

Informal document **GRSG-110-10**
(110th GRSG, 26-29 April 2016,
agenda item 5.)

Study of Pedestrian's fatal accidents (vs. motor vehicles at low speed) in Japan

110th GRSG
MLIT, Japan

In Japan;

- **37% of road fatalities were pedestrians in 2015.**
 - ✓ **8 – 32 % of pedestrian fatalities were killed by vehicles at low speed ($\leq 10\text{km/h}$) (e.g. when a vehicle starts moving, turns right, or backs)**
- **In October 2015, a visually impaired man was killed by a truck during backing.**
 - ✓ **It's our priority to protect pedestrians including visually impaired people from vehicles.**

➤ Possible solutions

- **Improvement of a driver's view by using devices for indirect vision such as mirrors, camera monitoring systems, or sonars**
- **Mandatory fitting of acoustic devices (e.g. back alarm, acoustic vehicle alerting system: AVAS) to alert pedestrians**

Pedestrian's fatal accidents (vs. motor vehicles at low speed)

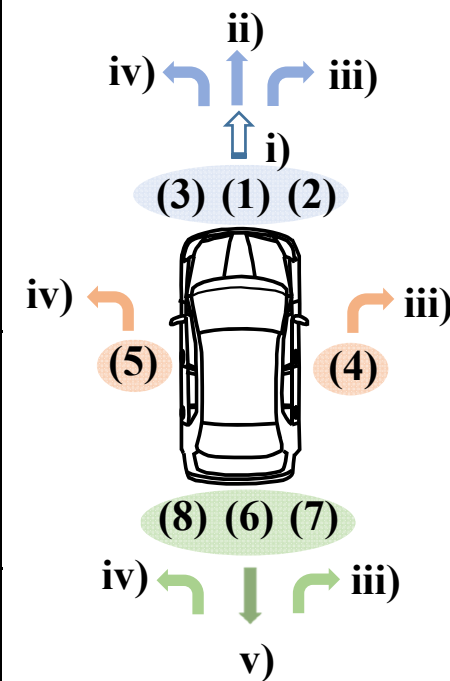
Data (provided by Institute for Traffic Accident Research and Data Analysis)

- **Country: Japan**
- **Type of accident: Pedestrian's fatal accidents (vs. motor vehicles)**
- **Period: 2010 – 2014 (5 years)**
- **Time: Daytime**
- **Vehicle type: (blue = new types added for 110th GRSG)**
 - a) $N \geq 7.5t$: Large vehicles designed for carriage of goods \equiv N3 and N2 (GVW $\geq 7.5t$)
 - b) $N < 7.5t$: Small vehicles designed for carriage of goods including d) box van \equiv N2 (GVW $< 7.5t$) and N1
 - c) **Bus: excluding micro bus**
 - d) **Box van: cargo van with GVW $< 3.5t$, front shape as 1 box**
 - e) **Mini van**
 - f) **SUV**
 - g) **Sedan: passenger vehicles of which capacity is 4-5 people other than SUVs and mini-vans**
 - h) **Light cargo van: N with engine displacement ≤ 660 cc**
 - i) **Light passenger car: N with engine displacement ≤ 660 cc**
- **Vehicle speed: less than or equal to 10 km/h**

Points of analyses

- Collision areas of vehicles involving pedestrian fatalities
- Behavior of vehicles involving pedestrian fatalities

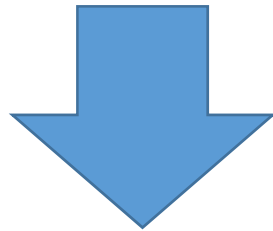
	Collision areas of vehicles	Behavior of vehicles
Front of vehicles	1) Front	i) Start ii) Forward iii) Turn right iv) Turn left
	2) Right-front (driver's side)	i) Start ii) Forward iii) Turn right iv) Turn left
	3) Left-front (the other side of the driver)	i) Start ii) Forward iii) Turn right iv) Turn left
Side of vehicles	4) Right-side (the driver's side)	iii) Turn right
	5) Left-side (the other side of the driver)	iv) Turn left
Rear of vehicles	6) Rear	v) Back
	7) Rear-right (the driver's side)	iii) Turn right v) Back
	8) Rear-left (the other side of the driver)	iv) Turn left v) Back



Pedestrians killed by vehicles at low speed

**Collision between pedestrians and vehicles
at low speed**

Could the driver be aware of the pedestrian?



