

Manual for Making Flood Hazard Map
Ubiquitous

DRAFT

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River Bureau
Ministry of Land, Infrastructure and Transport

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Introduction

In many parts of Japan, efforts to pass on regional memories of floods to later generations have included building steles, setting up stakes as water-level gauges and preserving other markings that recall people's experience with floods.

On the other hand, changes in local communities in recent years have led to a decrease in the numbers of residents that have experienced flood disasters. Most community residents lack information on major regional flood damage in the past and lack knowledge of projected flood water depths in the area in which they live and other facts pertaining to flood risk.

Along with the recent amendment to the Flood Fighting Law, progress has been made in designations and announcements of flood-prone areas and in preparing flood hazard maps. To help meet the need for wide dissemination of flood information, "The Flood Hazard Mapping Manual," which was published in June 2005 by the River Improvement and Management Division, River Bureau, Ministry of Land, Infrastructure and Transport, suggests preserving flood marks and staff gauges displayed on streets as a way to bring about greater public awareness of flood hazard maps.

The aims of this manual are to promote the further dissemination of flood hazard maps, to create a heightened sense of risks, and better awareness of shelters in case of floods in each community. To enable residents to appreciate the real risk of floods in their areas, this manual provides guidelines for the creation of "Ubiquitous Flood Hazard Maps (Comprehensive Town-Wide Hazard Maps)" and signs providing flood-fighting information that can be displayed in communities.

Main Section

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1. Main Section

1-1 Purpose

[Purpose of this Manual]

The aim of this manual is to help bring about safe and smooth evacuation necessitated by floods and to help minimize flood damage by providing facts and encouraging the dissemination of knowledge of possible flood water depths and shelters and raising awareness of risks by displaying information on flood water depths and shelters in the form of flood-related signs in towns.

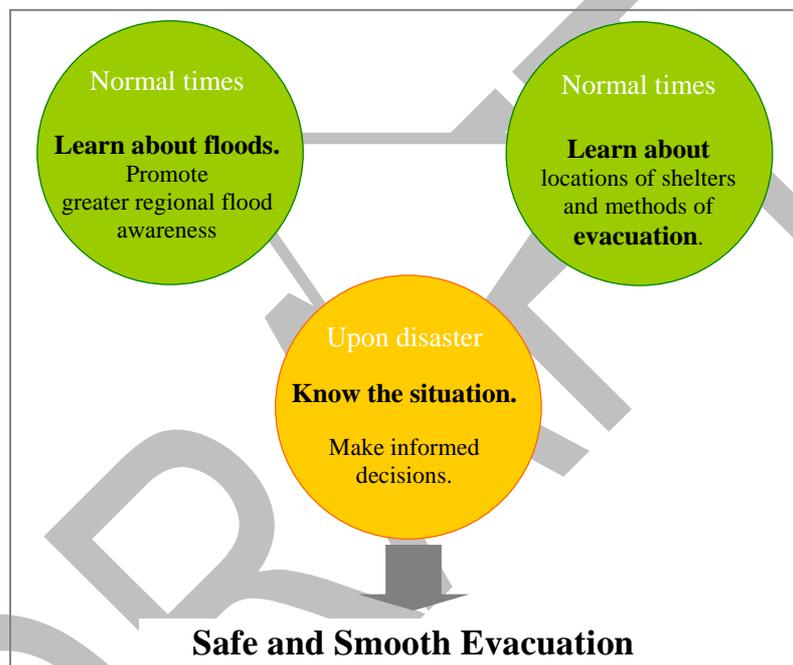


Fig. 1 Basic idea of flood-related signs in towns with ubiquitous flood hazard maps

1-2 Information provided and symbols

[Information provided and symbols]

This manual establishes three categories of information to be provided by flood-related signs: Flood (flood water depths), Shelters, and Levees.

The symbols indicated below are specified for nationwide use in providing each kind of information.¹

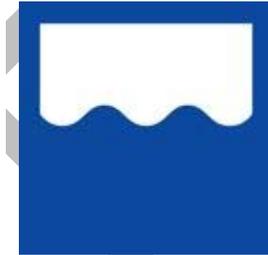
●Flood

[Meaning of the symbol]

Indicates river has overflowed.

[Purpose of the symbol]

To show areas likely to be affected by flooding.



●Shelter (building)

[Meaning of the symbol]

Indicates safe shelter (building) upon disaster

[Purpose of the symbol]

To show safe building as shelter in event of disaster.



●Levee

[Meaning of the symbol]

Indicates levee protecting residential area

[Purpose of the symbol]

To show the area is protected from flooding by a levee. (But it could be flooded if river overflows.)



Fig. 2 Meanings and purposes of the symbols of Flood, Shelter (building) and Levee

- In placing signs, it is recommended that eye-catching symbols be used nationwide for intuitive understanding by everyone and to urge evacuation.
- The colors and shapes of each symbol shall be in accordance with the “Conditions for using symbols” in Materials Section on page 16.
- The symbols should not only be used for flood-related signs, but also in paper hazard maps and other media related to flood fighting.

¹ You can download and use the electronic file of the symbols at:
http://www.river.or.jp/pict_flood/zukigou_download.htm

1-3 Implementation of “Ubiquitous Flood Hazard Maps” program

1-3-1 General considerations

[Collaboration between river administrators and municipalities]

To implement the measures outlined in the “Ubiquitous Flood Hazard Map” program, the river administrators and municipality shall work together from the pre-planning stage through installation and management.

- The river administrators and municipality shall work together to implement the “Ubiquitous Flood Hazard Map” program. It is desirable that the signs be installed as part of various disaster management drills or in coordination with disaster management education at schools, thereby promoting disaster management awareness.

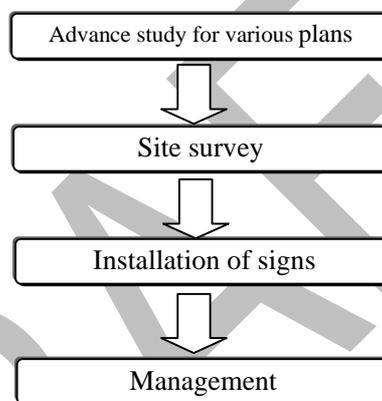


Fig. 3 Implementation Flow

1-3-2 Studies to be conducted prior to plan development

[Advance studies]

The signs shall be installed by coordinating various local plans after studying and grasping their content.

- To identify places or areas for sign placement, flood areas, projected flood water depths and recorded flood water depths should be confirmed by studying flood hazard maps and other materials.
- Disaster management plans as prescribed by municipalities such as regional disaster management plans should be studied.
- The possibility of inundation at shelters or along major evacuation routes should be confirmed, and reflected in the review of hazard maps as necessary.
- The contents and locations of any disaster management signs set up in the areas (wide-area shelter signs, etc.) must be grasped.
- If there are any ordinances or plans for landscaping, these considerations should be incorporated in the hazard mapping according to such ordinances or plans.

