



## Study on Barrier-Free Design in Open Spaces in Public Use Areas

メタデータ	言語: eng 出版者: 公開日: 2009-08-25 キーワード (Ja): キーワード (En): 作成者: MASUDA, Noboru, SHIMOMURA, Yasuhiko, YAMAMOTO, Satoshi, ABE, Daishu, SONOYAMA, Misaki メールアドレス: 所属:
URL	<a href="https://doi.org/10.24729/00009181">https://doi.org/10.24729/00009181</a>

## **Study on Barrier-Free Design in Open Spaces in Public Use Areas**

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(Received, November 13, 1996)

### **Abstract**

This study presents historical changes in and a basic framework for barrier-free design through literature review. It then explores ideal barrier-free design of open spaces found in public use areas in terms of landscape design.

The results of this study indicate that it is important to conduct an accurate evaluation of problems posed by an area or space based on clear evaluation standards to ensure public use spaces are barrier-free. In evaluation, it is especially important that outdoor spaces not only pass the minimum standards provided by design guidelines, but also satisfy a level which is necessary for overall amenity. In addition to making individual spaces and facilities barrier-free, it is critical to include the viewpoint of designing settings which deals with relationships between spaces, or facilities and their locations. It is also important to develop a comprehensive viewpoint which takes into consideration the density and locations of spaces and facilities located in public use areas, and their transportation networks.

### **Purpose of Research**

With the arrival of an aging society, the concept of barrier-free design is introduced, based on the ideal of normalization, in every possible field of our life ranging from outdoor environments to daily necessities. This study is to present historical changes in and a basic framework for barrier-free design through literature review, and then to explore ideal barrier-free design of open spaces located in public use areas in terms of landscape design.

### **Research Method**

First, this study summarized historical changes in barrier-free design and identified its concept by reviewing literature on welfare, civil engineering and architecture to establish a basic framework for this study. Next, it compared the design guidelines stipulated by the Tokyo Metropolis, Osaka Prefecture and the Americans With Disabilities Act (ADA), and then studied outdoor environments on their compliance with the design criteria. Taking these results into consideration, a case study was conducted from the viewpoint of landscape design to discuss ideal barrier-free design.

## Results of Analysis and Discussion

### *Historical Changes in Barrier-Free Design*

Principle movements of barrier-free design in outdoor spaces in Japan and abroad are shown in Table 1-2.

Barrier-free design, derived from the ideal of normalization which began in Northern Europe around 1960, became standardized in the United States a year later. Having this standardization as a starting point, this concept spread through most developed nations in the 1960's. Then, in 1974, a report on barrier-free design was submitted to the United Nations. The most recent example is the Americans With Disabilities Act established in 1990. In this way, the concept of barrier-free design has penetrated thinking throughout the world.

Barrier-free design was introduced to Japan in "A Model City Project Aimed at Welfare of Physically Handicapped People" issued by the Ministry of Health and Welfare, "Guidelines for

Table 1 Historical changes in barrier-free design

Year	Principle movements in Japan	Principle movements abroad
1960		• Around this time, the ideal of normalization began.
1961		• Barrier-free design first became standardized in the United States.
		• During the 1960's, the concept of barrier-free design spread through most developed nations.
1964	Public housing for the elderly	
1967	Public housing for physically handicapped people	
1973	(W) A Model City Project Aimed at Welfare of Physically Handicapped People, Improvement of Urban Environment	
	(C) Guidelines for Smaller Differences in Sidewalk and Road Level and the Use of Special Tiles to Guide the Blind	
1974	(M) Guidelines for Improving Buildings for People with Physical Limitations	• A report on barrier-free design was submitted to the United Nations.
	The introductory period of barrier-free design.	
	*From then on, the Ministry of Health and Welfare and that of Construction established design standards and issued memorandums.	
1977	Ordinance for Protecting the Well-being of the Citizens of Kobe	
1979		• The International Organization for Standardization issued Guidelines for Incorporating Handicapped People's Needs
1981	The International Year of Disabled Persons	
	* One after another local governments established improvement guidelines.	
	* Actual improvements did not progress much, since those guidelines were not imposed by law.	
	Barrier-free design was applied to the Port Liner in Kobe and the subway operated by Kyoto.	
1988	(T) Guidelines for Creation of Communities with Welfare Services	
1990	(C) A Model Project to Promote Creation of Communities with Welfare Services	• The Americans With Disabilities Act (ADA) was adopted in the United States.
	(W) A Project to Create Comfortable Communities with Welfare Services	
	The range of the target population was expanded nationwide.	
	* The target population was not limited to physically handicapped in any guidelines subsequently issued.	
	(K) Altered The Building Standard Law Enforcement Ordinances.	
	* Details on barrier-free design were included.	
	* Ordinances were enforced by law and imposed exclusively on "special buildings."	
1992	(O, H) Ordinances for Creation of Communities with Welfare Services Enforcement of these laws is weak. The range of facilities included in the ordinances expanded.	

