

# Evolution of UNECE R29

## OICA proposal

GRSP Informal Group on Cab Strength - 12 December 2006

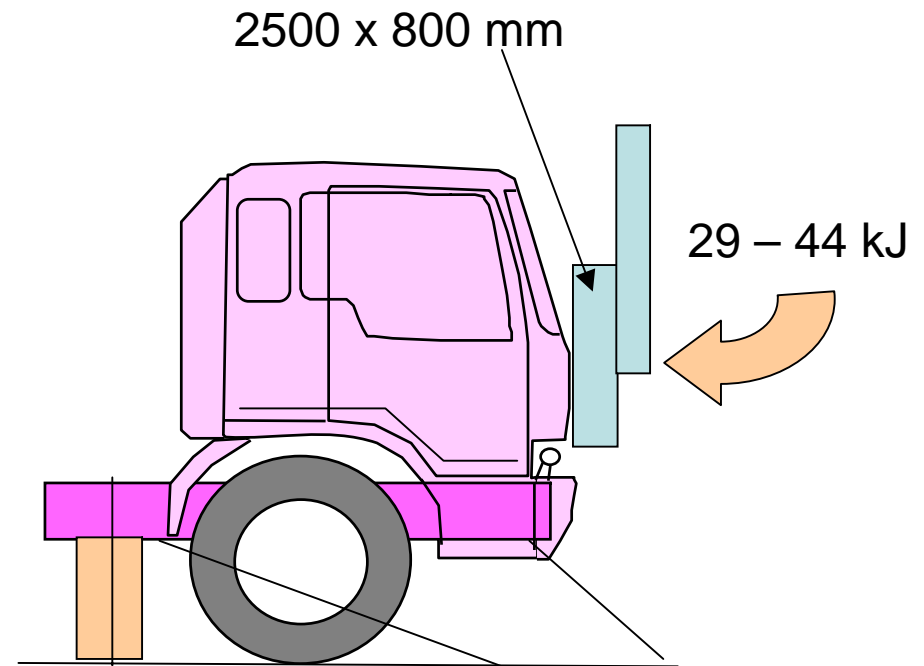
# Current UNECE R29 (R29.02)

- 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:

<b>Device</b>	<b>Pendulum</b>
<b>Energy</b>	<b>GVW &gt; 7t: 44.1kJ GVW ≤ 7t: 29.4kJ</b>
<b>Impactor</b>	<b>Flat (800 mm width x 2500 mm height )</b>
<b>Arm</b>	<b>Rigid</b>
<b>Overlap</b>	<b>100% overlap</b>



# OICA comments and suggestions

## Frontal impact of UNECE R29:

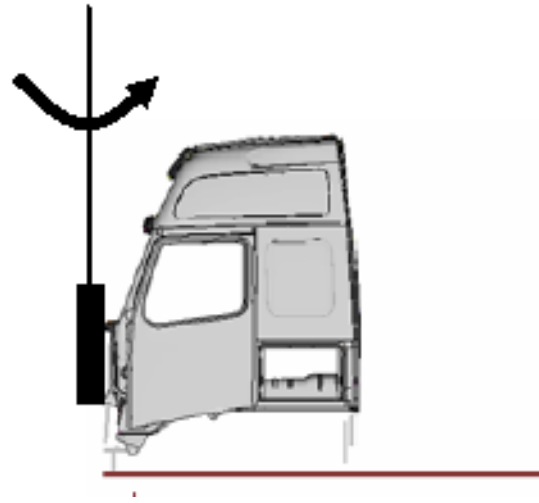
- Based on truck impacting rear of preceding truck
- Accident statistics confirm current impact configuration:
  - Impactor size 2500 x 800 mm
  - Centre of Gravity (CG): 50 mm below R-point
  - Large majority of overlap 75 – 100 %
- Energy for trucks > 7.5 t GVM could be increased to **50** kJ (+14%) 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  $\leq 7.5t$  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

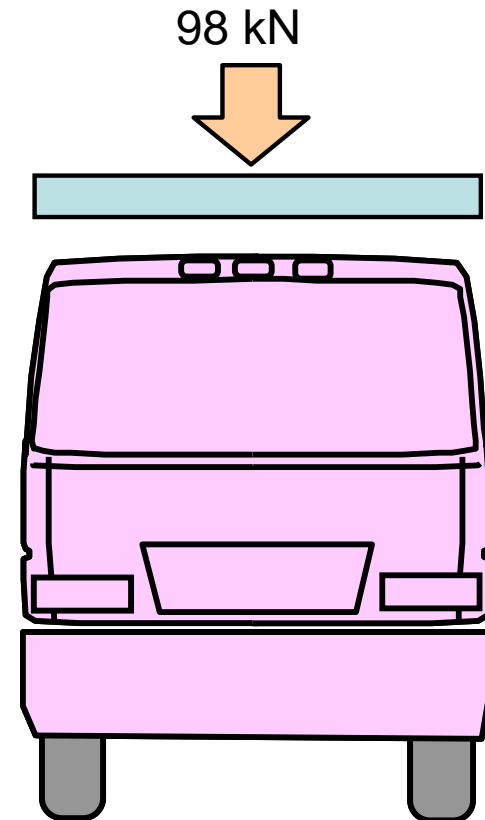


- Impactor size 2500 x 800 mm
- Rigid beams for impactor suspension
- CG: 50 mm below R-point
- CG in median longitudinal plane of truck
- N2 > 7.5 t GVM and N3: 50 kJ impact energy
- N2 ≤ 7.5 t GVM and N1: 29.4 kJ impact energy
- At least for N1 vehicles, allow UNECE R33 or UNECE R94 as alternative