1-3-3 Site surveys

[Local surveys]

Signs shall be installed to meet local conditions by studying and identifying the conditions of candidate spots for signs.

- The location and direction of signs will be studied by identifying the conditions of the locations where signs are to be actually installed.
- Conformity with the information on existing signs or advertisements shall be studied. It will also be studied whether flood signs to be newly installed can be conspicuous and whether several signs would result in congested information.
- In site surveys, studies will be conducted for the following facilities in the relevant areas:
Major facilities in the area (stations and other transportation facilities, schools, municipality offices, parks, etc.); and major roads in the area
- Coordinate efforts with facility administrators to determine where signs will be installed (power company, NTT, public facility administrators, etc.)

1-3-4 Installation

[Selecting installation spots]

Sign installation spots shall be selected on the basis of 1-3-2 “Studies to be conducted prior to plan development” and 1-3-3 “Site surveys” so that large numbers of pedestrians will become aware of effective evacuation procedures and so that the procedures can be accomplished.

- For efficient and effective provision of information by the flood-related signs, major evacuation routes and places where there is a great deal of pedestrian traffic (stations, bus stops and other transportation nodes, and public facilities such as town hall) shall be selected as sites for installation of signs.

[Added explanation]

As a rule, signs shall have symbols together with written explanations.

- As flood-related signs are products of brand new initiatives, written explanations shall be added to symbols to facilitate understanding of the policies. However, in consideration of the intervals of sign installation in an area, it is not necessary to add written explanation to all signs.
- Please refer to the following pages for examples of explanations.

[Installation of flood signs]

Flood signs shall indicate flood water depths (projected or recorded) in positions as high as the actual levels.

- From the viewpoint of providing information on overall flood water depths in an area, it is desirable to install water depth signs at the heights of 0.5m, 1.0m, 2.0m, 3.0m and 5.0m where practicable.
- In principle, flood water depth shall be indicated by the projected flood water depth. It is also possible to indicate flood water depths recorded during well known floods in the area. However, either projected depths or recorded depths shall be indicated in an area to avoid confusion between them.
- Example: "This place may suffer a flood water depth of ○m in the case of inundation of ○○ river."
"This place suffered a flood water depth of ○m due to Typhoon ○○ in the year ○○."

[Installation of signs indicating shelters from floods]

The signs of shelters in times of flood shall be installed at such shelters and in places that are suitable for effective guidance to the shelters.

- The shelters to be used in time of flood shall be indicated by using flood and shelter signs together.
- Example: "The shelter in the event of a flood in this area is ○○ Elementary School."
"Shelter upon flood: ○○ Elementary School"
- When indicating shelters in the event of a flood, the order shall be the shelter and flood.
Example : Vertical sign : Shelter above and flood below
Horizontal sign : Shelter left and flood right
Guidance : Align the order in the direction of an arrow
- The symbol for shelter shall indicate the direction of a shelter, right or left, in consideration of the position of the symbol with the shelter as shown below.



[Installation of levee signs]

The levee signs shall show that the relevant area is protected by levees (but may be inundated if the river overflows). Being different from flood signs, no height shall be indicated.

- Heights of levees vary depending on how they were constructed. Further, the heights of levees cannot be fixed uniformly. Unlike flood signs, the levee signs will not be accompanied by indication of heights. They will be used to show that a particular area is protected by levees.
- Example: This place is protected by levees from flooding of ○○ River. Inundation may occur if the ○○ River overflows."

1-3-5 Management

[Management of signs]

Signs shall be properly administered by compiling such information as where and when they were installed.

Because signs are set up outdoors, they are subject to damage and aging. In order to respond to damage such as posters or scars, and to protect the town landscape, it is necessary to keep them clean at all times by periodical cleaning and repair. Further, as town situations change over time, users may become confused without precise updating of information.

Proper use and maintenance shall be carried out by arranging information such as places and dates of installation.

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1-4 Examples of sign plates and installation images

1-4-1 Flood signs (flood water depth)

The blue color shall be in accordance with the Munsell value:
 ■ Safety color Blue: 2.5PB 3.5/10 □■ Contrast white: N9.5 Black: N1

1) Flood depth plates

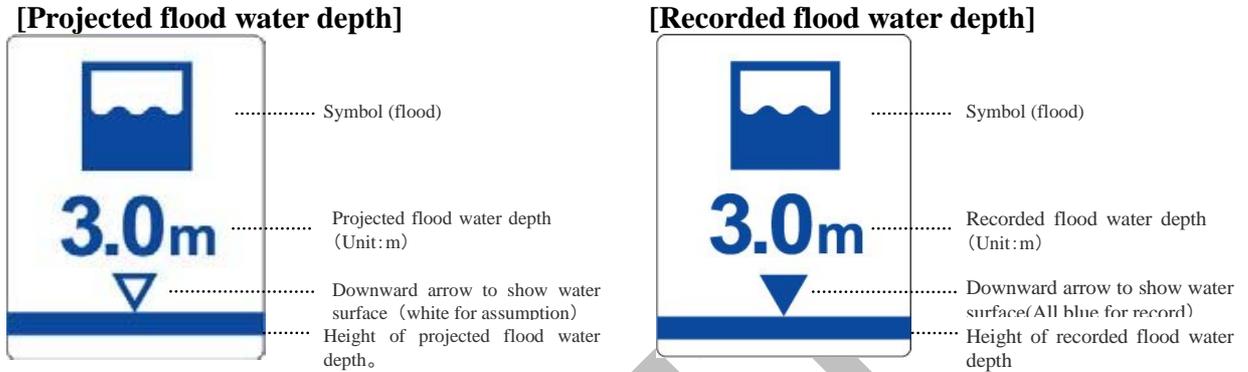


Fig. 4 Flood sign plates (indicating flood water depth)

2) Plates to explain the indications

a. Basic

It is desirable to show information in Japanese and English for wider dissemination.
 The examples below show Japanese-only sign and English-only sign.