**One of the promising countermeasures is
improving the driver's view**

Number and rates of pedestrian's accidents killed by vehicles at low speed

Type of vehicles	Number of pedestrians killed by vehicles ($\leq 10\text{km/h}$) (A)	Total number of pedestrians killed by vehicles (B)	Rates of $\leq 10\text{km/h}$ (A / B)
a) $N \geq 7.5\text{t}$	78	243	32.1%
b) $N < 7.5\text{t}$	92	640	14.4%
c) Bus*	8	28	28.6%
d) Box van*	6	30	20.0%
e) Mini van*	41	206	19.9%
f) SUV*	11	46	23.9%
g) Sedan	64	485	13.2%
h) Light cargo van*	37	447	8.3%
i) Light passenger car*	38	348	10.9%

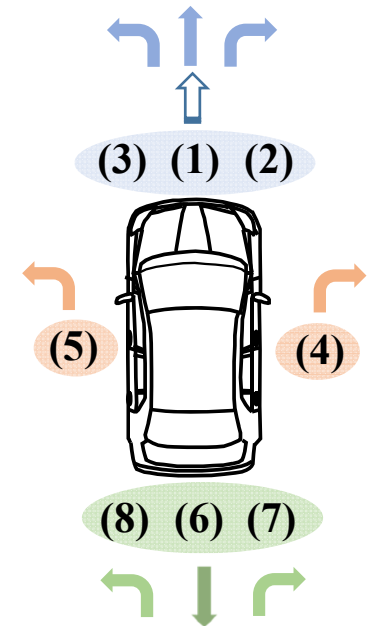
* = new types added for 110th GRSG

Number and rates of pedestrians killed by vehicles

Speed of vehicles: **All**

Collision area of vehicles Type of vehicles	Number of pedestrian fatalities								Total
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	
a) N ($\geq 7.5t$)	105	54	60	7	7	2	5	3	243
b) N ($< 7.5t$)	351	116	134	4	2	24	5	4	640
c) Bus	11	9	4	0	4	0	0	0	28
d) Box van	11	10	7	1	0	1	0	0	30
e) Mini van	106	42	41	0	2	10	2	3	206
f) SUV	23	11	7	0	1	3	1	0	46
g) Sedan	274	82	101	3	2	15	2	6	485
h) Light cargo van	247	78	111	0	0	8	1	2	447
i) Light passenger car	216	50	71	1	0	5	2	3	348

Collision area of vehicles Type of vehicles	Rates of pedestrian fatalities (%)								Total
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	
a) N ($\geq 7.5t$)	43	22	25	3	3	1	2	1	100
b) N ($< 7.5t$)	55	18	21	1	0	4	1	1	100
c) Bus	39	32	14	0	14	0	0	0	100
d) Box van	37	33	23	3	0	3	0	0	100
e) Mini van	51	20	20	0	1	5	1	1	100
f) SUV	50	24	15	0	2	7	2	0	100
g) Sedan	56	17	21	1	0	3	0	1	100
h) Light cargo van	55	17	25	0	0	2	0	0	100
i) Light passenger car	62	14	20	0	0	1	1	1	100