(W) The Ministry of Health and Welfare (C) The Ministry of Construction (M) Machida City  
 (T) The Tokyo Metropolis (K) Kanagawa Prefecture (O) Osaka Prefecture (H) Hyogo Prefecture

Table 2 Historical changes in barrier-free design

Year	Principle movements in Japan	Target population	Target facilities
1964	Public housing for the elderly	• Physically and mentally handicapped people	Family dwellings
1967	Public housing for physically handicapped people	• Intellectually handicapped people	
1973	(W) A Model City Project Aimed at Welfare of Physically Handicapped People, Improvement of Urban Environment	• Elderly people	Roads
1974	(C) Guidelines for Smaller Differences in Sidewalk and Road Level and the Use of Special Tiles to Guide the Blind	• Physically handicapped people	Public buildings
	(M) Guidelines for Improving Buildings for People with Physical Limitations		
	The introductory period of barrier-free design.		
	*From then on, the Ministry of Health and Welfare and that of Construction established design standards and issued memorandums.		
1977	Ordinance for Protecting the Well-being of the Citizens of Kobe		
1979			
1981	The International Year of Disabled Persons * One after another local governments established improvement guidelines. * Actual improvements did not progress much, since those guidelines were not imposed by law. Barrier-free design was applied to the Port Liner in Kobe and the subway operated by Kyoto.		Public transportation facilities
1988	(T) Guidelines for Creation of Communities with Welfare Services	• All people	Parks
1990	(C) A Model Project to Promote Creation of Communities with Welfare Services	"With Welfare Services"	"Comfortable "
	(W) A Project to Create Comfortable Communities with Welfare Services		
	The range of the target population was expanded nationwide.		
	* The target population was not limited to physically handicapped in any guidelines subsequently issued.		
	(K) Altered The Building Standard Law Enforcement Ordinances.		
	* Details on barrier-free design were included.		
	* Ordinances were enforced by law and imposed exclusively on "special buildings".		
1992	(O, H) Ordinances for Creation of Communities with Welfare Services Enforcement of these laws is weak. The range of facilities included in the ordinances expanded.		

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Smaller Differences in Sidewalk and Road Level and the Use of Truncated Tiles to Guide Visually-Impaired People" by the Ministry of Construction in 1973 and "Guidelines for Improving Buildings for People with Physical Limitations" by Machida City in 1974. "The International Year of Disabled Persons", 1981, triggered many local governments to establish "Guidelines for Creating Improved Living Environment." However, actual improvements did not progress much, since those guidelines were not imposed by law. In 1990, Kanagawa Prefecture altered the Building Standard Law Enforcement Ordinances to conform with Article 40 of the Building Standard Law of Japan, and thus included provisions enforced by law which require all "special buildings" be barrier-free. In 1992, "Ordinances for Creation of Communication Welfare Services/People-Friendly Environments" were set forth by Osaka and other prefectures, which indicates the beginning of a movement toward expanding the target facilities covered by ordinances compelled by law. Barrier-free design was initially adopted exclusively for "senior citizens", "physically handicapped" and other special groups of people, but recently the target of barrier-free design extended to "all people". The target facilities of barrier-free design were limited to "houses" and "roads" in the earlier stages. After "Guidelines for Creation of

Communities with Welfare Services in the Tokyo Metropolis" was presented in 1988, the target facilities include "public transportation" and "parks" as well. Therefore, barrier-free design has been developed to be universally adopted, covering "all people" and an expanded range of target facilities.