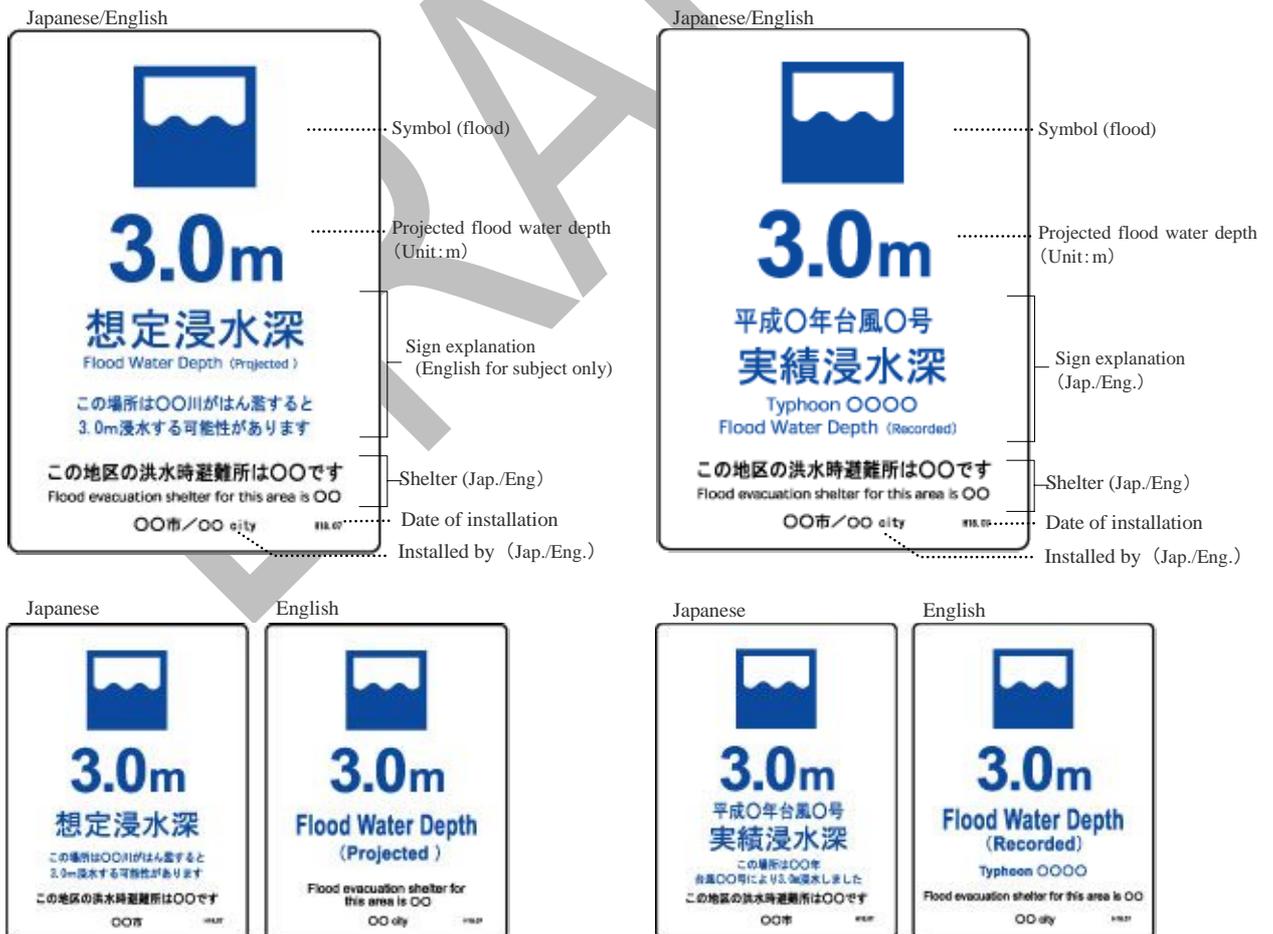


Fig. 5 Flood sign plates (with explanation of indications)

b. Integrated indication of symbol and figures (when plate is small)

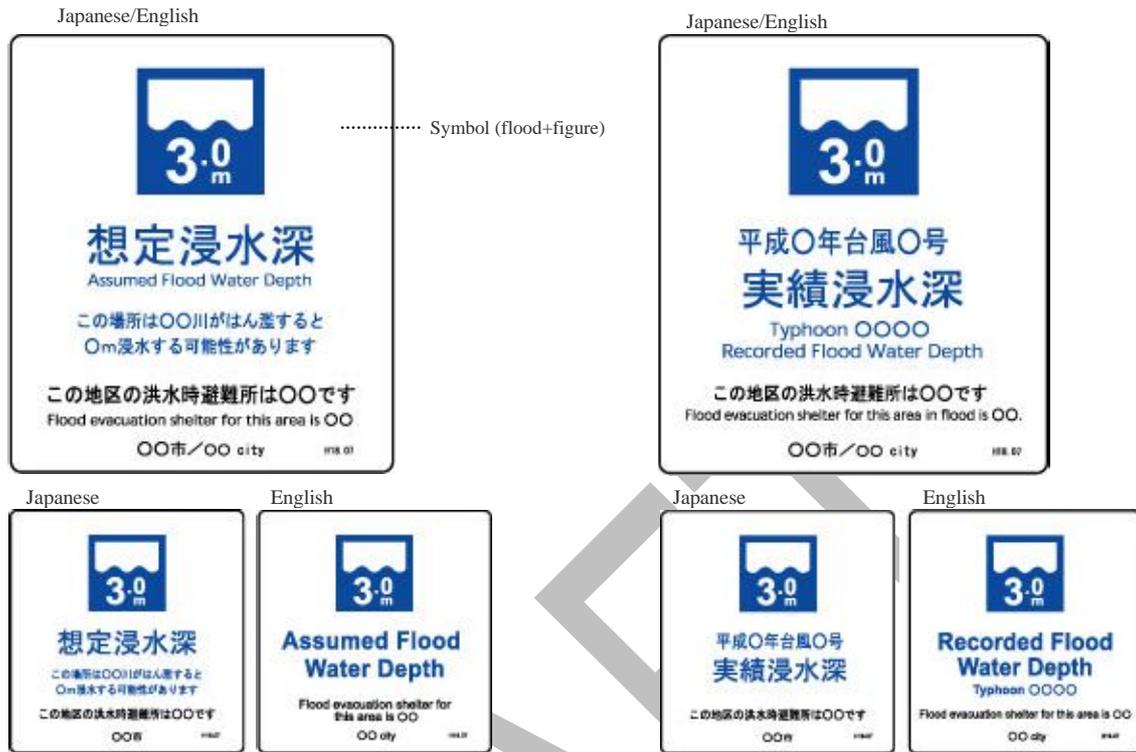


Fig. 6 Flood sign plates (integrated expression with symbols and numbers)

*If the minimum size (8mm x 8mm) is used for a hazard map, raised water surface shall be adopted for ease in reading.