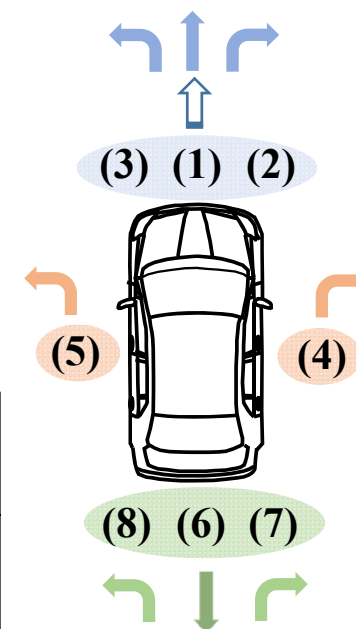


Number and rates of pedestrians killed by vehicles

Speed of vehicles: **less than or equal to 10km/h**

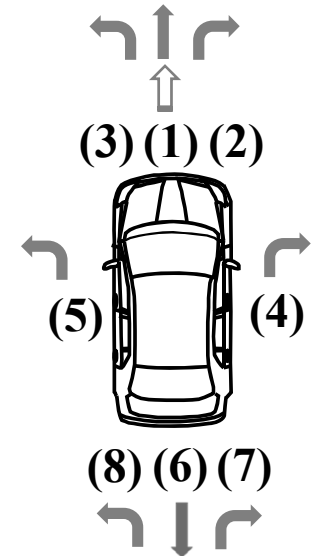
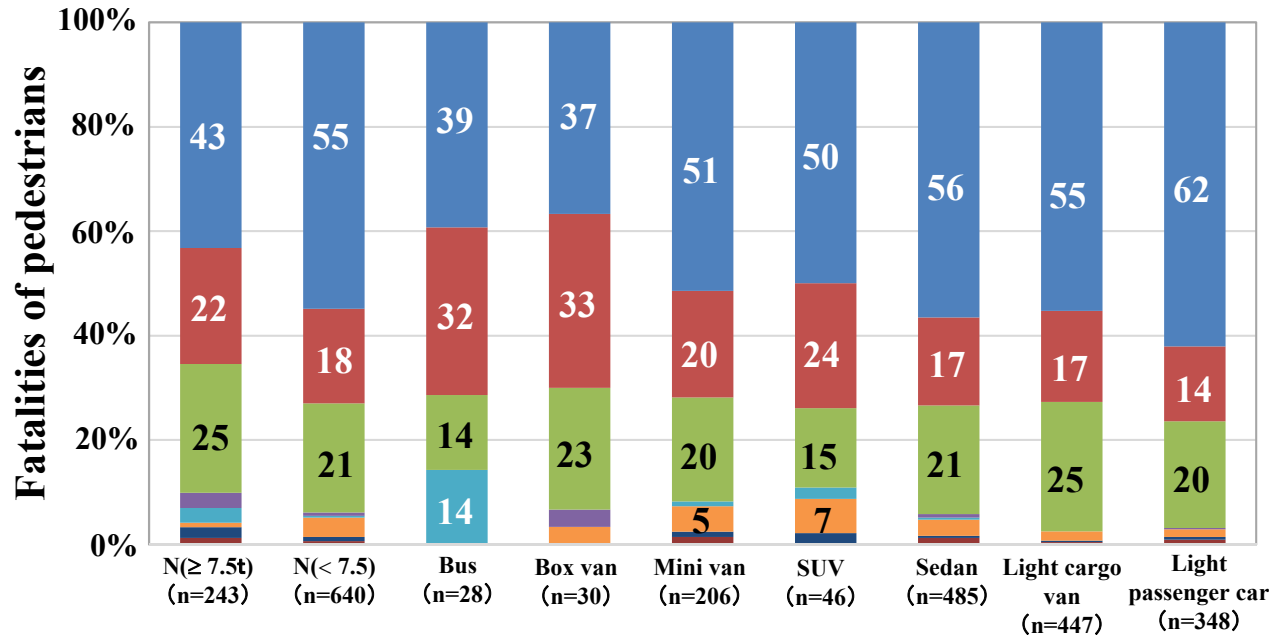
Collision area of vehicles Type of vehicles	Number of pedestrian fatalities								Total
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	
a) N ($\geq 7.5t$)	26	14	22	3	6	2	4	1	78
b) N ($< 7.5t$)	27	17	15	3	1	21	4	4	92
c) Bus	2	3	1	0	2	0	0	0	8
d) Box van	1	1	2	1	0	1	0	0	6
e) Mini van	9	9	9	0	2	7	2	3	41
f) SUV	5	1	1	0	0	3	1	0	11
g) Sedan	17	15	8	2	0	14	2	6	64
h) Light cargo van	19	5	4	0	0	7	1	1	37
i) Light passenger car	15	7	7	0	0	4	2	3	38