#### *A Basic Framework for Barrier-free Design*

Through document review mentioned above, normalization was defined in this study as "an idea and a method to create a society in which no discrimination against people with disabilities, senior citizens and other handicapped people exists, and therefore, all disabled people live life as do those with usual abilities." Barrier-free design is acknowledged as a design which does not impose additional barriers for people with physical limitations such as people with disabilities, senior citizens, pregnant women, small children and people carrying large packages or baggage. Therefore, barrier-free design serves as a means of realizing a society which operates on the ideal of normalization.

#### *Review of the Basic Concepts of Design Guidelines for Outdoor Spaces*

This study reviewed basic concepts of design guidelines addressed in the following, respectively; "Guidelines for Creation of Communities with Welfare Services" adopted by the Tokyo

Table 3 Description of guidelines and laws

Item	Guidelines for Creation of Communities with Welfare Services in the Tokyo Metropolis in 1988	Ordinance for Creation of Communities with Welfare Services set forth by Osaka Prefecture in 1992	ADA (The Americans With Disabilities Act) in 1990
Target population	All people residing in Tokyo including people with disabilities, elderly people, young children and pregnant women.	All residents in Osaka including disabled and elderly people.	Individuals with disabilities including those who use wheelchairs.
Target facilities	All facilities an unspecified number of people use, which basically consist of buildings except for those specifically built for physically handicapped people, public transportation facilities, roads and parks.	Urban facilities, which, regardless of their size, an unspecified and great number of people use; such as buildings, roads, parks and parking lots.	All public facilities regardless of federal funding, including facilities such as restaurants, hospitals, movie theaters, medical and law offices, and retail stores.
Law Enforcement	Technical standards shall be applied to new facilities, and existing facilities undergoing enlargement or alteration. For improvement of existing facilities, the above shall apply.	Proprietors shall make urban facilities conform to the design guidelines. Prior to construction of certain specified facilities (urban facilities used by a large number of people), counsel is required, and for existing facilities the degree of conformance should be assessed and improvement plans should be prepared.	Barriers shall be removed in compliance with the requirements of the law of each state. Approval shall be obtained.
Security provisions	None	Spot inspection, recommendation, public announcement.	

Metropolis in 1988, "Ordinance for Creation of Communities with Welfare Services" by Osaka Prefecture in 1992, and "ADA" by the U.S. in 1990. Table 3 summarizes each concept.

In comparison, the guidelines of the Tokyo Metropolis and those of Osaka Prefecture have almost the same definitions for the following items; The former defines subjects as all people residing in Tokyo including people with disabilities, elderly people, young children and pregnant women, while the latter as all residents in Osaka including disabled and elderly people. Outdoor facilities addressed in the former guidelines are referred to as all outdoor facilities an unspecified number of people use, such as buildings, public transportation facilities, roads and parks, and those addressed in the latter guidelines as all outdoor facilities an unspecified and great number of people use, such as buildings, roads and parks. In regard to law enforcement, however, Osaka Prefecture has more stringent guidelines than the Tokyo Metropolis, because the guidelines are specified in ordinances, accompanied by security provisions.

Table 4 Guidelines for parks (accessible paths of walk)