Basic style
: less illegible letters



Raised water surface
: easy to read the larger letters

c. Combined indication of flood shelters by symbols



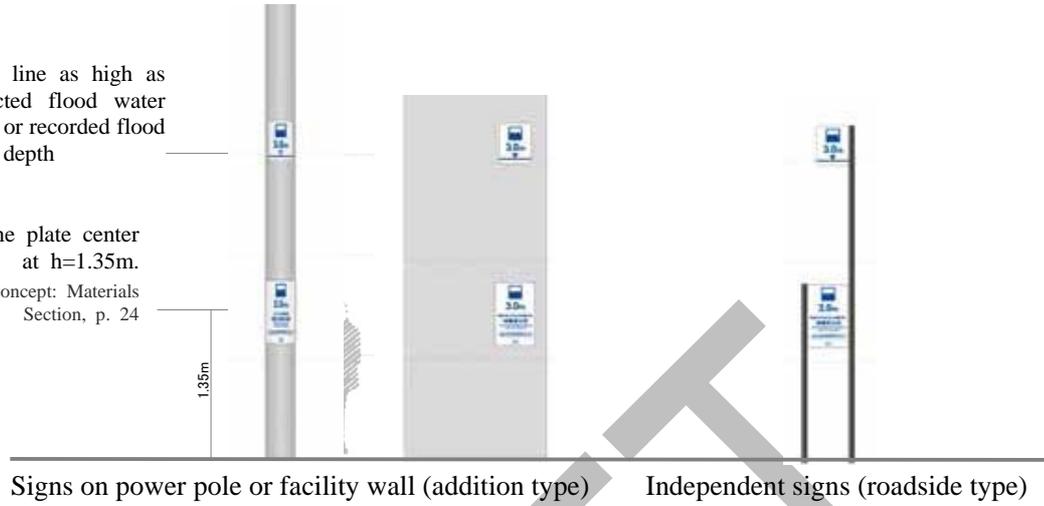
Fig. 7 Flood sign plates (with shelter symbol)

3) Image of installation

Set a line as high as projected flood water depth or recorded flood water depth

Set the plate center at $h=1.35\text{m}$.

*Concept: Materials Section, p. 24



Sign on power pole
(projected flood water depth)



Sign on a wall
(projected flood water depth)

Fig. 8 Image of flood sign placement (flood water depth, projected or recorded)

1-4-2 Shelter sign

1) Indicating shelter location with symbol

Use Munsell values below:

■ Safety color green: 10G 4/10

■ Safety color blue: 2.5PB 3.5/10 □■ Contrast white: N9.5 Black: N1

a. Basic: Horizontal



The man's direction can be left or right.
(Man escaping from water.)

The man's symbol cannot be left or right. (expression moving in the direction of water.)



b. Basic: Vertical



The man's direction can be left or right.
Shelter (building) on the flood symbol

Do not place shelter (building) below water.



Fig. 9 Conditions for using symbols to show flood shelters

2) Plate with name of shelter

a. Horizontal

Symbol: Shelter (building)/flood Explanation of the sign (in Jap. and Eng.)



Facility name (Japanese/English/furigana)

Date established

Built by (in Jap. and Eng.)

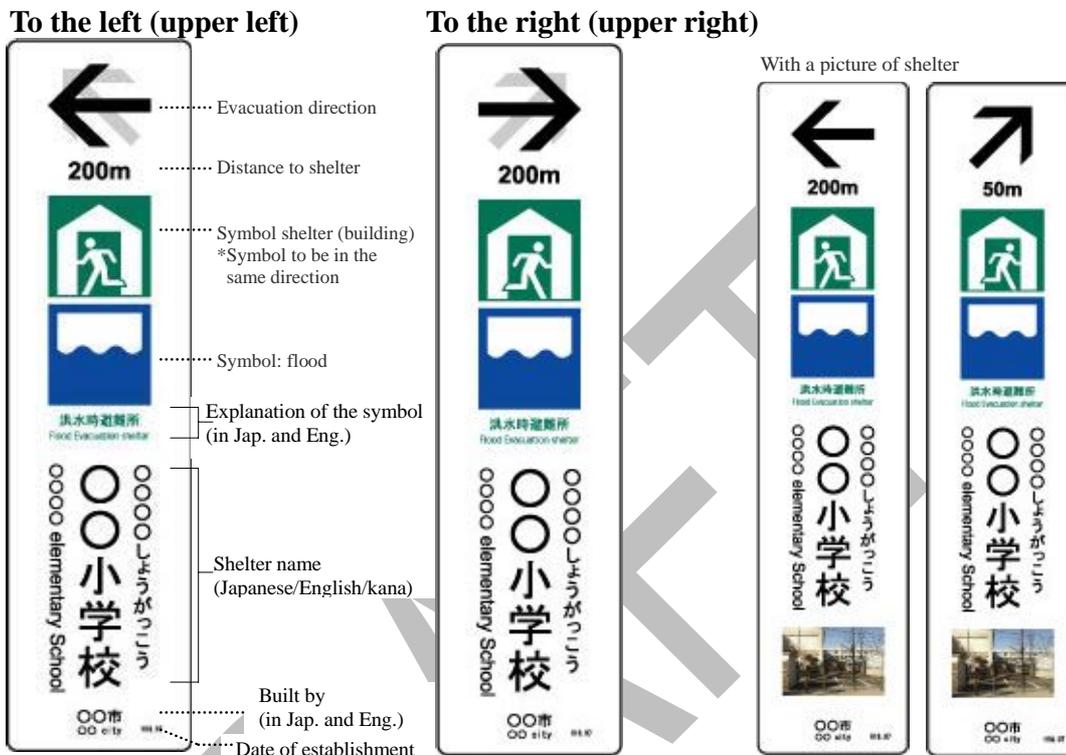
b. Vertical



Fig. 10 Shelter signs (with shelter name)

3) Shelter guidance plate

a. Vertical



b. Horizontal

As a basic style, an arrow (distance), a shelter (building) and flood are grouped together and names (characters) are placed to the right or left.

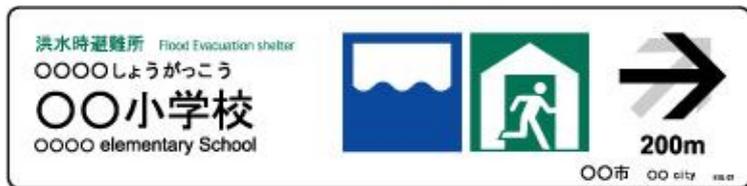
To the left (upper left)



From the left, arrow (distance), shelter (building) and flood



To the right (upper right)