Collision area of vehicles Type of vehicles	Rates of pedestrian fatalities (%)								Total
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	
a) N ($\geq 7.5t$)	33	18	28	4	8	3	5	1	100
b) N ($< 7.5t$)	29	18	16	3	1	23	4	4	100
c) Bus	25	38	13	0	25	0	0	0	100
d) Box van	17	17	33	17	0	17	0	0	100
e) Mini van	22	22	22	0	5	17	5	7	100
f) SUV	45	9	9	0	0	27	9	0	100
g) Sedan	27	23	13	3	0	22	3	9	100
h) Light cargo van	51	14	11	0	0	19	3	3	100
i) Light passenger car	39	18	18	0	0	11	5	8	100

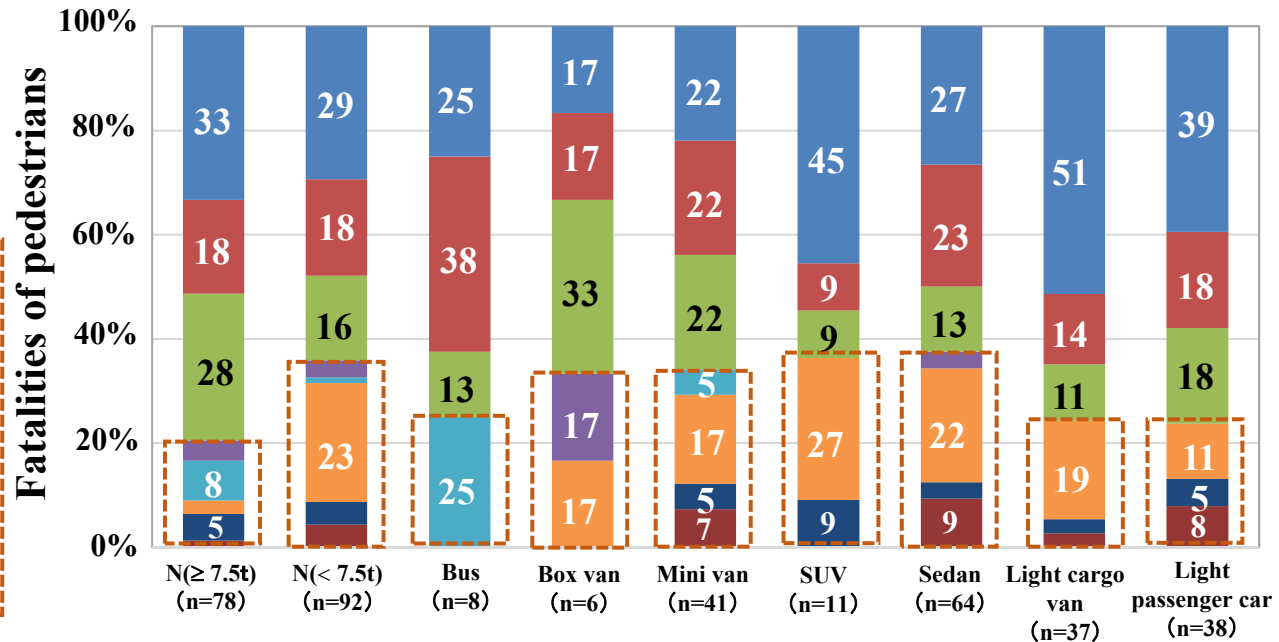


Data of collision areas of vehicles

Total



≤ 10km/h



Collision rate at side and rear is high comparing to total data.

