Road Safety Facilities Implemented in Japan
Road Safety Facilities

1. Guard Fence
2. Road Lighting
3. Other Road Safety Facilities
Road Safety Facilities

1. Guard Fence
2. Road Lighting
3. Other Road Safety Facilities
Classification of Guard Fences

1) Traffic Barrier:
   – To prevent a motor vehicle traveling in an incorrect course

2) Fences for pedestrians/cyclists:
   – To prevent pedestrians and cyclists from falling or recklessly crossing streets.
Traffic Barriers

- **Primarily**
  - To prevent a vehicle traveling in an incorrect course from deviating into an off-road area, into a lane used by oncoming traffic, or into a pedestrian sidewalk,
  - To minimize injuries to its occupants and damage to the vehicle,

- **Secondary**
  - To guide the line of sight of drivers.
Installation Location of Traffic Barriers

1. Guard Fence    1) Traffic Barriers

- Road side
- Shoulder
- Sidewalk
- Pedestrian/Traffic Boundary
- Median

Standard
1. Guard Fence 1) Traffic Barriers

**Installation Section (1)**

- To **prevent personal injury to occupants of a vehicle** caused by its deviation into the off-road area.
  - embankments, precipices, and retaining walls, and on bridges and viaducts.
  - close to the sea, a lake, a river, a marsh, or a canal.
  - entrance to a bridge, viaduct, tunnel etc. or close to some structure.
1.Guard Fence  1) Traffic Barriers

Installation Section (2)

• To prevent personal injuries to third parties caused by a motor vehicle deviating into the off-road area
  – Section crossing over a railway line or an arterial road
  – Median of national expressways and motorways.
  – Median of sections of which vertical or horizontal alignment is severer or where traffic moves at higher speed than common sections.
To prevent pedestrians from serious accidents on the boundaries between the traffic lane and sidewalks

- Sections of roads where traffic moves at high speed
# Traffic Barrier Categories for Application

<table>
<thead>
<tr>
<th>Road Category</th>
<th>Design Speed</th>
<th>Ordinary Section</th>
<th>Serious Injury Section</th>
<th>Crossing or Close to Shinkansen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expressways Motor Ways</td>
<td>80km/h ≤</td>
<td>A</td>
<td>SB</td>
<td>SS</td>
</tr>
<tr>
<td></td>
<td>60km/h</td>
<td></td>
<td>SC</td>
<td>SA</td>
</tr>
<tr>
<td>Other Roads</td>
<td>60km/h ≤</td>
<td>B</td>
<td>A</td>
<td>SB</td>
</tr>
<tr>
<td></td>
<td>≤ 50km/h</td>
<td>C</td>
<td>B</td>
<td></td>
</tr>
</tbody>
</table>
Role of a Traffic Barrier

Ⅰ. Roadway Deviation Prevention
   (To prevent motor vehicles from deviating into off-road areas)

Ⅱ. Occupant Safety
   (To preserve the safety of occupants)

Ⅲ. Motor Vehicle Guidance
   (To guide motor vehicles)

Ⅳ. Prevention of Accident
   Caused by Broken Traffic Barriers Parts
   (To prevent accidents caused by broken traffic barrier parts.)
Collision Test for Confirmation of Performance

• Confirming by two kinds of collision tests
  - Collision A : 25 tonf truck
  - Collision B : 1 tonf passenger car
Collision Test A

- Vehicle: 25 tonf truck
- Collision Angle: 15 degree
- Collision Speed:

<table>
<thead>
<tr>
<th>Traffic Barriers Category</th>
<th>C</th>
<th>B</th>
<th>A</th>
<th>SC</th>
<th>SB</th>
<th>SA</th>
<th>SS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collision speed (km/h)</td>
<td>26</td>
<td>30</td>
<td>45</td>
<td>50</td>
<td>65</td>
<td>80</td>
<td>100</td>
</tr>
</tbody>
</table>
Collision Test B

- Vehicle: 1 tonf passenger car
- Collision Angle: 20 degree
- Collision Speed: C, B: 60km/h
  A--SS: 100km/h
Collision Test

I. Roadway Deviation Prevention (Collision Test A)

• A traffic barrier must not be broken through.
Collision Test

II. Occupant Safety (Collision Test B)

- The collision deceleration loaded on the body of an occupant in a vehicle impacting a traffic barrier must be lower than evaluation standard values by category of collision speed.

<table>
<thead>
<tr>
<th>Category</th>
<th>Collision Speed</th>
<th>Deceleration Maximum Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>B, C</td>
<td>60km/h</td>
<td>9-12G</td>
</tr>
<tr>
<td>A</td>
<td>100km/h</td>
<td>15-18G</td>
</tr>
<tr>
<td>SC, SB, SA, SS</td>
<td>100km/h</td>
<td>18-20G</td>
</tr>
</tbody>
</table>

G : Gravity acceleration
Collision Test

III. Motor Vehicle Guidance  
(Collision Test A, B)

- After striking the traffic barrier, a motor vehicle must not overturn etc., and its exit speed and exit angle must satisfy the stipulated values
  - Exit speed shall be greater than 60% of collision speed
  - Exit angle shall be smaller than 60% of collision angle
Collision Test

### IV. Prevention of Accidents Caused by Broken Traffic Barrier Parts (Collision Test A, B)

- After a motor vehicle strikes a traffic barrier, traffic barriers parts must not be scattered very far.
Example of Traffic Barriers

