Current Status in Korea
for Pedestrian Safety Rule-making Researches

2004. 2.

Ministry of Construction and Transportation
Republic of Korea
CONTENTS

I. Accident Assessments
II. Research Activities for Pedestrian
III. Harmonization Activities
I. Accident Assessment
1. Backgrounds

- Korea Pedestrian Fatality
  - 37.2% (2000): 3,890 (10,236)
  - 43.5% (2002): 3,086 (7,090)

- Need Pedestrian Regulation for Domestic Environment
- Consider Current Technology and Maker’s Preparations
- Must be Harmonized with Europe/IHRA
2. Trends of Vehicle Increments

![Graph showing the number of vehicle registrations from 1988 to 2002. The graph indicates a steady increase in vehicle registrations over the years.]
3. Frequency of Traffic Accidents

![Bar Chart showing the number of traffic accidents from 1988 to 2002.](chart.png)
4. Trends of Traffic Accident Fatalities

The graph illustrates the trends of traffic accident fatalities from 1988 to 2002. The y-axis represents the number of fatalities, while the x-axis represents the years. The data shows a general trend of decreasing fatalities over the years, with a peak in 1991.
5. Trends of Traffic Accident Fatalities
(Number of Fatalities / 1 Million Vehicles)
6. Trends of Traffic Accident Injuries

![Graph showing trends of traffic accident injuries from 1988 to 2002.](image-url)
7. Trends of Traffic Accident Injuries
(Number of Injuries / 1 Million Vehicles)
8. Trends of Accident Types - Fatalities

![Graph showing trends of accident types - fatalities from 1989 to 1999. The graph compares vehicle vs. pedestrian, vehicle vs. vehicle, and vehicle alone accidents.]
9. Trends of Accident Types
(Number of Fatalities / 1 Millions Vehicles)
10. Trends of Pedestrian Accident Types - Fatalities

- Walking against Vehicle
- Walking parallel to Vehicle
- Crossing while Playing on Road
- While Working on Road
- While Stopping on Road-Side
- While Walking on Sidewalk
- While Walking on Road-Side
- Others
11. ’02 Year Accident Types - Fatalities

Total Fatalities: 7,090

- Pedestrian vs. Vehicle: 44%
- Vehicle vs. Vehicle: 39%
- Vehicle vs. Pedestrian: 17%
- Vehicle Alone: 0%

Vehicle vs. pedestrian • Vehicle vs. Vehicle • Vehicle Alone
12. ‘02 Year Pedestrian Accident Types - Fatalities

Accidents While Crossing

- Walking against Vehicle: 2%
- Walking Parallel to Vehicle: 2%
- Crossing: 52%
- While Playing on Road: 4%
- While Working on Road: 1%
- While Stopping on Road-Side: 1%
- While Walking on Sidewalk: 1%
- While Walking on Road-Side: 1%
- Others: 36%
13. ‘02 Pedestrian Accident by Vehicle Types - Injuries

Total Injuries: 59,236

- Sedan: 56% (17,088)
- Van/SUV: 15% (8,886)
- Heavy-truck: 5% (2,962)
- Special-vehicle: 7% (4,146)
- Motorcycle: 0% (0)
- ETC: 17% (10,060)

Sedan Type Vehicles: 56%
14. ’02 Pedestrian Accident by Vehicle Types - Fatalities

Total Fatalities : 3,086
15. ’02 Pedestrian Injured Body - Injured

Total Injuries: 57,476

- Head: 17%
- Neck: 28%
- Lo. Leg: 28%
- Chest: 8%
- Abdominal: 4%
- Arm: 5%
- Upper_Leg: 10%
- Lower_leg: 10%
16. ’02 Pedestrian Injured Body - Fatalities

Total Fatalities: 3048

- Head: 64%
- Neck: 9%
- Chest: 7%
- Abdominal: 5%
- Arm: 11%
- Upper Leg: 3%
- Lower Leg: 1%

Lo. Leg: 11%
II. Research Activities for Pedestrian in Korea
1. Objective of Research

Goal

- P/S Evaluation Protocol
- P/S Impactor
- Feasibility Study for P/S Device

Application

- Safety Criteria
- Safety Technology
- P/S Politic & Strategy
- Join Int’l. Harmonization

1. Objective of Research

- P/S Evaluation Protocol
- P/S Impactor
- Feasibility Study for P/S Device

- Safety Criteria
- Safety Technology
- P/S Politic & Strategy
- Join Int’l. Harmonization
2. Research Scopes
3. Plan for P/S Rule-Making Activities

Stage 1
- (’03.7 - ) Head Protection

Stage 2
- (’05.5 - ) Legs Protection

’04
- (’05.4) Propose Head Criteria

(’05-’06.12) Head NPRM

’06
- (’07.12) Propose Legs Criteria

(’07.01 - ) Legs NPRM

After 2010 Legs Rule Application

(’07.12) Propose Legs Criteria

(’09) Head Rule Application

(’06) (’05.5 - ) Legs Protection

Stage 1
- Stage 2

Figure 20 EEVC Pedestrian Sub-system Tests
4. Expected Plans for Pedestrian Safety

**Stage 1**
- **1990’s**
- 2003
- 2004
- 2005

**Stage 2**
- 2006
- 2007
- 2008
- After 2009

**From 1996 Euro-NCAP**
- Head, Leg Rule Apply

**Since ‘90 R&D Start**
- Leg Rule and Criteria Study

**2003 J-NCAP (Head)**
- Head Rule Apply

**MOCT NCAP Study (Head)**
- MOCT Rule-making (Head)

**K-NCAP (Head)**
- MOCT (Leg)

**‘09 Head Rule may Applicable**

**Final**
- Dec.
- April

**2008**

**After 2009**
5. GTR Vehicle Classification

1) Evaluate Domestic Vehicles in terms of GTR Classification

- Bon. Angle $\geq 30^\circ$
- BLE height $\geq 835$mm

Category 3
1 Box

Category 2
SUV

Category 1
Sedan

2) Different Impact Speed, Angles

Various Test Methods

Korean Vehicle?
5-1. Vehicle Classification (Sedan)

