Research on Design Optimization Strategy of Barrier-Free Road System in Residential Area

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Abstract: Improving the Barrier-Free Road System in Residential Areas is an Important Part of the Humanization Concept of Road Design in China. However, through Practical Investigation, It Can Be Found That There is No Perfect Barrier-Free Road System in Many Residential Areas, Especially in the Old Residential Areas. Taking the Domestic and Foreign Residential Area Barrier-Free Road Design Cases As a Breakthrough, This Paper Focuses on How to Optimize the Design of China's Residential Area Barrier-Free Road.

1. The Problems in the Design of Barrier-Free Roads in Residential Areas in China

Many roads in residential areas in China do not reflect the design concept of barrier-free roads, which brings a lot of inconvenience to the residents in the community. The main reason for this situation has a lot to do with China's basic national conditions. First of all, many residential area designers in China lack the concept of barrier-free design, focusing on the road design of the community on healthy people, with high-end, luxury and modernization as the design goal, but ignoring the travel difficulties of the disabled, the elderly and children inside the community. Secondly, barrier-free road design lacks integrity. Barrier-free road system is a complex design concept, which requires detailed design in many aspects. Making barrier-free design in only a few aspects cannot reflect the superior performance of the overall system. Thirdly, in order to enhance the commercial value of residential areas, design departments and construction enterprises deliberately ignore the construction of barrier-free system. Because the design of barrier-free roads will greatly increase the cost, but the owners of newly built residential areas are mostly healthy people, so the design of barrier-free roads cannot become the selling point of the residential areas. It's just plain thankless. The disabled, the elderly and other social vulnerable groups often live in the old community. Due to the age of construction in this part of the area, the barrier-free road system cannot meet the use requirements. Finally, there is the issue of people's attitude towards vulnerable groups, which many people do not pay attention to. Although the state and the government have repeatedly stressed the concern for the life of vulnerable groups, in the process of implementation, the task cannot be fulfilled with both quality and quantity. Therefore, in order to ensure the interests of vulnerable groups, the road design in residential areas must be optimized.

2. Case Analysis of Barrier-Free Road Design in Residential Areas Abroad

The construction of barrier-free roads in developed countries. The United States first proposed barrier-free road design to facilitate the lives of disabled military personnel. But with the development of society, the design of accessible roads in the United States has been serving more and more American citizens. In addition, in the United States, the design standards of barrier-free roads have been included in the law, and professional institutions have been engaged in research work, and the major of barrier-free road design has been set up in universities. It can be said that at present, the barrier-free road in the United States has formed a comprehensive system from partial design to overall layout, and has reached the world-class level under the supervision and guarantee of laws. European countries also attach great importance to the construction of barrier-free roads. They attach great importance to creating barrier-free environment, and have begun to call on the whole society to provide convenience for vulnerable groups. Japan, Korea, Malaysia and other

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countries have formulated the national uniform barrier free road acceptance standards. After the completion of a residential area, professional departments will conduct strict acceptance of the barrier free facilities in the community. In the process of acceptance, barrier-free roads and the construction of barrier-free environment will be checked and accepted according to the scale and grade of the community. Not only will the roads in the residential areas be designed without barriers, but other supporting facilities will also take the needs of vulnerable groups into full consideration. It can be seen that barrier-free design in many developed countries has reached a very high level, and many classic cases have been generated, which China should learn from. But China's barrier-free road construction needs to make specific changes according to its national conditions.

3. Optimal Design Strategy of Barrier-Free Roads in Residential Areas

3.1 Optimization of Residential Road System Design

The road design in residential areas should follow the principle of smoothness, and the road surface should not have obvious difference in height. It is necessary to ensure the smooth communication between the outside and inside of the community and to avoid traffic congestion. At the same time, the design of roads should be based on the concept of accessibility to ensure the safety and convenience of the elderly, children and people with disabilities. Only in this way can a warm and comfortable family atmosphere be created and residents of the community feel the care of the society.

1) Residential district trunk road design. The main road of residential area is the link between the residential area and the urban traffic system, so it is necessary to ensure that the width of the main road can meet the relevant requirements. There should be a green belt in the middle of the road, which can separate the motor vehicle lane from the non-motor vehicle lane, which can not only protect the environment, but also provide safer travel conditions for residents. Stone ramps shall be provided at the starting and ending positions of the sidewalk and at both ends of the pedestrian crossing. Kerb ramps at road intersections should be aligned with crosswalks. In addition, the road should be paved for the blind, and the public facilities should also take into account the travel difficulties of the blind and special groups.If the community scale is large and the community interior has the public transportation station, the safety of residents' vehicles should also be taken into account in road design.

2) Internal road design of the community. The roads in the residential area are mainly designed for residents to travel, which are mainly non-motor vehicles and sidewalks. Therefore, there must be kerb ramps at the beginning and end of the road and at the road position where the height difference exists, so that it is easier to carry things and wheelchairs. Ramps shall be provided where steps must be provided and handrails shall be provided on one or both sides of the ramps.