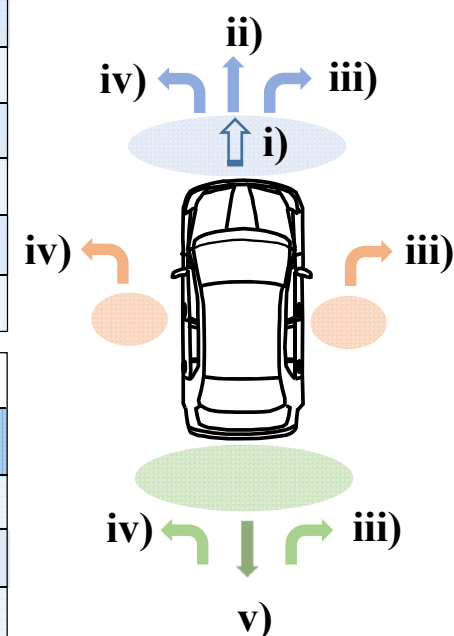
- (1)
- (2)
- (3)
- (4)
- (5)
- (6)
- (7)
- (8)

Behavior of vehicles killed pedestrians at low speed

Speed of vehicles: **less than or equal to 10km/h**

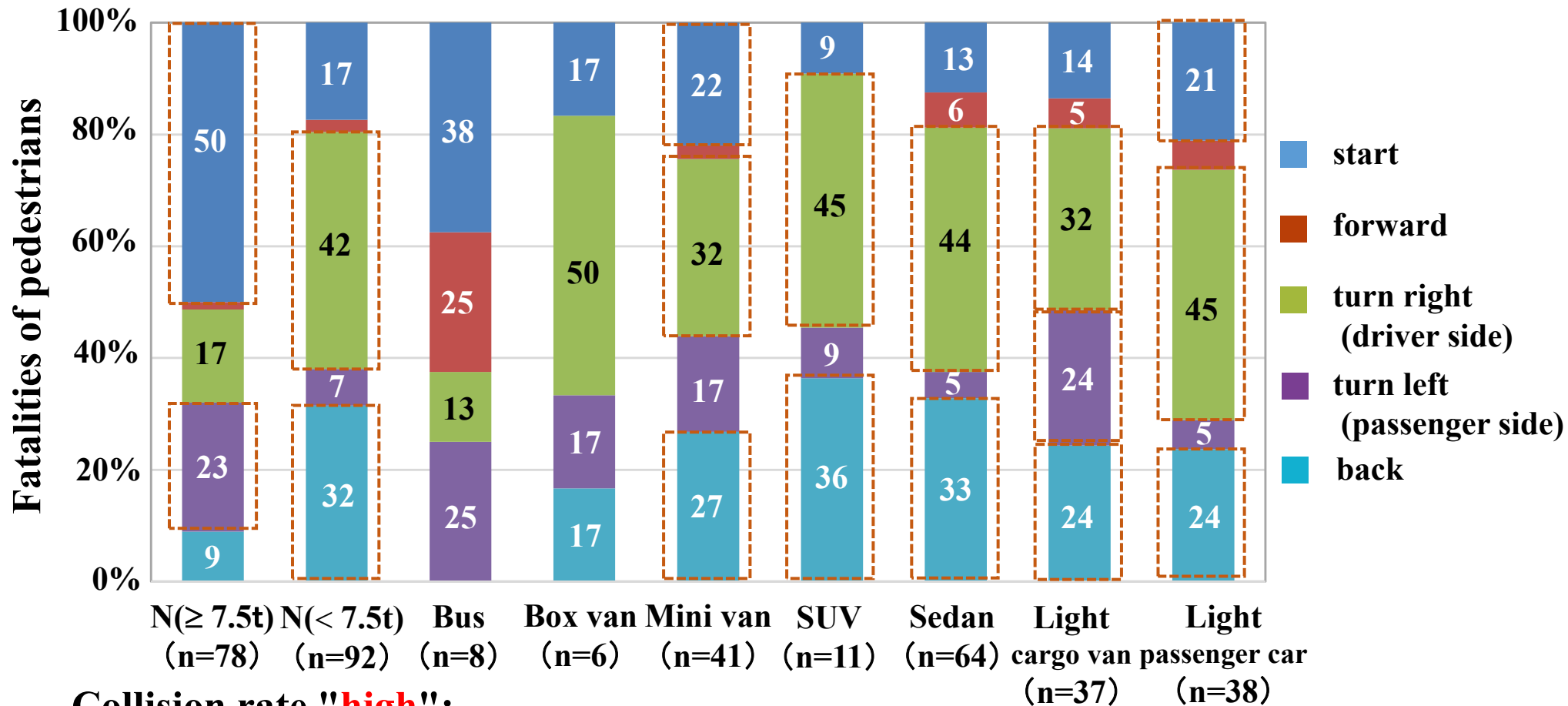
Behavior of vehicles Type of vehicles	Number of pedestrian fatalities					
	i) Start	ii) Forward	iii) Turn right	iv) Turn left	v) Back	Total
a) N ($\geq 7.5t$)	39	1	13	18	7	78
b) N ($< 7.5t$)	16	2	39	6	29	92
c) Bus	3	2	1	2	0	8
d) Box van	1	0	3	1	1	6
e) Mini van	9	1	13	7	11	41
f) SUV	1	0	5	1	4	11
g) Sedan	8	4	28	3	21	64
h) Light cargo van	5	2	12	9	9	37
i) Light passenger car	8	2	17	2	9	38