Median Barrier

Guard Rail
Example of Traffic Barriers

Median Barrier

Box Beam
Example of Traffic Barriers

Median Barrier

Concrete Traffic Barrier

F type

S type
Example of Traffic Barriers

Roadside Barrier

Guard Rail
Example of Traffic Barriers

Roadside Barrier

Guard Pipe
Example of Traffic Barriers

Roadside Barrier

Guard Cable
Example of Traffic Barriers

Roadside Barrier

Bridge Railing
Consideration of Scenery
-ProBLEM-

1. Guard Fence   1) Traffic Barriers
Consideration of Scenery
-Guard Pipe with Slim Members-
Consideration of Scenery
-Timber Rail-
Road Safety Facilities

1. Guard Fence
2. Road Lighting
3. Other Road Safety Facilities
2. Road Lighting

Purpose of Road Lighting

- Road lighting is installed so drivers can accurately understand road conditions and traffic conditions at night, or at locations where brightness changes abruptly, such as tunnels.
2. Road Lighting

Purpose of Road Lighting

• Visual information necessary to clarify road conditions and traffic conditions
  ✓ Existence and location of obstructions, pedestrians, etc. on the road
  ✓ Road width, road alignment, and other features of road structure
  ✓ Existence and location of special locations on the road (intersection, divergence, or curve, etc.)
  ✓ State of road surface in the travelling lane (dry/wet, bumpy, etc.)
  ✓ Existence, type, speed, direction of motion of other automobiles
  ✓ State of road surroundings

Road alignment

Existence of other automobiles, etc.
Types of Road Lighting

• **Continuous lighting**
  In a road section, lighting are installed at fixed intervals to continuously illuminate the section.

• **Localized lighting**
  This type locally illuminates intersections, bridges, sidewalks, interchanges, rest areas and other locations where it is necessary.

• **Tunnel lighting**
  This type illuminates inside of tunnels
2. Road Lighting

Continuous Lighting Installation Sections (Standard)

1) Ordinary national highways etc. in urban areas.

- Sections with dangers of pedestrians crossing the road where the traffic volume of vehicles and pedestrians is high.
- High traffic volume sections where there are dangers of automobiles deviating from the traffic lane.
- Sections where there are special conditions requiring continuous lighting except the above conditions.
2) National Expressways

- Sections in urban areas where the light of buildings etc. along the roads impacts road traffic.
- Sections where there are special conditions requiring continuous lighting except the above conditions.
Road Safety Facilities

1. Guard Fence
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Median Strips (Example 1)
3. Other Road Safety Facilities

**Median Strips (Example 2)**

*Before*

*After*
3. Other Road Safety Facilities

Sidewalk

Before

After
3. Other Road Safety Facilities

Bicycle paths and bicycle lanes
Separate pedestrian and vehicle traffic signals
3. Other Road Safety Facilities

High-visibility Markings

- Running off the lane prevented by vibration and sound caused by projections on the marking
High-visibility Markings

- High retroreflective performance for headlights even in the rainy nighttime

【 Normal marking 】

【 High visibility marking 】

- Pavement
- Marking
- Glass beads
- Water film
- Headlights

(rainy day) 

(fine day)
3. Other Road Safety Facilities

**High-visibility Markings (Example 1)**

- Curved section in the suburb
- Radius of curve 135 meter
- Gradient 5.6%
- Prevention of running off the road due to over speed
3. Other Road Safety Facilities

Road Marking

Text indications
“be careful to prevent rear-end collisions”

Dot marks
3. Other Road Safety Facilities

Colored Pavement
Speed Bumps
3. Other Road Safety Facilities

**Rumble Strips**

- Running off the road prevented by vibration and sound caused by grooves
Rain water permeates through voids and drains from the road surface.

Air escapes through voids and the road noise decreases.
3. Other Road Safety Facilities

Road Signs (Guide Signs)
Types of Signs and Comprehension

Illustration type

Stack-up type
Visibility at Night

- Incident light (Headlight)
- Retro-reflective light
- Glass bead
Appearance at Night
3. Other Road Safety Facilities

Delineator

Photograph by SEKISUI JUSHI Corporation
3. Other Road Safety Facilities

**Delineator**

- Self-lighting delineator

![Self-lighting delineator](image1)

- Self-lighting road studs

![Self-lighting road studs](image2)

*Photograph by SEKISUI JUSHI Corporation*
3. Other Road Safety Facilities

**Delineator**

- Self-lighting linear delineator
- Self-lighting obstruction warning light

*Photograph by SEKISUI JUSHI Corporation*
3. Other Road Safety Facilities

Curve Sign
3. Other Road Safety Facilities

Rubber Pole
3. Other Road Safety Facilities

Rubber Pole for Reducing the radius of the corners

(the corner cut is reduced using zebra markings or rubber poles)
3. Other Road Safety Facilities

Road Studs
3. Other Road Safety Facilities

Approaching oncoming car indicator device

“Attention!! Oncoming Car”
3. Other Road Safety Facilities

**Right turn lane (Example 1)**

*Before*

*After*
3. Other Road Safety Facilities

Right turn lane (Example2)
3. Other Road Safety Facilities

Right turn direction marking
Reflective Mirrors
Glare Prevention Plates
3. Other Road Safety Facilities

Crash Attenuators
3. Other Road Safety Facilities

Attenuator Barrels /Sand Attenuators