	The Guidelines for Creation of Communities with Welfare Services in the Tokyo Metropolis (1988)	Thy Ordinance for Creation of Communities with Welfare Services in Osaka Prefecture (1992)	ADA (1990)
Basic concepts	To be usable by wheelchair users, at least one accessible route of travel must be provided to each different activity provided in the play area.	An accessible path of travel must be designed to be usable by disabled people. An accessible path of travel provided for disabled people from an accessible entry into the play area must be designed in accordance with the following structures.	To be usable by individuals with disabilities such as visually-impaired people and people on crutches, as accessible route of travel must be provided from an accessible entry to each different activity provided in the play area.
Walk Slope	Walk slope must not exceed 1:25. If a 3% to 4% walk slope is more than 50 meters long, intermediate landings at least 150 cm long and as wide as the path must be provided. Cross slope must not exceed 1:25. Cross slope is avoided, whenever possible.	Walk slope does not exceed 1:12.5. If 3 to 4% walk slope is more than 50 m long, intermediate landings at least 150 cm long and as wide as the path must be provided.	Walk slope must not exceed 1:20. Cross slope must not exceed 1:50.
Width of a path	Walks must be at least 120 cm wide. However, more than 180 cm is preferable to allow a wheelchair user and one person to pass or to provide a crosspath.	Walks must be at least 120 cm wide. However, more than 180 cm is preferable to allow a wheelchair user and one person to pass or to provide a crosspath.	Walks must be at least 122 cm wide. However, more than 224 cm is preferable to allow two children using wheelchairs, walkers or crutches to pass.
Surfacing	The walk surface must be slip-resistant and level. Sand is not acceptable.	The walk surface must be level, slip-resistant. Sand is not acceptable.	The walk surface must be safe, firm and stable. Sand shredded rubber and wood chips are not acceptable.
Level changes	Level changes caused by the differences between curb or underdrain level and its adjacent surface must be beveled until they are less than 2 cm. The slope of the curb ramp must not exceed 1:25. The curb ramp must be at least 120 cm wide. If level changes are up to 75 cm, they are eased restriction on.	The slope of the curb ramp must be more than 1:2. Level changes must be avoided between curb and adjacent surface levels. The slope of the curb ramp must not exceed 1:12.5.	Abrupt level changes are acceptable if level changes that may be caused by tree roots, cracks do not exceed 0.6 cm. Level changes up to 1.3 cm are acceptable if they are beveled with a slope that does not exceed 1:2.
Truncated tiles to guide visually-impaired people	Truncated tiles must be place where they are necessary.	Truncated tiles must be placed to avoid possible danger and lead visually-impaired people to outdoor facilities.	
Handrails		Handrails must be placed where they are necessary.	

On the other hand, ADA has a clear definition, that is, individuals with disabilities. Its aims are helping disabled people become socially independent, and prohibiting discrimination against individuals with disabilities. In addition, it provides detailed criteria to enable disabled people to access all services related to employment, public transportation, and telecommunication; and public facilities such as public housing.

Table 4 shows improvement criteria for paths of travel in a park excerpted from design guidelines of the Tokyo Metropolis, Osaka Prefecture, and ADA respectively.

Design guidelines of the Tokyo Metropolis limit subjects only to people who use wheelchairs, but those of Osaka Prefecture extend their definition to people with other disabilities, and ADA to every individual with disabilities, such as visually-impaired people and people using crutches. ADA states that an accessible route of travel is provided to each different play activity in a play equipment area. It also provides criteria which put emphasis on easy circulation among play equipment and their areas. The guidelines of the Tokyo Metropolis and Osaka Prefecture refer only to the basic provisions concerning this criteria. For example, they state that surface level changes do not exceed 8.0 % and that walks are more than 1.2 meters wide. On the other hand, ADA demands more detailed provisions as well as the above-mentioned basic provisions. It states that surface level changes are acceptable if they do not exceed 0.6 cm, and that level changes up to 1.3 cm are acceptable if they are properly beveled with a 1 : 2 slope.

### *Case Study*

On the basis of the basic framework for barrier-free design and the design guidelines described in 2 and 3 above, a case study was carried out by using one area and its spaces.

In conducting the case study, attention was focused on public use areas, because it is important to take people's daily lives into consideration when a reform design plan is made. Travelling spaces were chosen as spaces to be studied from the view point that it is significant to establish a network connecting each outdoor facility. Block and parks located within walking distance in the studied area were also chosen as spaces to be studied from the perspective that it is essential for all people to enjoy their health, to be relaxed and to communicate with one another in their daily lives.

