Evolution of UNECE R29

OICA proposal

GRSP Informal Group on Cab Strength - 12 December 2006
Current UNECE R29 (R29.02)

• Applies to all N vehicles (N1+N2+N3)

• 2 mandatory tests: frontal impact, roof strength

• 1 optional test: rear wall
Current UNECE R29 (R29.02)

Frontal impact:

<table>
<thead>
<tr>
<th>Device</th>
<th>Pendulum</th>
</tr>
</thead>
</table>
| Energy | GVW > 7t: 44.1kJ  
          GVW ≤ 7t: 29.4kJ |
| Impactor | Flat (800 mm width x 2500 mm height) |
| Arm | Rigid |
| Overlap | 100% overlap |

2500 x 800 mm

29 – 44 kJ
OICA comments and suggestions

**Frontal impact of UNECE R29:**

- Based on truck impacting rear of preceding truck

- Accident statistics confirm current impact configuration:
  - Impactor size 2500 x 800 mm
  - Centre of Gravity (CG): 50 mm below R-point
  - Large majority of overlap 75 – 100 %

- Energy for trucks > 7.5 t GVM could be increased to 50 kJ (+14%) to increase severity and occupant protection

- Any reduction of impactor size would require maintaining current energy level of 44.1 kJ and redefinition of location of impactor (150 mm below R-point) to avoid interaction with lower windscreens
OICA comments and suggestions

Frontal impact of UNECE R29 (continued):

• For N vehicles ≤ 7.5t GVM, current R29.02 energy level of 29.4 kJ is adequate

• At least for N1 vehicles, approval to UNECE R33 or UNECE R94 should be possible alternative to the manufacturer
Frontal Impact - OICA proposal

- Impactor size 2500 x 800 mm
- Rigid beams for impactor suspension
- CG: 50 mm below R-point
- CG in median longitudinal plane of truck
- N2 > 7.5 t GVM and N3: 50 kJ impact energy
- N2 ≤ 7.5 t GVM and N1: 29.4 kJ impact energy
- At least for N1 vehicles, allow UNECE R33 or UNECE R94 as alternative
Current UNECE R29 (R29.02)

Roof strength test

<table>
<thead>
<tr>
<th>Device</th>
<th>Rigid flat plate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Load</td>
<td>Equal to max load on front axle(s), max 98 kN</td>
</tr>
</tbody>
</table>
OICA comments and suggestions

**Roof strength test of UNECE R29:**

- Supposed to represent 180° rollover accident

- Accident statistics confirm rather poor representativity:
  - Omits the pre-phase of a 180° rollover, namely the 90° sequence
  - 90° rollover results in lateral deformation of the cab
  - SAE has developed representative test sequence

- 180° rollover identified in various regions as a major injury causation accident configuration, especially in Europe and USA (but less so in Japan)
180° rollover – OICA proposal

Test 2: quasi-static load $\leq 98$ kN

Test 1: dynamic pre-load $17.6$ kJ

Test 1 - dynamic pre-deformation:
- Rigid platen
- Inclined $20^\circ$ to the vertical
- Energy level: $17.6$ kJ
- Direction of the impact: perpendicular to the longitudinal axis of the cab
180° rollover – OICA proposal (cont'd)

Test 2 – quasi-static load:
- On same cab as test 1
- Rigid platen
- Force = maximum authorised load front axle(s), ≤ 98 kN
- Direction of the load: vertical

Test 1: dynamic pre-load 17.6 kJ

20°
Current UNECE R29 (R29.02)

Rear wall test

<table>
<thead>
<tr>
<th>Device</th>
<th>Rigid barrier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Load</td>
<td>1.96 kN per tonne payload</td>
</tr>
</tbody>
</table>
OICA comments and suggestions

Rear wall test:
- Supposed to represent impact by load shifting forward
- Accident statistics show very few injuries (< 2%)
- Test is irrelevant for most heavy truck configurations (load separated from cab)
- Test is irrelevant for lighter trucks (1-box)
- Test should be deleted altogether and replaced by far more important accident configuration (see below)
OICA proposal – new test

90° rollover with subsequent impact (A-pillar test) – to be included in UNECE R29:

• Represents 90° rollover, with truck subsequently impacting an obstacle (tree, pillar, road bank, …)

• Accident statistics indicate high frequency of injuries
OICA proposal – new test

90° rollover with subsequent impact (A-pillar test) – to be included in UNECE R29:

Based on Swedish test, with further improvements:

- Steel pendulum $\geq 1,000$ kg
- Inclined 45° to vertical, 15 ° in horizontal XZ plane
- Impact direction: 15° to vehicle longitudinal axis
- Impact energy 30 kJ
OICA proposal – new test

A-pillar test:
Other comments and suggestions

• Current UNECE R29 uses manikin to assess survival space:
  – Uninstrumented Hybrid III – 50th percentile male dummy more representative and adequate

• Calculations should be acceptable alternative to physical tests for the 3 impact configurations (front, 90° and 180° rollover)

• Extension of approvals for cabs approved to UNECE R29.02 should remain possible indefinitely
Conclusion

• OICA proposals to revise UNECE R29:
  – Frontal impact (increased energy level)
  – 90° rollover with subsequent impact (new test)
  – 180° rollover (addition of dynamic pre-load)

• OICA proposals represent clear improvement to safety of truck cabs ≥ 7.5 t GVM, based on accident data (Europe, USA, Japan)

• OICA proposals very severe and need adequate transitional provisions:
  – 5 years (minimum) for new approvals
  – Existing cabs cannot meet (re-design would result in new approvals!)
  – Extension of approvals to remain possible

• Current UNECE R29.02 requirements however adequate for lighter trucks

• UNECE R94 should be possible alternative for light trucks
Thank you for your attention