Safe Road Design Practiced by KEC

2013. 05. 09.

SHIN HYOUNG PARK, Ph.D.

Korea Expressway Corporation Research Institute
Contents

1. Road Traffic Safety in Korea
2. For the Safety of Expressways
1 Road Traffic Safety in Korea
40 Years Accident Trend

Fatalities, Crashes(x10)

Length(km), Volume(million)

- Length
- Volume
- Fatalities
- Crashes

Speed Control
Roadside Safety Features

Motorization

Enforcement Campaign

RSA

Korea Expressway Corporation
Expressway Traffic Safety Plan (in the year 2008)

**Mid-Term**
- Traffic Accident Mortality Rate until 2012
- Establish Advanced Traffic Safety System

**Long-Term**
- OECD Ranking in 2020 (Traffic Safety Indicators)
- Build a Safer Road Environment
- Enhance the Public Awareness of Traffic Safety

50% ↓

TOP 5

Promotion Strategies

Korea Expressway Corporation
However...
Recent Trend of Traffic Accident (1)

Crash Counts (Except D level crashes)
Recent Trend of Traffic Accident (2)

Fatalities

![Graph showing the trend of traffic fatalities from 2008 to 2012. The fatalities range from 200 to 400. The graph shows a decrease from 2009 to 2011 and then an increase from 2011 to 2012.](image-url)
## Characteristics of Traffic Accident on Expressway

<table>
<thead>
<tr>
<th></th>
<th>Crashes (ratio, %)</th>
<th>Fatalities (ratio, %)</th>
<th>Fatal Rate (fatalities/crashx10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>231,990 (100)</td>
<td>5,838 (100)</td>
<td>0.25</td>
</tr>
<tr>
<td>Expressway</td>
<td>3,748 (1.6)</td>
<td>397 (6.8)</td>
<td><strong>1.06</strong></td>
</tr>
<tr>
<td>National Highway</td>
<td>36,056 (15.5)</td>
<td>1,666 (28.5)</td>
<td>0.46</td>
</tr>
<tr>
<td>Provincial Road and others</td>
<td>192,186 (82.9)</td>
<td>3,775 (64.7)</td>
<td>0.20</td>
</tr>
</tbody>
</table>

National Police Agency, 2010
Comparison of Fatality Rate in OECD Countries

Fatality Rate (persons/billion vehicle-km) in 2010

Road Safety Annual Report 2011

International Transport Forum

International Traffic Safety Data and Analysis Group

Korea Expressway Corporation
Factors of Road Traffic Accidents

Total Expressway Crashes in Yr 2011 (9813 Crashes including D level)

- Human Factor: 75%
- Road & Environment Factor: 17%
- Vehicle Factor: 8%

Fatal Crashes on Expressways

- Yr 2010: 90%
- Yr 2011: 84%
- Yr 2012: 92%

[Charts showing percentages for each year]
2 For the Safety of Expressways
Levels to Improve Road Safety

<table>
<thead>
<tr>
<th></th>
<th>Enforcement</th>
<th>Education</th>
<th>Facilities (Engineering)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level I</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level II</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level III</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Level I: drivers accept poor road conditions
- Level III: road conditions accept poorly performing drivers
Engineering
Safe Road Design Concept – “Forgiving Highway”

Section A-A
Support / Utility Pole

Section B-B
Transition

Section C-C
Bridge

Crash Cushion

Clear Zone

End Treatment

Support / Utility Pole

Transition
Building a Safer Road Environment (1)

Small-sized rest area for preventing drowsy driving

- Installed in a section where the distance between rest areas exceed 15km
- Amenities: Parking lots, Pergola, Benches, etc.
- 45% reduction in traffic accident caused by driver’s drowsiness (340 -> 188)
- As of 2012, total of 110 shelters are in operation
- Additional 92 shelters will be installed
Building a Safer Road Environment (2)

Expansion Road Safety Facilities for protecting passengers

Development of the equipment for driving stability and safety

Grooving  Rumble Strips  Crash Cushion  LED Signs

Fallen Objects Collecting Device
Building a Safer Road Environment (3)

Safe and comfortable driving Environment - Road remodeling

- Planting trees (Aesthetic Consideration)
- Sound-Proof Wall (Renewal)
- Guardrail Replacement
- New Median Barrier (81cm → 127cm)
- Improving Bus-stop
- Repavement & Line marking
Concrete Median Barrier

**Improvement of Concrete Median Barrier**

- Before: 81cm-tall Concrete Barrier + 45cm-tall Screen
- After: 127cm-tall Concrete only Barrier
- Visual Guidance Line Marking
- Improve Traffic Safety and Reduce Maintenance Labor
Bus-stop/Traffic Signs

### Bus-stop

<table>
<thead>
<tr>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Before image" /></td>
<td><img src="image2.png" alt="After image" /></td>
</tr>
</tbody>
</table>