KOREA Sedan Corridor
IHRA/Japan Sedan Corridor
5-2. Vehicle Classification (Sedan)

**Comparison of Sedan Corridor**

- **IHRA/Japan Definition**
  - Sedan: Bon. Angle < 30° & LEH < 835mm

<table>
<thead>
<tr>
<th>Classification</th>
<th>Korea Lower</th>
<th>Korea Upper</th>
<th>IHRA/Japan Lower</th>
<th>IHRA/Japan Upper</th>
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<td>BCH (mm)</td>
<td>431</td>
<td>479</td>
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<td>LEH (mm)</td>
<td>656</td>
<td>849</td>
<td>565</td>
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<td>Bon. Length (mm)</td>
<td>1099</td>
<td>895</td>
<td>1200</td>
<td>635</td>
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<tr>
<td>Bon. Angle (°)</td>
<td>13</td>
<td>19</td>
<td>11</td>
<td>18</td>
</tr>
<tr>
<td>Win. Angle (°)</td>
<td>29</td>
<td>32</td>
<td>29</td>
<td>40</td>
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</tbody>
</table>

**Angle**
- **Sedan**
  - Child: 65°
  - Adult: 65°
- **SUV**
  - Child: 60°
  - Adult: 90°
- **1box**
  - Child: 25°
  - Adult: 50°
5-3. Vehicle Classification (SUV)

Comparison of SUV Corridor

- **IHRA/Japan Definition**

  SUV: Bon. Angle < 30° & LEH > 835mm

<table>
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<td>51</td>
<td>36</td>
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5-4. Vehicle Classification (1Box)

Comparison of 1 BOX Corridor

IHRA/Japan Definition
1 Box: Bonnet Angle > 30°

<table>
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<th>Classification</th>
<th>Korea Lower</th>
<th>Korea Upper</th>
<th>IHRA/Japan Lower</th>
<th>IHRA/Japan Upper</th>
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<td>LEH (mm)</td>
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<td>989</td>
<td>864</td>
<td>1144</td>
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<tr>
<td>Bon. Length (mm)</td>
<td>521</td>
<td>129</td>
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<td>157</td>
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<tr>
<td>Bon. Angle (°)</td>
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<td>47</td>
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<tr>
<td>Win. Angle (°)</td>
<td>32</td>
<td>43</td>
<td>30</td>
<td>46</td>
</tr>
</tbody>
</table>

KOREA 1 BOX Corridor
IHRA/Japan 1 BOX Corridor
5-5. Counter-measure of Vehicle Class for 1.5 Box Type Vehicle (Bonnet Angle <30)

**Vehicle Class**

1. Current Vehicle Class: 1.5 Box
2. IHRA Vehicle Class: SUV

**Counter-measure Method**

LS-Dyna Simulation:
FE Headform : ACEA Child / EEVC Adult

Child: Impact Angle: 60°(SUV), 25°(1 Box)
Adult: Impact Angle: 90°(SUV), 50°(1 Box)
Impact Speed: 32km/h

**HIC**

Child: SUV(1082), 1 Box(487)
Adult: SUV(756.6), 1 Box(538.9)

HIC is influenced significantly by impact angles
6. Pedestrian Kinematics Simulations

- Reconstructing Real Accidents
- Classify Pedestrian Walking Types
- Classify Head Speeds
- Classify WAD Contours
- Classify Head Rotation Angles

Purpose
7. Injury Assessment in Test Methods

- Child Headform 2.5kg with 32/35/40km/h

**Purpose**

- Injury Variations
- Test Tolerance Analysis
- Accuracy of Test Methods
- Targeting Point Clearance
8. Injury Assessment by Simulations

- FE Child Headform 2.5kg/3.5kg & 32/35/40km/h

Purpose

- Injury Variations
- Test Tolerance Analysis
- Effects of Angular Velocity
- Feasibility Study
9. Feasibility Study by H-Model

Purpose

- MADYMO: Overall Pedestrian Responses
- H-Model Simulation: Detailed Injury Mechanism (Full Human Model)
  - Rotation & Flexion of Neck
  - Angular Rotation of Head
  - Head Impact Speed
  - WAD Contours
10. Development Test Equipment

● **Components**
  - Control Units (H/W & S/W)
  - Impact Mechanism
  - Data Acq. & Processing
  - Main Frame
  - Headforms & Legforms

● **Specifications**
  - Develop each Module
  - Module Integrations
III. Harmonization Activities
1. Cooperation & Participation

● **Expect to Share & Cooperate with GRSP/IHRA**
  - Strengthen MOCT(Korea) International Activities
  - Exchanges Government based Information
    - Participate Worldwide P/S Expert Regular Meetings
  - Statistical & Technical Information in Vehicle Safety Fields

● **Participations**
  - UNECE/WP29 GRSP Meetings
  - UNECE/WP29 GRSP - P/S Informal Group Meeting
  - Join in 1958 Agreements in the near future
  - Possibly Joining ESV/IHRA Member
2. Organization of Korean Expert Group for Pedestrian Research

International Activities

Advisory Committee
- MOCT
- Professors
- Researchers
- KAMA
- Makers

Technical Committee
- Car Makers
- KAMA
- Researchers
- WP29/GRSP T/F (Korean Delegates)
Thank You!

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