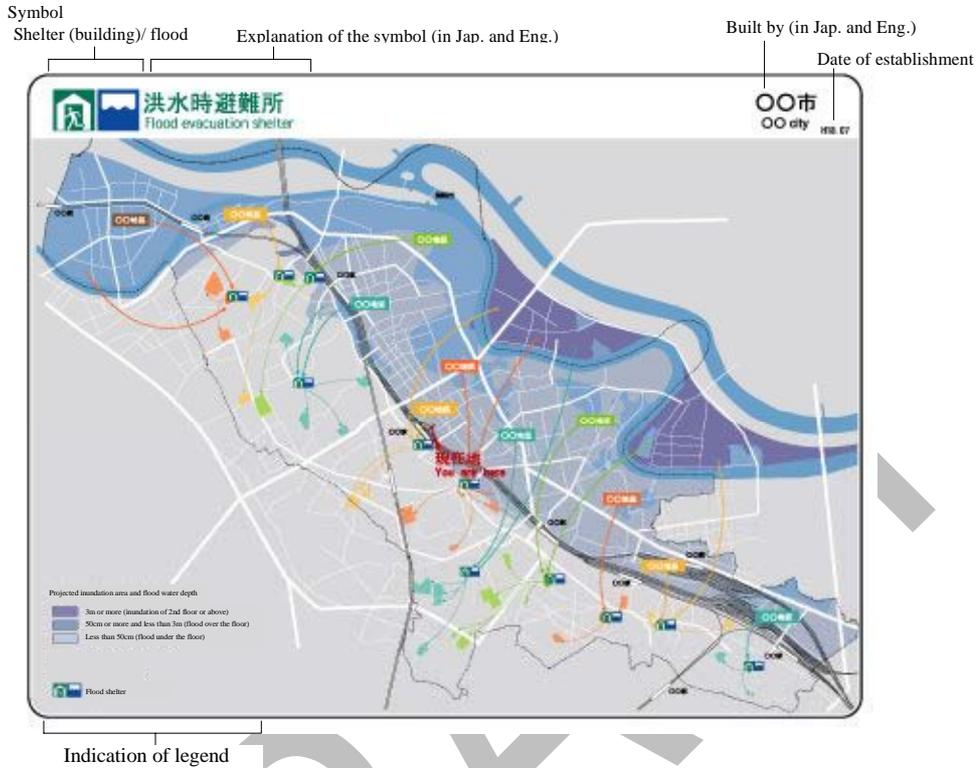
From the left, flood, shelter symbols and arrow (distance)



Fig 11 Shelter sign plates with guidance

4) Shelter guidance type plate

a. Independent (wide-area)



b. Addition type (on facility walls or power poles: middle area)

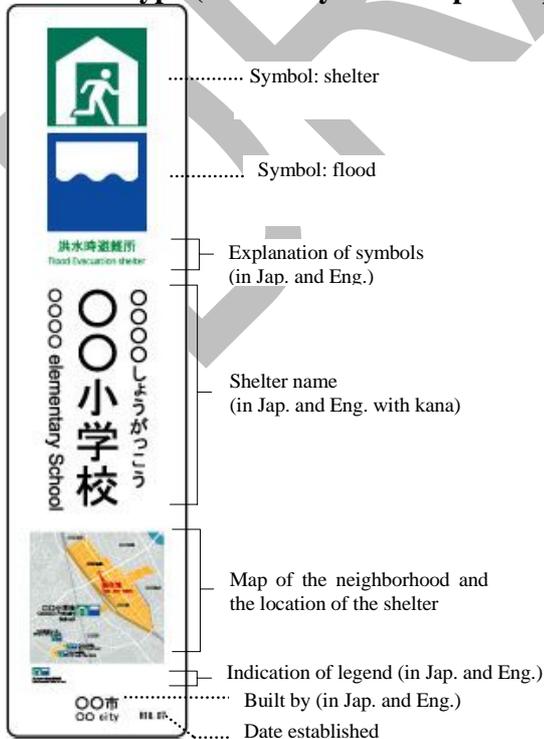


Fig. 12 Shelter guidance type plates

5) Image of installation



Shelter sign with name (additional)



Shelter guidance plate (additional)



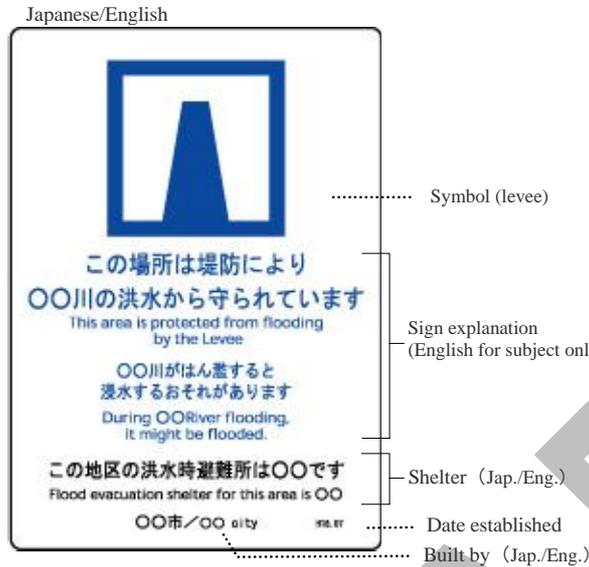
Shelter guidance plate (independent)

Fig. 13 Image of shelter signs

1-4-3 Levee sign

1) Levee sign plate

a. Basic



Use the following Munsell values:
 ■ Safety color blue: 2.5PB 3.5/10 □■ Contrast white: N9.5
 Black: N1

b. Shelter symbol added



c. Levee symbol with picture



Fig. 14 Levee sign plates

2) Installation image



Signs on power poles and facility walls (additional)

Independent signs (roadside)



Plate attached on a power pole



Independent display

Fig. 15 Image of levee signs

Materials Section

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2. Materials Section

2-1 Conditions for using symbols

▶ Color/shape

The colors used to indicate symbols of facilities or equipment can be freely selected in principle.

The colors used to express “safety, caution and direction” by symbols should be integrated, including the use of white and black as contrasting colors. The colors to be used for shelter symbols (buildings) should be integrated in this way.

In this case, the colors and shapes designated in ISO3864 (Safety Colors and Safety Signs JIS Z9101) shall be complied with as indicated below.

Color/meaning	Contrast	Shape/meaning
 Directions to follow		 Prohibition (Must obey)
 Caution/Risk		 Warning (JIS: Caution)
 Safety Evacuation		 Information (including directions)

See the following Munsell values when using.