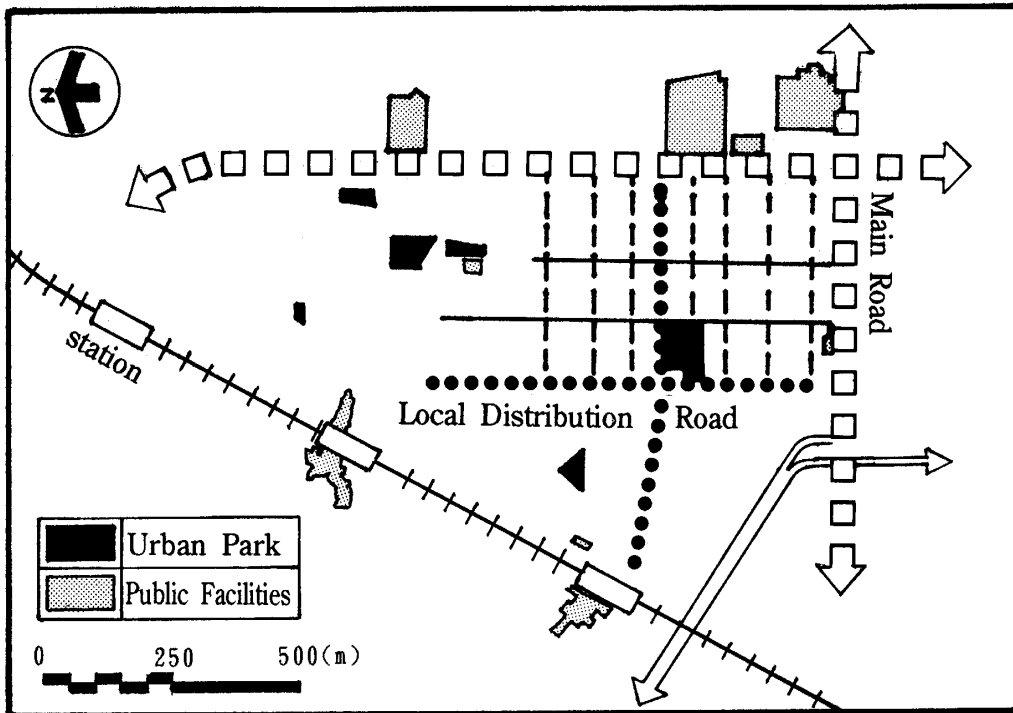
The case study proceeded with the following procedure; to precisely evaluate spaces to be studied for barrier-free design, and then to suggest a reform design plan which would solve issues arising from the evaluation. Studied areas were evaluated on three levels; district, zoning of each space and detail design of each space or outdoor facility. District-related evaluation items were the density and location of studied spaces in a district and networks between them. Those of a zoning level check the relation of travelling spaces and outdoor facilities in a park, and those of detail design level, detail design of spaces and facilities in a park.

In addition to this standard, another standard was set to evaluate the degree to which spaces and facilities are designed to be barrier-free. Sites were classified according to the following; Difficult: all outdoor facilities are not always accessible to all people, Acceptable: people can accept the minimum use of facilities, Accessible: well identified outdoor facilities for healthy living are conveniently, safely and comfortably accessible to all people and helpful to restore the environment.

The case study was carried out in the Shimizu/Morishyoji area, Ashahi-ku, Osaka City. Figure 1 demonstrates the result of the area evaluated on an district level and a reform design plan.

Outdoor facilities related to people's daily lives, such as governmental and public facilities including parks, commercial facilities, the post office and social welfare facilities are located on this figure. The issues arising from the evaluation are that the density of roads is low in the

