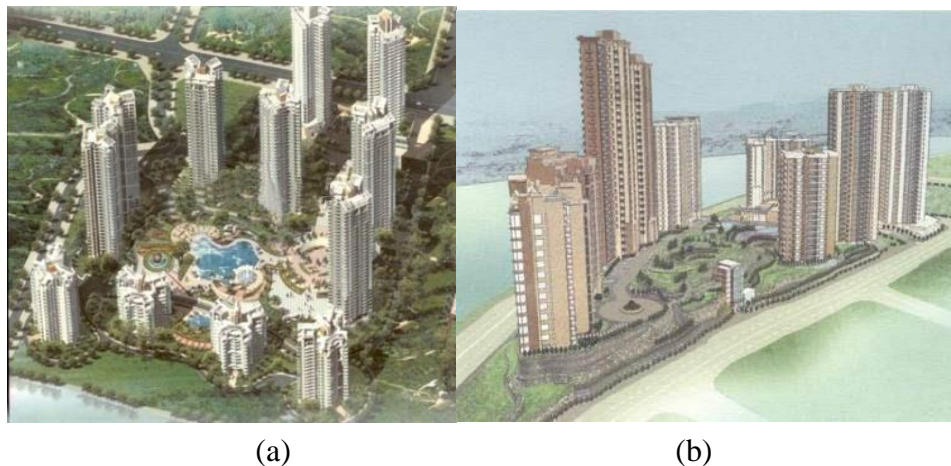


Figure 1. The layout of JY residential community (Source from Baidu)

3. Pedestrian System Analysis



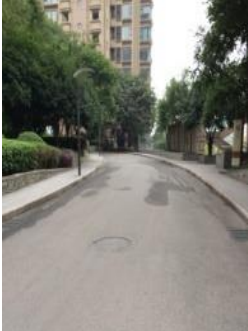





The connection between the pedestrian system in the residential area and the city is mainly through the connection between the pedestrian entrance and the city road. Reasonable entrance and exit settings can not only meet the needs of people's walking range, but also improve the utilization rate of service facilities distributed along the city road, to meet the different needs of the residents in the daily life. The main entrance of JY's pedestrian located in the main road of the city (Danfeng road), and the secondary entrance located in the branch road of the city. The main pedestrian entrance of YJY is located on the urban secondary trunk road (Ruitian road), and the secondary pedestrian entrance is located on the planning branch road. The setting of pedestrian entrances and exits in the two communities is closely related to the peripheral traffic. The main entrance, pedestrian entrance and vehicle entrance are separated to meet the safety and convenience of walking.

Since the Radburn Idea was put forward, the residential road planning is mostly a pedestrian vehicle diversion system, but the pedestrian function is often ignored. The general practice of residential area is to give priority to vehicle behavior, and because of the limited road space, the pedestrian walking space is often insufficient. Different modes of traffic organization in residential areas will form different feelings of living space, and the quality of pedestrian space is closely related to the residential atmosphere. JY adopts part of the pedestrian and vehicle branch system, and uses the height difference to form a complete branch of the main pedestrian road and the community level

vehicle line (Tab.1). The entrance space of some residential buildings is like that of the group level vehicle line, creating a complete pedestrian space. YJY district adopts the traffic system of completely mixed traffic of people and vehicles. The road is combined with the terrain. There are pedestrian footpaths on both sides of the district level road, forming a traffic system dominated by vehicles. Under the current situation of meeting the construction standards of basic supporting facilities in the community, creating the guidance of walking system for internal residents is conducive to improving the utilization rate of facilities and providing better leisure and entertainment places for residents. JY located on one side of the main pedestrian path of the community, adjacent to the central landscape of the community. The kindergarten relates to many footpaths around, with strong accessibility. The club facilities are combined with residential buildings. YJY forms the center of the community with the clubhouse, which relates to several footpaths and has strong accessibility. The kindergarten is located near the pedestrian entrance, providing a quiet environment for the interior of the residential area.

Under the background of mountainous area, the undulating urban terrain, people climbing the slope, the whole walking process changes with the change of urban environment, which is the basis and advantage of constructing the walking system of mountainous residential area. In the principle of residential road design, unobstructed and the zigzag change of walking path led to the continuous change of vision, forming a series of continuous psychological feelings, creating a livable living environment.

Table 1. Walking path dimension analysis

	JY		YJY	
Main pedestrian routes				
Width (m)	4.5	2	7(Driveway) and 1.2(Walkway)	7(Driveway) and 1.2(Walkway)
Pedestrian paths				
Width (m)	1.5	2.4	1.5	1.2

The whole enclosed building layout was adopted in JY. The small high-rise and high-rise buildings form an inward courtyard space. The small high-rise buildings are arranged on the river. The high-rise buildings are arranged in a staggered way, forming a rich courtyard pedestrian space, and the walking range is expanded. The main pedestrian paths in the community are closely connected with the mountain terrain, the main pedestrian paths are closely connected with the garden footpath (secondary walking path), and the node space is formed at the connection between the main and secondary footpath, which forms the branch pedestrian network covering the community. The pedestrian node space is mainly composed of small square of main pedestrian road and courtyard

space before residential buildings enter the house. At the same time, three sight corridors are formed by the staggered layout of the building, and the main scenic spots are distributed on the main pedestrian and waterfront landscape footpaths. The main pedestrian entrance is on the important sight corridor, which forms a rich different view effect with the terrain height difference of the community. The activity space and landscape in the community are integrated, mostly for ribbon space and small activity site. According to on-site survey, it is mainly spontaneous and social activities.