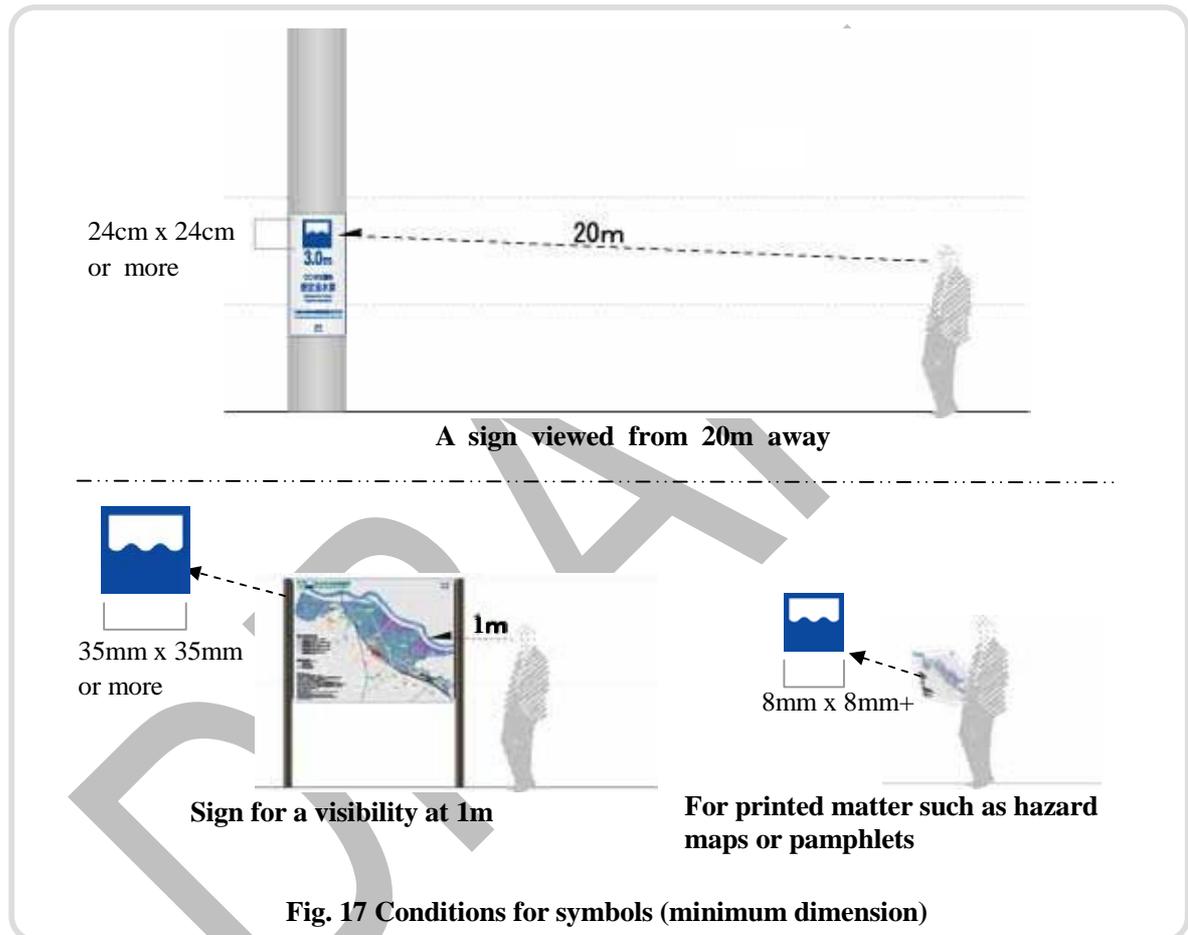
Safety color blue: 2.5PB 3.5/10 yellow: 2.5Y 8/14 green: 10G 4/10 / Contrast white: N9.5 black: N1

Fig. 16 Conditions for using symbols (color/shape)

► **Minimum dimensions**

This manual recommends 24cm x 24cm or more to assure visibility from 20 meters away when using symbols in signs.

For a sign to be visible 1 meter away, 35mm x 35mm or more shall be used, and 8mm x 8mm or more shall be used for printed matter such as a hazard map or pamphlet. (Visibility could not be assured for indications smaller than that.)



Visibility distance	Basic frame dimension of symbols
30m	360mm x 360mm or more
20m	240mm x 240mm or more
10m	120mm x 120mm or more
5m	60mm x 60mm or more
1m	35mm x 35mm or more

Source: Foundation for Promoting Personal Mobility and Ecological Transportation, Guideline for Smooth Mobility in Public Transportation Facilities

2-2 Standards for fonts

For character expressions on signs, Gothic fonts of even square size and thickness (sans-serif for Roman characters) or other functionally excellent fonts shall be used in principle while carefully considering visibility from a distance. It is effective to select fonts frequently used in filmsetting or computer systems when we consider the use and maintenance of indications.

Japanese font (Gothic)

- Gothic-B Medium
(PS Now)
- Gothic-B Bold
(PS Now)

洪水時避難所
洪水時避難所

European font (sans-serif)

- Frutiger Roman
- Frutiger Bold

flood Evacuation shelter
flood Evacuation shelter

Digital font (sans-serif)

- Frutiger Roman
- Frutiger Bold

1234567890
1234567890

Fig. 18 Standards for fonts

2-3 Character arrangement

Characters may be arranged horizontally or vertically in principle. Horizontal arrangement is the most common because it enables bilingual expressions. Vertical arrangement is used to minimize the width of the indication or take advantage of unique Japanese arrangement. In this case, the English expression is vertically arranged, which may cause difficulty in reading.

The ratio of heights of letters to Japanese characters shall be 6:10 as a rule.

Foreign language expressions shall be added in accordance with the examples below.



Fig. 19 Character arrangement standards

2-4 Character size standards

The minimum height of characters to be used in signs and guide maps shall be in accordance with the following table while carefully considering visibility and distance, the volume of information, the size of the plate and other pertinent factors.

▶ Standard character scale of signs

Source: Foundation for Promoting Personal Mobility and Ecological Transportation, Guideline for Smooth Mobility in Public Transportation Facilities

Visibility distance	Japanese character height	English character height
30m	120mm or more	90mm or more
20m	80mm or more	60mm or more
10m	40mm or more	30mm or more
4 ~ 5m	20mm or more	15mm or more
1 ~ 2m	90mm or more	7mm or more

▶ Standard character scale of signs

Source: Guidebook for Road Signs using Maps; edited by Road Management Technology Center under the supervision of Planning Division, Road Bureau, MLIT

	Symbol	Japanese	English
Legend	24.0mm	10.5mm	8.0mm
Special large	-	18.0mm	14.0mm
Large	21.0mm	9.0mm	7.0mm
Medium	16.5mm	7.0mm	5.5mm
Small	12.0mm	5.0mm	4.0mm

2-5 Language to be used

To provide information for tourists from overseas, it is necessary to give information in languages other than Japanese, such as English. Information of vital necessity should be indicated simply, not in a complex way.

2-6 Color standards

The colors should enhance the legibility of the information, the visibility of the signs and expressiveness. Legibility increases with contrast (difference in brightness) between a figure and characters. Using bright colors such as white for characters against a dark background has the effect of enlarging the characters and increasing legibility by cutting the ambient light.

The colors of a guide map should look like natural conditions to express geography, park, green zones, etc. Accordingly, use blue for rivers and the sea and green for hills, parks and green zones.