Existing Condition



A Reform Design Plan

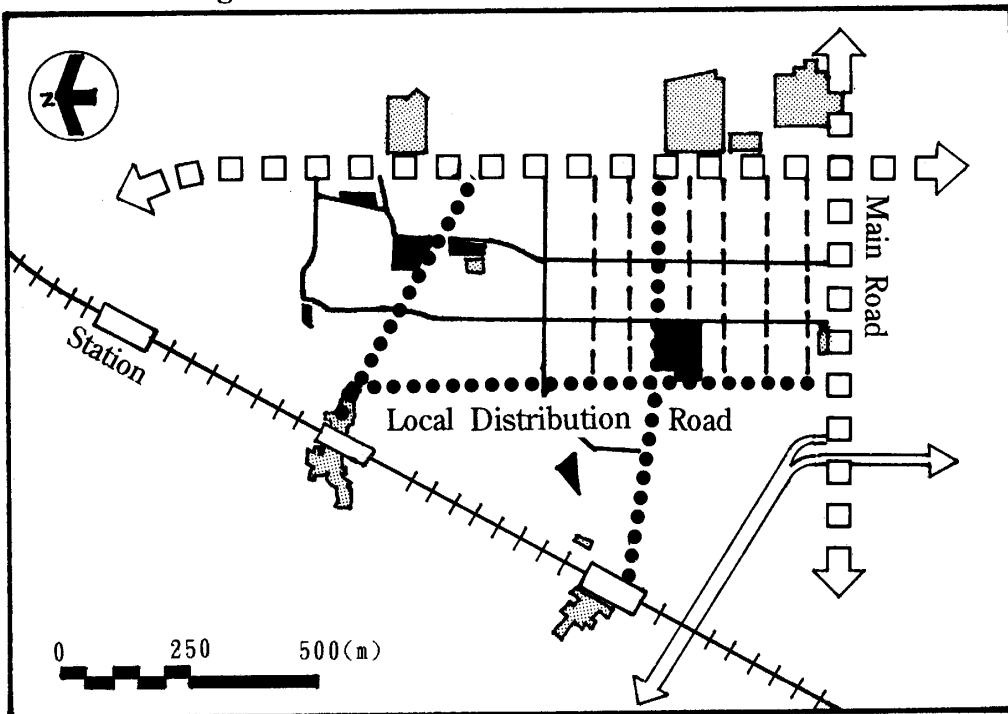


Fig. 1 A reform design plan on a district level

north part of the area and that transportation networks connecting facilities related to people's daily lives are not well established. In regard to location of block parks, the studied block parks, each of which is located within the service radius of 250 m, satisfy the whole area. No