### Traffic Signs

<table>
<thead>
<tr>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image3.png" alt="Exit Notice image" /></td>
<td><img src="image4.png" alt="Exit Notice image" /></td>
</tr>
<tr>
<td><img src="image5.png" alt="Exit Direction image" /></td>
<td><img src="image6.png" alt="Exit Direction image" /></td>
</tr>
</tbody>
</table>
Roadside Barriers/Soundproof Wall

Roadside Barriers

<table>
<thead>
<tr>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Before Image" /></td>
<td><img src="image2" alt="After Image" /></td>
</tr>
</tbody>
</table>

Soundproof Wall

<table>
<thead>
<tr>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image3" alt="Before Image" /></td>
<td><img src="image4" alt="After Image" /></td>
</tr>
</tbody>
</table>
Advanced Technologies
Establishing Advanced Traffic Safety Systems (1)

- CCTV based crash auto-detecting system using (1,460 places)
  - Regular Monitoring
  - Crash Detection

- Crash Reporting System using Smart-phone Application
  - Reducing crash detection/reporting time by users
  - Auto-collection of location information
  - One-click Transmission
Establishing Advanced Traffic Safety Systems (3)

SMART Highway Research Project

- Objective: Realize World Class Fast and Convenient Intelligent Green Road by Converging Advanced Information Technologies
- Project Period: 2008~2014
- Budget: 93.8 billion KR Won (≒ USD 85.3 million)

**Core Project**

**Core 1: Road-Infra Tech.**
- Installation Methods of SMART Highway Safety Equipment
- Light Collecting Type Signs to Save Energy
- Fog Visible Distance Measurement and Fog Dissipation Device

**Core 2: Traffic Tech.**
- Development of Automatic Accident Detection System
- Development of User-oriented SMART Communication System
- Development of SMART Tolling System (Nonstop/Multilane)

**Core 3: Automobile Tech.**
- Construction of Road-Vehicle Situation Management System
- Lane Departure Prevention Technology
- Vehicle Control Supporting System Based On Road Information

Korea Expressway Corporation
SMART Highway - Safety Related Research

Development of Automatic Accident Detection System

Detecting and tracking possible unforeseen accidents

Automatic Tracking CCTV

Array Camera

Accidents

ARRAY Camera

Detecting Accidents

Automatic Tracking CCTV

Confirming Unforeseen Accidents
SMART Highway - Safety Related Research

Construction of Road-Vehicle Situation Management System

Providing information on both road surface and vehicle abnormality

WARNING! Fallen Objects

- Collect road surface information
- Detect fallen objects
- RADAR detecting
SMART Highway - Safety Related Research

Development of Lane Departure Prevention Technology

Detecting Lane Departure using DGPS

- Detecting lane departure using high-precision vehicle position
- Preventing accidents by carelessness of the driver
  - 858 cases out of 2,368 cases (36%) (2010)
Automatic Vehicle Control Through Linking Road-Vehicle

- Provide hazard information on road-vehicle
- Prevent accidents through automatic vehicle control in emergency situation
Education/Campaign/PR
Enhance the Public Awareness of Traffic Safety (1)

Public Relations (Mass Media)

Public Relations (Others)

Photos (Rest Area)

VOD (Rest Area)

Korea Expressway Corporation
Enhance the Public Awareness of Traffic Safety (2)

Campaigns

Education
Enforcement
Click it or Ticket!!

Overweight Enforcement System (Hi-WIM)

- Illegal axle manipulations for evading law enforcement may be permanently eradicated
- Minimization of severe traffic accidents that are frequently caused by overloaded vehicles
- Build a minute highway traffic information database
Point-to-Point Enforcement of Speed Limit

Concept of P2P Enforcement

1. Taking pictures of plate at 50fms
2. Another cameras in several kilometers apart to acquire average travel speed

• Effects
  Speed : -6.0%
  Frequencies : -7.7%

Korea Expressway Corporation
Emergency
Emergency System

Helicopter Emergency Medical Service (HEMS)
- Rapid rescue and evacuation by 119 emergency helicopters
- 20 persons rescued from Jan. 2011 to Sep. 2012 (18 times)

Emergency towing service for preventing secondary collisions
- by rapid clearance of road after an accident
- Move damaged vehicles to the nearest IC or rest area
- by 2011, a total of 4,062 service was provide
Other Efforts...
Cooperation with relevant organizations (1)
Cooperation with relevant organizations (2)

**Reinforcement of Cooperative relationship with relevant organizations**
- Traffic Safety T.F.T: MoLIT, KEC, Korea Transportation Safety Authority
- Accident Reduction T.F.T: KEC, Korea Transportation Safety Authority, National Police Agency, Korea Road Authority
- HEMS: National Emergency Management Agency, KEC, National Police Agency
THANK YOU!

Email to shinhpark@ex.co.kr