When it comes to making a map understandable, the indication of the location of the viewers is the most important piece of information. This should be indicated in bright red as an advancing color^{*1} and in eye-catching characters.^{*2}

*¹ Advancing color

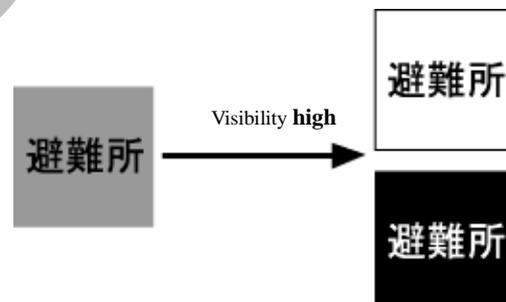
Some colors look near and others look far. If a color looks near you, it is called an advancing color. Generally the order of advancement is red, yellow, green and blue. Warmer colors look near and cooler colors look far.

*² Eye-catching character

The degree to which a sign stands out amid surrounding potential obstacles is what determines how conspicuousness and noticeable it is. Generally, the brighter the color, the more it will catch your eye. Red, red-yellow and yellow hues are more eye-catching than and blue and green.

*Consideration for the elderly, persons with weak eyesight and the disabled in color perception

Visibility increases with stronger contrast between the symbol and the background. It is better not to use combinations of less contrasting colors such as blue and black, yellow and white, and red and green.



2-7 Clearances

The following standards shall be adhered to when a sign is to be placed on part of a road.

▶ Road Sign Installation Standards with Explanations

Selection of location

When selecting locations for road signs, decisions shall be made with the following considerations in mind:

- 1) Consider specific actions by road users.
- 2) Avoid hindering visibility along the road.
- 3) Avoid blocking use of the road from the roadside.
- 4) Avoid placing signs at intersections when they can be installed elsewhere.
- 5) Avoid disturbing road management.

▶ Road Structure Ordinance

Clearances

Clearances that must be maintained on roads are limits set to secure spaces free from obstacles of a certain width or height in order to assure traffic safety for vehicles and pedestrians.

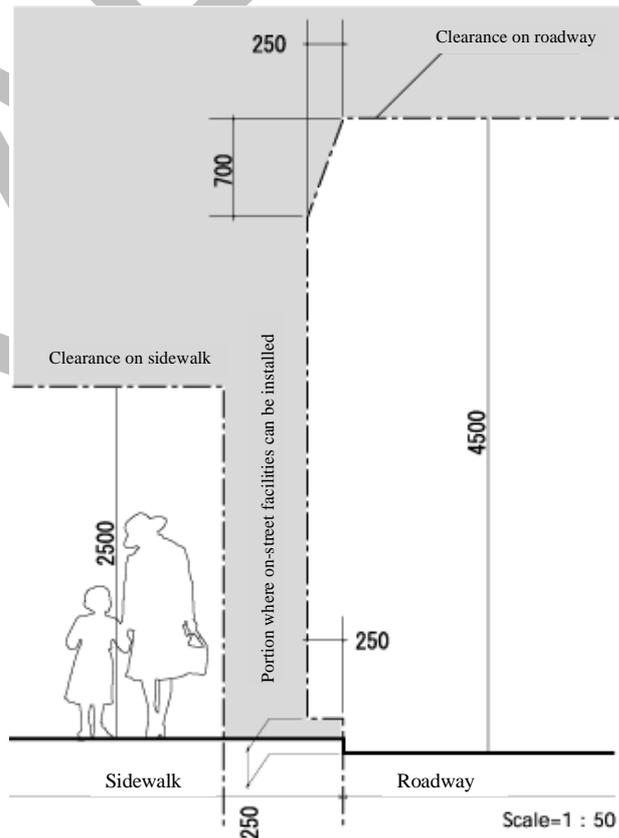


Fig. 20 Clearances

2-8 Materials used to make signs

Materials for signs should be selected with the following basic points in mind:

Durability

Signs that are spoiled or damaged will be of no use and will degrade landscapes. It is indispensable to select materials of excellent durability that will make sturdy structures.

***Preventing posters and graffiti**

To prevent illegal posters, it is effective to applying a coating or film to the signs to prevent posters from being attached.

The former, a resin coating containing special granules of silicon, etc. is effective in preventing posters because it also creates a concave-convex surface. The latter, also a concave-convex film, is a covering for signs to prevent posters from being attached. Customized colors can be selected for both methods, so they will achieve effects to prevent posters and support the intentions of the design.

It is clearly a good idea to use material to interference from illegal posters and graffiti.

Economy

Signs function as a system and it is necessary to manage them regularly so that they work together as a whole. It is important to focus on economic viewpoints as well as installation costs.

Environmental conformity

It is necessary to select materials that do not harm human bodies or the environment. It is important to take into account the possibility of reuse and safe disposal and destruction (disposal by burning). It is necessary to select appropriate materials from among the wide variety available by carefully considering their properties.

2-9 Installation heights

Idea of the heights of signs to be viewed from far away

- At facilities used by large numbers of people, persons stand or pass by in front of others and block their field of vision. A sign above the height of people passing by will not be obstructed.
- Persons in wheelchairs, who may be 40 centimeters lower than a standing person, will often have their vision blocked.

In consideration of the above, the range of vision of a person standing some distance away from the sign should be set lower than an elevation (angle above a horizontal line from the viewer) of 10° , but as high as possible within that range.

Note: In “Illustrated Ergonomics” edited by Akio Noro, 1990, Japanese Standards Association, the range (effective line of vision that is superior to information sent out amid ambient noise) for perceiving specific information instantly is described as about 8° .

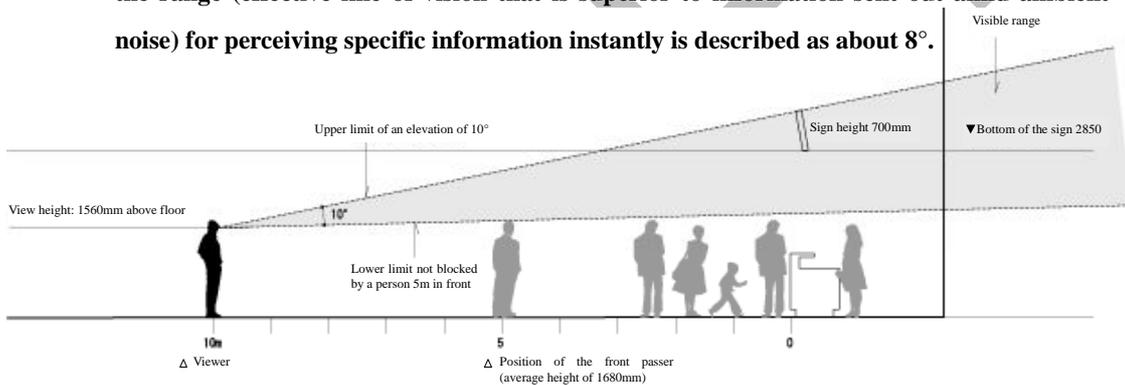


Fig. 21 Desirable sign heights (1)

Heights of signs viewed up close

- When viewing something directly in front of them, the range of vision of a persons sitting in a wheelchair is about 40 centimeters lower than that of a standing person.
- The height for good visibility for both a standing person and a user of a wheelchair shall be **about 135cm** for the center of the sign as the middle of the range of vision of both persons.