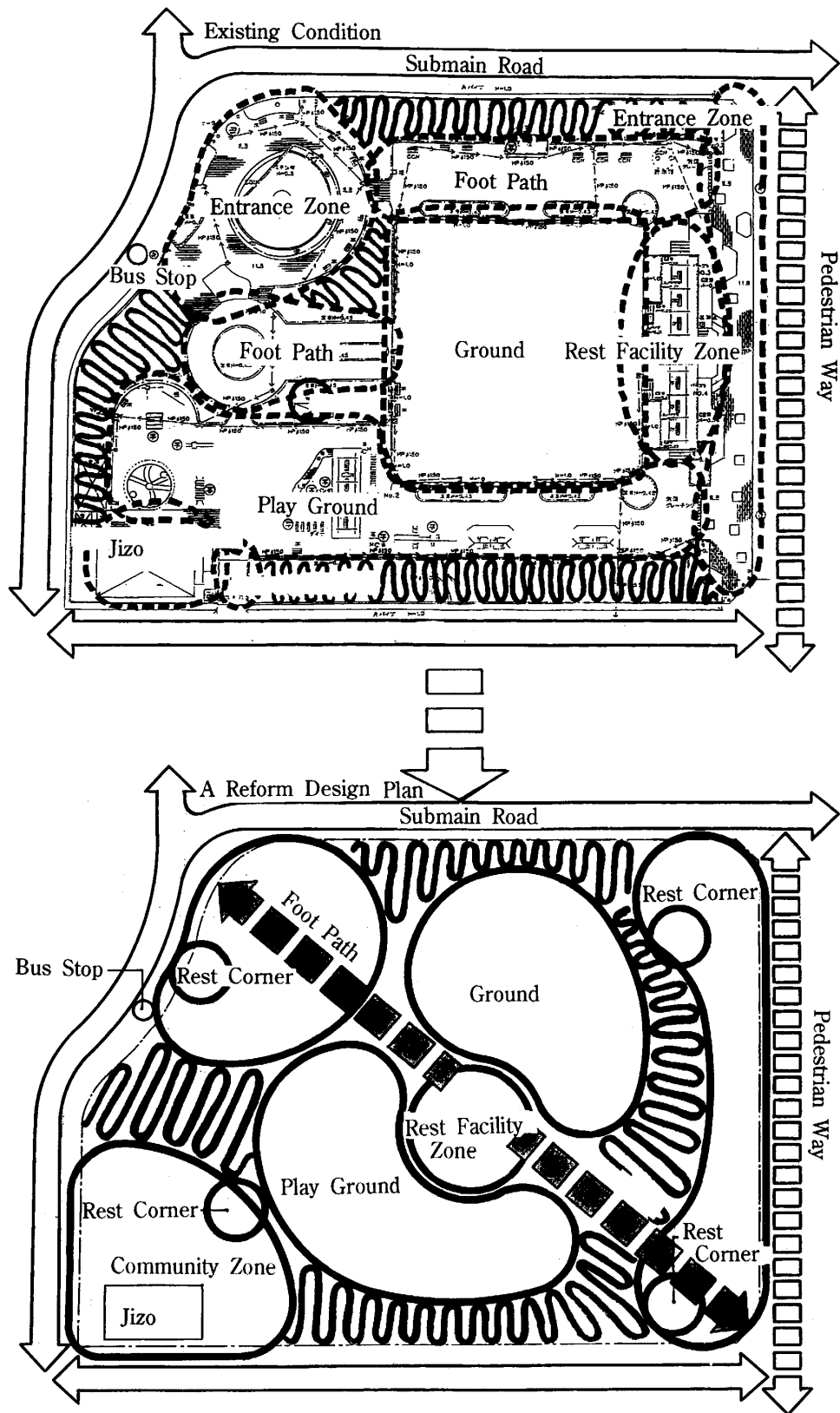


Fig. 2 A reform design plan on a zoning level

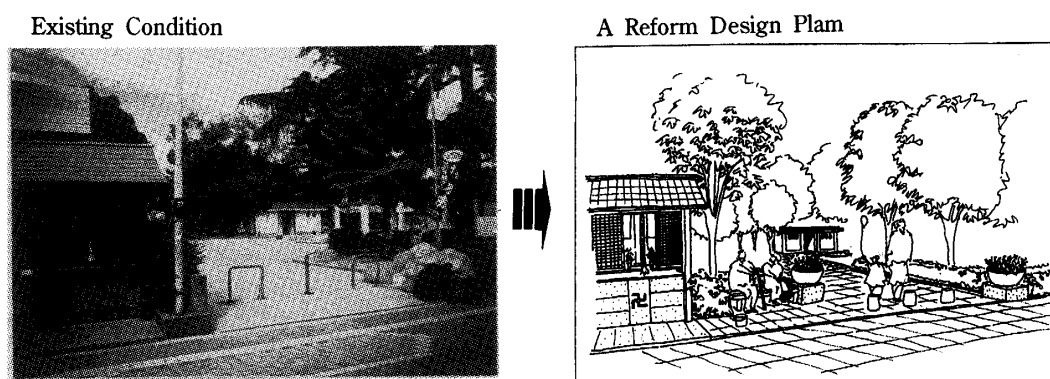


Fig. 3 A reform design plan on a detail design level

issue related to the density of block parks in the area arises. As the result of the evaluation, a reform design plan proposes improvement of local distribution roads to reinforce the network in the north of the area.

Figure 2 shows the result of one block park in the area evaluated on a zoning level.

The block park suggests two issues. One is that a safe access route of travel is not provided from an entrance zone to each other zone. The other is that the rest facility zone is located on one side of the park, so that elderly people are forced to struggle to walk more than 300 meters for their rest if they are on the other side. To solve these issues, a reform design plan proposes to provide a safe, accessible route of travel from an entrance zone to each other zone in the park, and to locate a rest zone and rest corners so that their sites are well distributed.

Figure 3 shows the result of the block park evaluated on a detail design level and a reform design plan.

At issue are the entrances of the evaluated park. Benches are not provided around the bus stop near an entrance, level changes remain on pavement surfaces, the entrance areas are not designed to be inviting. Next to the entrance zone lies the statue of Jizo, regarded as one of the cultural assets, but the park and this cultural asset were designed independently. A reform design plan suggests placing several benches inside the park, near the bus stop close to the entrance to provide a rest spot for people on the principal road. Additionally, it proposes to redesign the park, and this cultural asset as a whole in terms of promoting communication of people and to stimulate use of the rest spots in the park.

### Conclusion

The case study above suggested that it is extremely important to illustrate problems posed by an area or space using check lists to ensure public use spaces are barrier-free and that appropriate improvement actions are taken only when problems are accurately revealed. It is especially crucial in evaluation that outdoor spaces should not only satisfy minimum standards provided by design guidelines, but they should also meet the accessible level essential for overall amenity. The results of this study indicated that individual spaces and outdoor facilities should be designed barrier-free, and more importantly, they should be located from the viewpoint of designing the entire setting, with a special attention to their relations in the area. Furthermore, it is important to take a comprehensive viewpoint which considers the density and locations of spaces and outdoor facilities in the area, and their networks, considering the area's characteristics, that is, the area in which people conduct their daily lives.

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