Behavior of vehicles Type of vehicles	Rates of pedestrian fatalities (%)					
	i) Start	ii) Forward	iii) Turn right	iv) Turn left	v) Back	Total
a) N ($\geq 7.5t$)	50	1	17	23	9	100
b) N ($< 7.5t$)	17	2	42	7	32	100
c) Bus	38	25	13	25	0	100
d) Box van	17	0	50	17	17	100
e) Mini van	22	2	32	17	27	100
f) SUV	9	0	45	9	36	100
g) Sedan	13	6	44	5	33	100
h) Light cargo van	14	5	32	24	24	100
i) Light passenger car	21	5	45	5	24	100



Behavior of vehicles killed pedestrians at low speed

Speed of vehicles: **less than or equal to 10km/h**



Collision rate "high":

- Start N (>7.5) , mini van, LPC
- Turning right N (≤ 7.5), mini van, SUV, sedan, LCV and LPC
- Turning left N (>7.5) and LCV
- Back N (≤ 7.5), mini van, SUV, sedan, LCV and LPC

Summary

- Fatal accidents of pedestrians killed by vehicles at low speed
 - Rates of fatal accidents of pedestrians killed by the vehicles at low speed are **NOT low**.
 - One of the promising countermeasures is improving the driver's view.

- Collision areas of vehicles (pedestrians vs. vehicles at low speed)
 - Rates of side and rear collision are high (especially small N and sedan)
 - * The possible reason why the number/rate of rear collisions of large N is not high in Japan is that voluntary fitting of camera monitoring systems (rear view monitor) are popular for these vehicles.