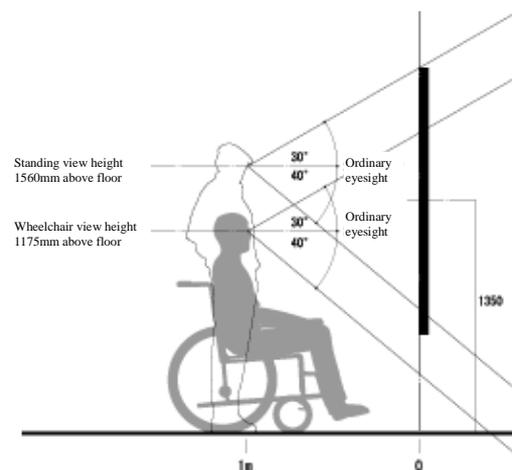


Fig. 22 Desirable sign heights (2)
“Building Materials—Human,”
Architectural Institute of Japan, 2003, Maruzen

2-10 On the angle of vision

The view angle (angle between the axis of the viewer's **line of vision** and the target) is a factor deciding the legibility of signs. It is said that a view angle of 45° or less leads to erroneous reading. When setting up a sign with a great deal of information, the sign should not go beyond the limit of the view angle.

For this purpose, it is desirable to set the sign width, height and inclination, while maintaining a view angle that will not drop to 45° or less horizontally and vertically from the assumed viewer position.

*The floodwater depth plate shall be installed at the actual height and the information must be minimized.

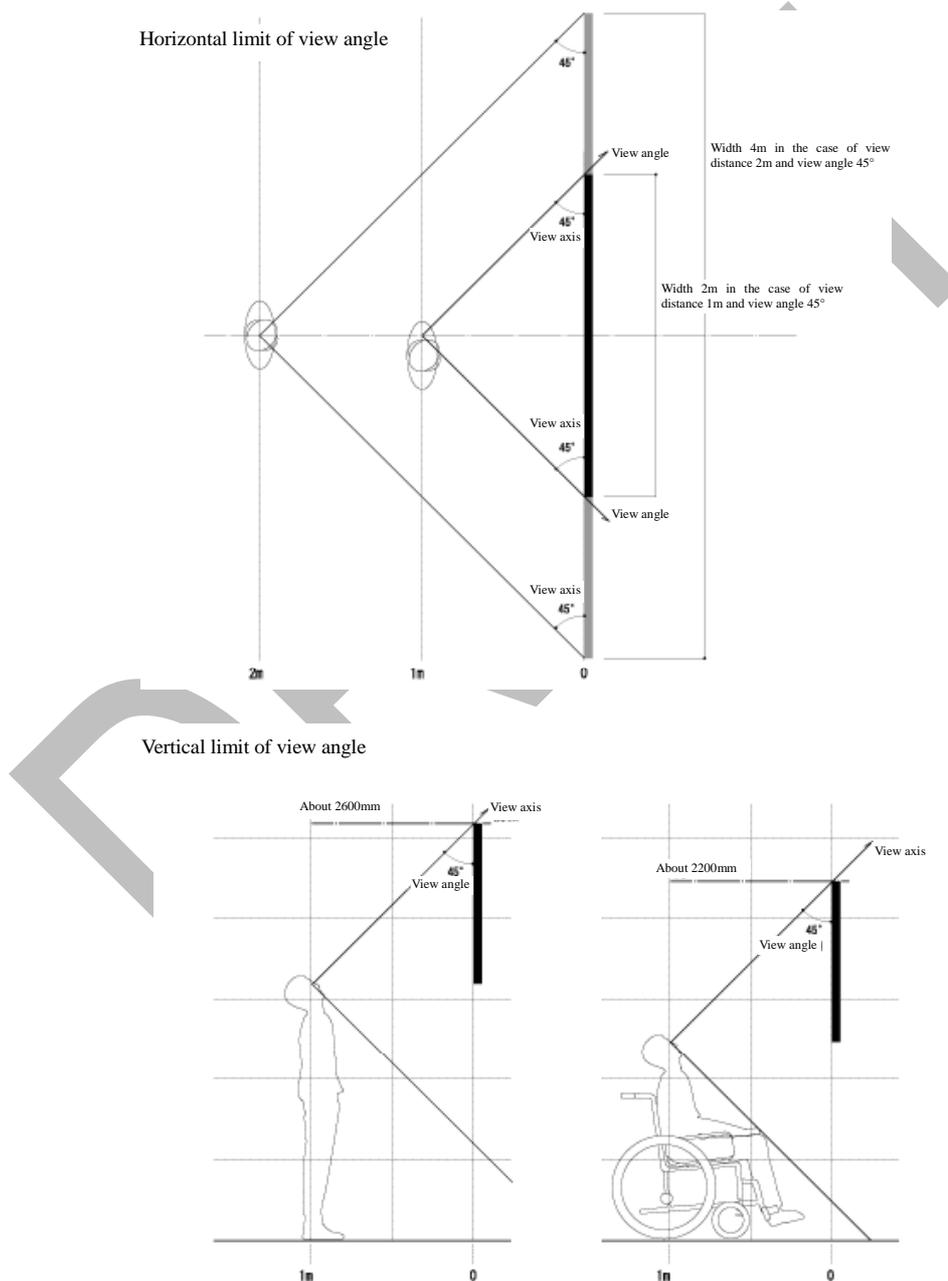


Fig. 23 Concept of view angle

2-11 Management and maintenance

It is necessary to manage and maintain signs by arranging proper installation locations and dates of installation. The following is an example of a sign management sheet.

■Example of Management Sheet

Reference No.			
Managing section			
General matters			
Date of installation			
Place of installation	Landmark:	Manufacturer	Company
			Section
Person in charge			
Sign type	1. Information 2. Guidance 3. Name 4. Explanation 5. Ban/regulation 6. Public relations 7. Other	Display producer	Phone Fax
			Company
Sign dimension		Display producer	Section
Displayed plate dimension		Display producer	Person in charge
Sign specifications	Plate	Constructor	Phone Fax
			Company
	Pillar		Section
	1. Stainless steel 2. Aluminum 3. Steel 4. Resin 5. Other ()	Constructor	Person in charge
	1. Internal 2. External Lamp type () Standard W lights	Constructor	Phone
Permission for occupancy given by			
Map of installation location			Display producer
Site condition photograph/display photograph			

*Please attach sign design documents, if any.