3) Pedestrian path design. In residential areas. The design of pedestrian paths should take the needs of special groups into full consideration and try to inculcate the concept of barrier-free design. For example, when designing the landscape around the pedestrian path of the residential area, in order to add fashionable atmosphere, many landscapes are designed full of interest. However, many landscapes will bring trouble to people with disabilities, and also bring safety risks to the elderly and children. Therefore, the surrounding environment of the pedestrian path inside the community should be kept as simple and lively as possible. On the walkway, facilities such as telegraph poles, billboards, traffic signs should be avoided, so as not to bring inconvenience to the disabled and the elderly, children's travel. Here, I particularly emphasize the design of speed bumps. In order to ensure the safety of residents' travel, many residential areas use speed bumps to reduce the speed of motor vehicles. This design is in line with the standards of safe traffic. But make sure that a wide gap should be left on either side of the seat belt. This optimized design allows wheelchairs and strollers to pass through. The specific width can refer to the specific size of wheelchairs and trolleys.

4) Kerb ramp design. Kerb ramps are the transition areas between crosswalks and other roads, so they are the key to accessibility. But at present, the slope design of many kerb ramps is still

relatively high, many people with mobility difficulties will still have a lot of inconvenience when passing through. Therefore, in the future residential road design, the slope height can be appropriately reduced, so as to achieve a true barrier-free road design.

5) Design of other ancillary facilities around the road. There will be other ancillary facilities around residential roads. The design of this part of the facilities should also fully consider the needs of special groups, to achieve accessibility. For example, public telephone booths, post boxes and other facilities will be set up around the road. The external selection of these facilities should be reasonable. They should not be located in remote places, and should not obstruct the traffic. And the needs of people with disabilities and children in height should be considered. Be sure to check regularly the safety of the trench cover designed for the convenience of drainage in residential areas. The corner hole of the mesh trench cover and the width of the grid bar must meet the national standards, to avoid the danger of wheelchairs or prams falling into the gapp.

3.2 Optimization of Road Design in Residential Entertainment Areas

In order to create a good living environment for the residents in the residential area and give them opportunities to get close to nature, there will be small squares, green Spaces and sports and entertainment facilities. In order to make disabled people, the elderly and children have the right to enjoy public facilities, the road design around these facilities should also be barrier-free.

1) Road design at the entrance and exit. Fences are often erected around recreational areas in residential areas to avoid motor vehicles. But if the railings are too close to each other, they can interfere with access to wheelchairs and baby strollers, so keep them at a moderate distance. If there is a certain slope at the entrance, try to slow down the slope of the rampp. The material used on the ramp must have good anti-skid function to ensure pedestrian safety as much as possible. Signs for civilized use of public facilities should be placed at the entrances and exits, and braille should be printed on the signs. Only in this way can the humanity care of the society be better reflected and all residents in the community can enjoy the public facilities equally.

2) Garden road design. The garden road in the residential area must be designed with warmth, moderate width and smooth pavement. In areas where steps must be provided, be sure to have ramps in place. The paving materials used on the road surface of the garden should have good skidproof performance, and there should be obvious suggestion standard in the area with step or height difference, for example, changing the color of laying materials or designing suggestive signs with different colors of laying materials. Many residential areas like to use sand or natural stone to create a variety of patterns, which can add to the area's artistic atmosphere. But the stone road surface will often appear uneven conditions, which is not conducive to the disabled or the elderly, children to walk. Therefore, the roads in residential areas should be as smooth as possible, with barrier-free access as the main concept of the design.

3) Others. There will also be many public recreational facilities in the residential area, so the roads around these facilities will be carefully designed. For example, public seats, dustbins and fitness equipment should be placed and designed with the needs of all people in mind, and the needs of disabled people should be taken into account as much as possible, so that they will not feel discriminated against. Many residential areas will also have pools or fountains and other recreational facilities, and the roads around these areas are harder and less slippery than other areas. There should also be handrails or other protective devices around the pool to prevent children or disabled people from falling into the water.

4. Conclusion

Residential areas are the main areas where people live, especially the elderly, children and people with disabilities, most of their life is carried out in the community. Therefore, the process of barrier-free construction of roads in residential areas should be strengthened to provide them with a more comfortable and pleasant living environment. With the improvement of human living standard, the society pays more attention to the vulnerable groups. As the bridge between human and the outside world, the road system should embody the characteristics of humanization. The

optimization of barrier-free road design is to show the society's care for vulnerable groups in the most life-like way.

References

[1] Lu Bin. The expression of barrier-free design in municipal roads [J]. Straits science and technology & industry. 2018(07), PP. 26-28.

[2] Li Congbao; Wang Hongcheng. Research on design method and matters needing attention of municipal road reconstruction project [J]. Jiangxi building materials. 2019(07), PP. 65-67.

[3] Wu Yuxing. The embodiment of barrier-free design in municipal road design [J]. Green and environment-friendly building materials. 2019(07), PP. 33-34.

[4] Lu Li. Application of barrier-free design concept in municipal road planning and design [J]. Housing and real estate. 2019(06), PP.57-61.