US Side Impact Protection Rule

Federal Motor Vehicle Safety Standard No. 214
National Highway Traffic Safety Administration
47th Session of GRSP, May 2010
Near-side Fatalities by Crash Partner

2005 FARS, Nonrollover Occupant Fatalities
MY 1995+ Struck Vehicle

Rigid narrow object 22.7%
Large car 15.0%
Compact SUV or P/U 14.9%
Large SUV or P/U 18.7%
Minivan 3.4%
Large van 2.5%
Other event or object 3.8%
Small car 1.1%
Other vehicle 1.0%
Heavy vehicle 13.9%
Rigid non-narrow object 2.9%

(Represented by FMVSS No. 214 MDB Test)

All Occupants n =3,333

Rigid narrow object countermeasures apply to all configurations
Real World Crash Injury Data
(Basis for US Rulemaking)

2001 FARS
1997-2001 NASS

<table>
<thead>
<tr>
<th>Injury Occurrence</th>
<th>Serious</th>
<th>Fatal</th>
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<tbody>
<tr>
<td>Head</td>
<td>13%</td>
<td>40%</td>
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<tr>
<td>Chest</td>
<td>59%</td>
<td>38%</td>
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</tbody>
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- Short stature occupants (<5’4”)
  - 35% serious/fatal injured occupants; 93% are female
  - Increased risk of head injury
Major Provisions of Rulemaking

- Add 75 degree oblique pole tests
  - 20 mph
  - Front outboard occupants

- Upgrades 50th percentile male dummy
  - EuroSID-2 with Rib Extensions (ES-2re)
  - Pole and existing moving barrier tests

- Adds 5th percentile female dummy
  - SID-IIIsD
  - Pole and existing moving barrier tests
Why 75° Oblique Angle vs. 90° FMVSS No 201

- Only 11% of seriously injured occupant represented by 90 degree angle from a review of NASS data.
- Oblique angle to assure more robust sensor performance
  - Early testing showed vehicles with head protection did not pick up the impact with the oblique pole and deploy the bags
- Oblique angle to assure better head protection and larger air bags (curtains)
  - Early testing showed vehicles equipped with a combo head and chest bag did not adequately protect occupants head in oblique condition.
- Vehicles certified to the upgraded side impact requirements exempt from pole test specified in FMVSS No. 201.

- NHTSA SIDE IMPACT RESEARCH: MOTIVATION FOR UPGRADED TEST PROCEDURES, R. Samaha and D. Elliott, 18ESV492
Pole Test – 2004/05 Toyota Sienna

SID-IIssD - Driver
HIC  = 2019
Th Defl = 37
Abd Def = 57.9
Iw Spine = 55
Pelvis F = 4670

ES-2re - Driver
HIC  = 667
Th Defl = 47
Abd Force = 1751
Iw Spine = 60
Pelvis F = 2127
Major Comments & Responses

- General support from manufacturer and consumer groups
- Alliance: 5th dummy not needed
  - Response: Considerable basis for benefits; incorporated SID-IIhsD
- Manufacturers: use voluntary agreement
  - Phase 1 (9/1/07): 50% either FMVSS No. 201 pole or IIHS MDB;
  - Phase 2 (9/1/09): 100% IIHS MDB
  - Response: IIHS/Alliance voluntary agreement benefits only about 50% of Rule
- Consumer groups wanted more requirements
  - Rear seat pole test
    - Response: Manufacturers will likely install curtains in response to: 214 final rule, IIHS ratings & ejection mitigation; Curtains will provide head protection to front and rear seat occupants in side impacts.
  - More stringent injury criteria (HIC of 800, deflections < 35 mm)
    - Response: Adopted injury criteria is consistent with existing pole test requirements; and deflections were adjusted for age
**Incremental Costs**

- **New systems**
  - Wide head/torso combo bag w/ 2 sensors ~ $126/vehicle
  - Wide window curtain + torso bag w/ 2 sensors ~ $243/vehicle
  - Wide window curtain + torso bag w/ 4 sensors ~ $280/vehicle

- **Vehicles with Side Air Bags**
  - In 2005, over 40% have head and/or torso inflatable protection systems
  - In 2011, manufacturers project 89% head and 73% torso air bags
  - Added sensors and/or wider bags required to meet requirements

- **Average incremental cost ~ $25-66/vehicle, with MY 2011 fleet**
Target Population*  
(NASS CDS, 12 –25 mph)

- Fatalities: 2,311
- AIS 3-5 Injuries: 5,891

* Excludes Rollover Crashes
### Incremental Benefits*
(Lives & Injuries Saved)

- About 80% of benefits are from head injuries

<table>
<thead>
<tr>
<th>Configuration</th>
<th>Fatalities saved</th>
<th>AIS 3-5 injuries prevented</th>
</tr>
</thead>
<tbody>
<tr>
<td>Combination head/torso air bag w/ 2 sensors</td>
<td>266</td>
<td>352</td>
</tr>
<tr>
<td>Window curtain + torso air bag w/ 2 sensors</td>
<td>311</td>
<td>361</td>
</tr>
<tr>
<td>Window curtain + torso air bag w/ 4 sensors</td>
<td>311</td>
<td>371</td>
</tr>
</tbody>
</table>

*Benefit estimates are based on 100% ESC
*Based on projected air bag sales in MY 2011
# Cost Effectiveness Estimates

<table>
<thead>
<tr>
<th>Costs (2004 dollars)</th>
<th>Benefits</th>
<th>Cost per ELS</th>
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</table>
| $429M – 1.1B         | 266-311 fatalities  
352-371 injuries   | $1.6* – 4.6 M† |

* - 3% discount; head/torso combo bag  
† - 7% discount; window curtains + torso bag w/ 4 sensors

The most likely scenario is window curtains and separate thorax bags with 2 sensors, the cost per equivalent life saved is $1.8 to $2.3 million.
References

- Federal Register Notices
  (http://www.gpoaccess.gov/fr/index.html)
  - Notice of Proposed Rulemaking: 69 FR 27993
  - Final Rule: 72 FR 51957
  - Response to Comments on Final Rule: 73 FR 32483
- NHTSA Side Impact Research: Motivation For Upgraded Test Procedures, R. Samaha and D. Elliott, 18ESV492
- FMVSS 214 Pole Tests w/ SID-IIsD and ES2-re
  - Test #s: 5436, 5317, 5443, 5408, 5457, 5472, 5444, 4859, 5458, 5407, 5438, 5300, 5459, 5405, 5421, 5439, 5417, 5296, 5437, 5406, 5470, 5416
Thank You

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