YJY adopts semi enclosed building layout to form the high-rise and small high-rise buildings and residential courtyard space, strive for a larger landscape space and landscape interface, providing important pedestrian activities for residents and strengthen the concentration of walking path. The main pedestrian lanes in the community are arranged in parallel with the carriageway, and the secondary pedestrian (garden walk) is mainly combined with courtyard landscape and waterfront landscape. The main node space is formed around the club, and the secondary node space is formed along the waterfront landscape footpath and courtyard space before the residence enters the house. The architectural layout of YJY adopts several high-view point landscape corridors, the main scenic spots and main activities are combined, among which the residential space is formed in the overhead space at the bottom of waterfront residence. The activity space of the community is concentrated around the club. According to on-site survey, the active crowd is mainly concentrated in the interior of the club, and the outdoor activity crowd mostly stays briefly, and the spontaneous and social behavior activities are not much, and the most of them are mandatory activities, such as driving to work and taking children to school.

4. Results

4.1 Human-Oriented Design

Through the investigation of residential areas in the mountainous cities along the river, the author has a deeper understanding of the design starting point of human-oriented residential area. The paper reviews the theory of human beings' development of pedestrian system in residential areas, from Perry's neighborhood unit to the Radburn Idea of people and vehicles diversion under the background of the influence of private automobile age on urban life, advocating the priority of walking and coexistence of people and vehicles [3]. From the concept of traffic peace to sharing of people and vehicles, eventually to equality between people and vehicles [4]. In the age of automobile, pedestrian transportation is becoming more and more important in residential areas. The demand of pedestrian system is different from that of plain city, and pedestrian traffic accounts for a high proportion of the residents in mountainous cities. It plays an important role in the design of residential areas.

On the other hand, people living in Chongqing have special feelings for the river, whether it is the Yangtze river with infinite source and mother's feelings or Jialing river, has become a part of Chongqing's typical life. The residential areas of this survey have typical regional characteristics in Chongqing. In the residential area, the planning of river view needs to be paid great attention to meet the sensory experience and psychological needs of looking at the river.

4.2 Adjust Measures to Local Conditions

Due to geographical differences, the sunshine distance of residential buildings in northern areas is required to be relatively higher. For high-rise and small high-rise residential quarters, in terms of layout form, the courtyard space surrounded by the building is larger than Chongqing. According to the analysis of height width ratio, the scale will be more open. In terms of road network organization, because of the large residential space in northern residential areas, the inter residential roads are connected with the group level roads driving, and the road network organization is mainly mixed by people and vehicles or some people and vehicles to meet the convenient travel needs of people [4-5]. In terms of landscape organization, according to the terrain characteristics, the landscape of northern residential areas is mostly plain landscape. It can create a pleasant living environment through courtyard landscape.

By contrast, in the background of mountain, the undulating terrain changes constitute the largest environment for people to rely on walking. However, this special terrain has caused the dualization of people's travel mode, which is mainly reflected in the traffic organization and landscape construction in the residential area. In residential areas, terrain is used more skillfully by pedestrian system with the support of modern engineering technology. It emphasizes that the limited mountain space is used stereoscopic, especially in important nodes, which forms a unique three-dimensional walking space [6]. Walking space depends on terrain, combined with landscape that creating unique mountain spatial landscape. In terms of the combination of traffic and landscape in residential areas, the courtyard space surrounded by small and high-rise residential areas in Chongqing is stronger than that of urban residential areas in the north. The landscape scale of courtyard space and the design of pedestrian space are very important. At the same time, the reasonable organization of the traffic and the traffic within the community can increase the safety and continuity of the walking activities. In the reality of limited road space, it is necessary to avoid taking the car road as the dominant function of the traffic in the community. It can create more space for residents to take place from indoor to outdoor spontaneous and social activities, and more harmonious community social atmosphere.

5. Conclusion

Based on the field investigation of two waterfront residential areas, the design methods of pedestrian system in residential areas are compared; In the case of maintaining the regional characteristics, combined with their own field research experience, although the two settlements are more clever use of the mountain terrain, compared with the research direction walking system, the combination of JY walking traffic and landscape organization has more reference significance. The walking path scale and spatial organization of JY community pay more attention to human-care for residents, and the walking and vehicle traffic are effectively connected. However, the design of YJY district is more motorized and ignores people's walking needs. The terraced mountain landscape and the central courtyard landscape have completely become the negative space with weak utilization.

References

- [1] Pan Jing. Research on the development of mountain scale residential area in Chongqing Based on Symbiosis Theory -- Research on the planning method of pedestrian system [D]. Chongqing. Chongqing University, 2012
- [2] Lei Cheng, Zhao Wanmin. Theory and practice of pedestrian system planning and design in mountainous cities [J]. Journal of Urban Planning, 2008, (3): 71-77.
- [3] Wu Yue. Study on development strategy and mode of riverside residential area in Chongqing main city [D]. Chongqing, Chongqing University. 2007.
- [4] Wang Li. Preliminary study on landscape space of residential path design [J]. Anhui Architecture, 2004, (6): 9-10.
- [5] Yoshinobu Ashihara. Exterior Design in Architecture [M]. China Architecture & Building Press, 2000.
- [6] Jan Gehl. Life between Buildings [M]. China Architecture & Building Press, 1992.