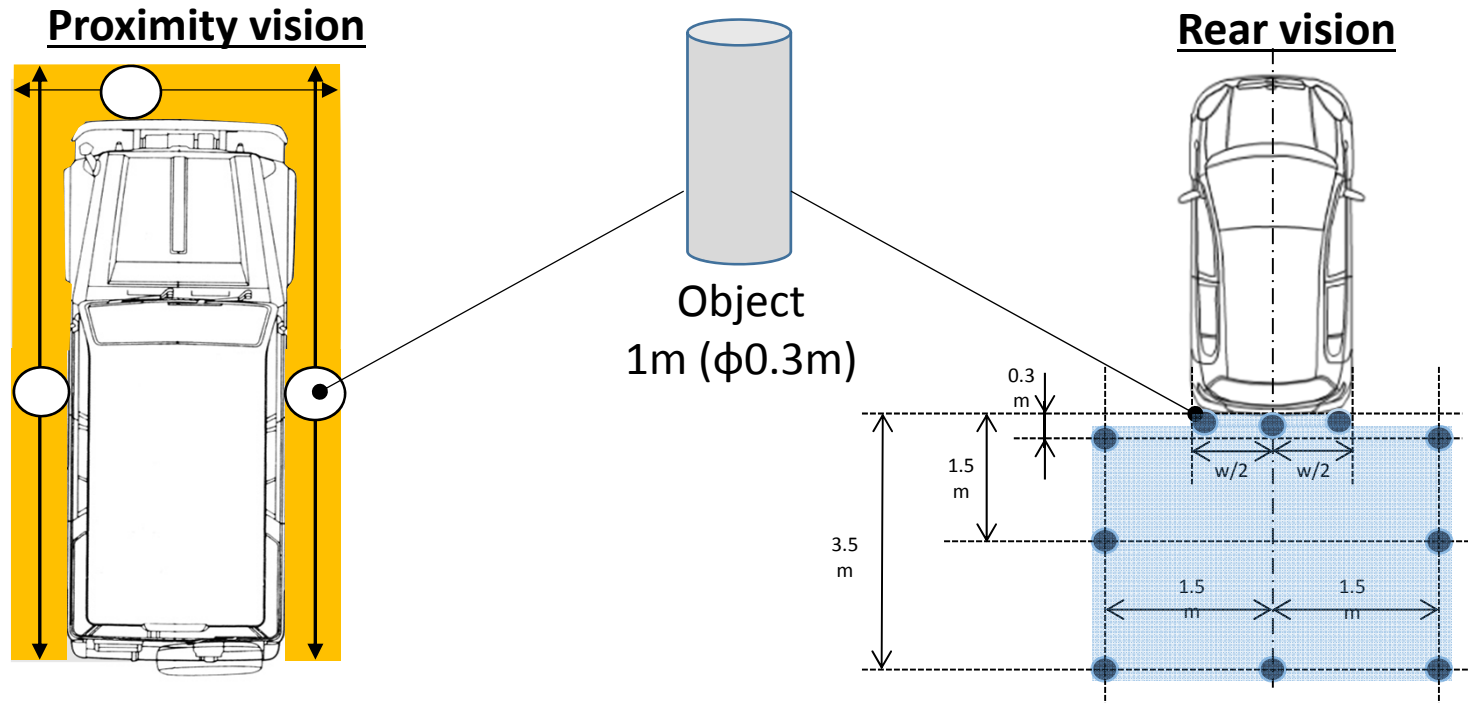
In Japan, about 70% of large N is fitted rear view monitoring systems

- Behaviors of vehicles killed pedestrians at low speed

		<u>Requirements of;</u>
<ul style="list-style-type: none"> • Start • Turning left 	<ul style="list-style-type: none"> $N (\geq 7.5)$, Mini van, LPC $N (\geq 7.5)$ and LCV 	} Front and side vision (Class 5 and 6)
<ul style="list-style-type: none"> • Turning right 	<ul style="list-style-type: none"> $N (< 7.5)$, mini van, SUV, sedan, LCV and LPC Direct vision (e.g. A pillar)
<ul style="list-style-type: none"> • Back 	<ul style="list-style-type: none"> $N (< 7.5)$, mini van, SUV, sedan, LCV and LPC Rear vision

Proposal of new requirements for proximity and rear visions

- All or part of the object (1m, $\phi 0.3\text{m}$) shall be seen from the driver's seat by direct vision or devices for indirect vision.
- Instead of the above requirements, vehicles can detect the existence of the object by sonars and inform it to the drivers.
- New requirements shall be proposed as Class VIII.



Roadmap toward adoption of R46 In Japan