# Current UNECE R29 (R29.02)

## Roof strength test

Device	Rigid flat plate
Load	Equal to max load on front axle(s), max 98 kN



# OICA comments and suggestions

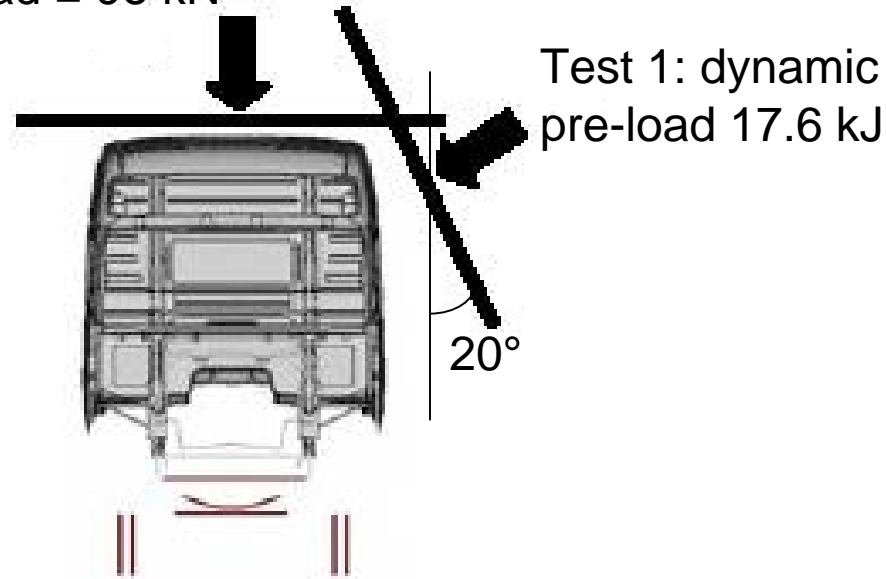
## Roof strength test of UNECE R29:

- 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

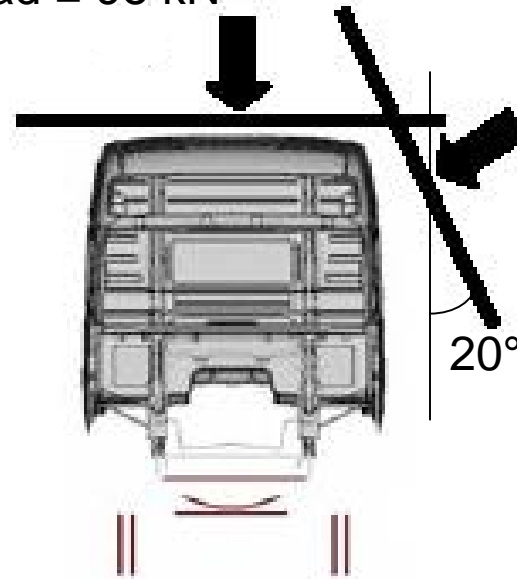
20°

## Test 1 - dynamic pre-deformation:

- Rigid platen
- Inclined 20° 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  $\leq 98$  kN



Test 1: dynamic  
pre-load 17.6 kJ

20°

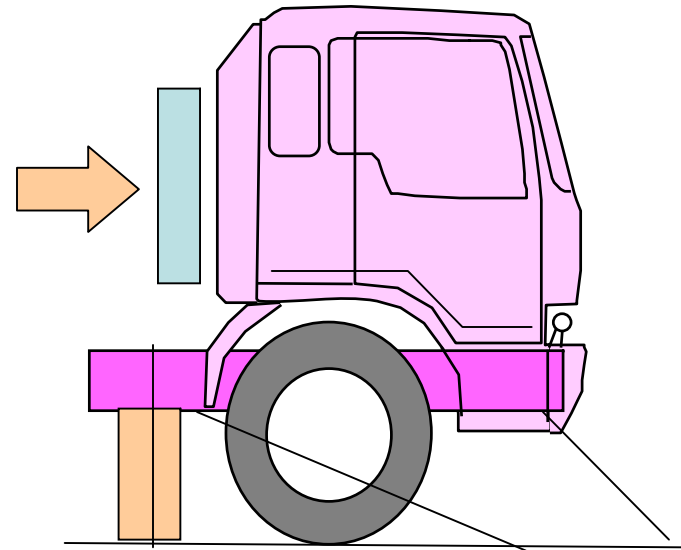
## Test 2 – quasi-static load:

- On same cab as test 1
- Rigid platen
- Force = maximum authorised load front axle(s),  $\leq 98$  kN
- Direction of the load: vertical

# Current UNECE R29 (R29.02)

## Rear wall test

<b>Device</b>	<b>Rigid barrier</b>
<b>Load</b>	<b>1.96 kN per tonne payload</b>



# 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)

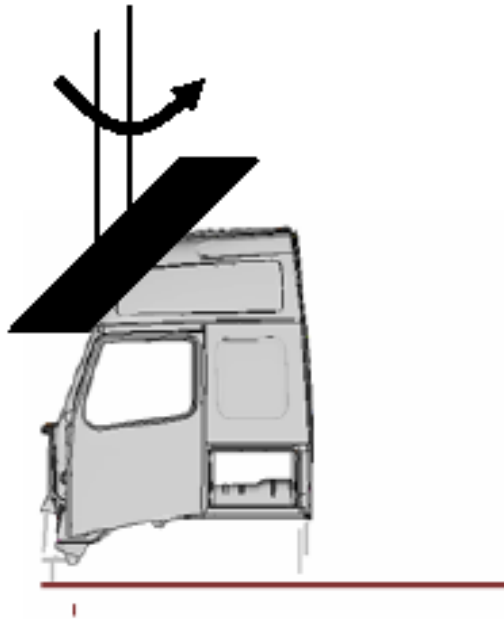
# OICA proposal – new test

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:

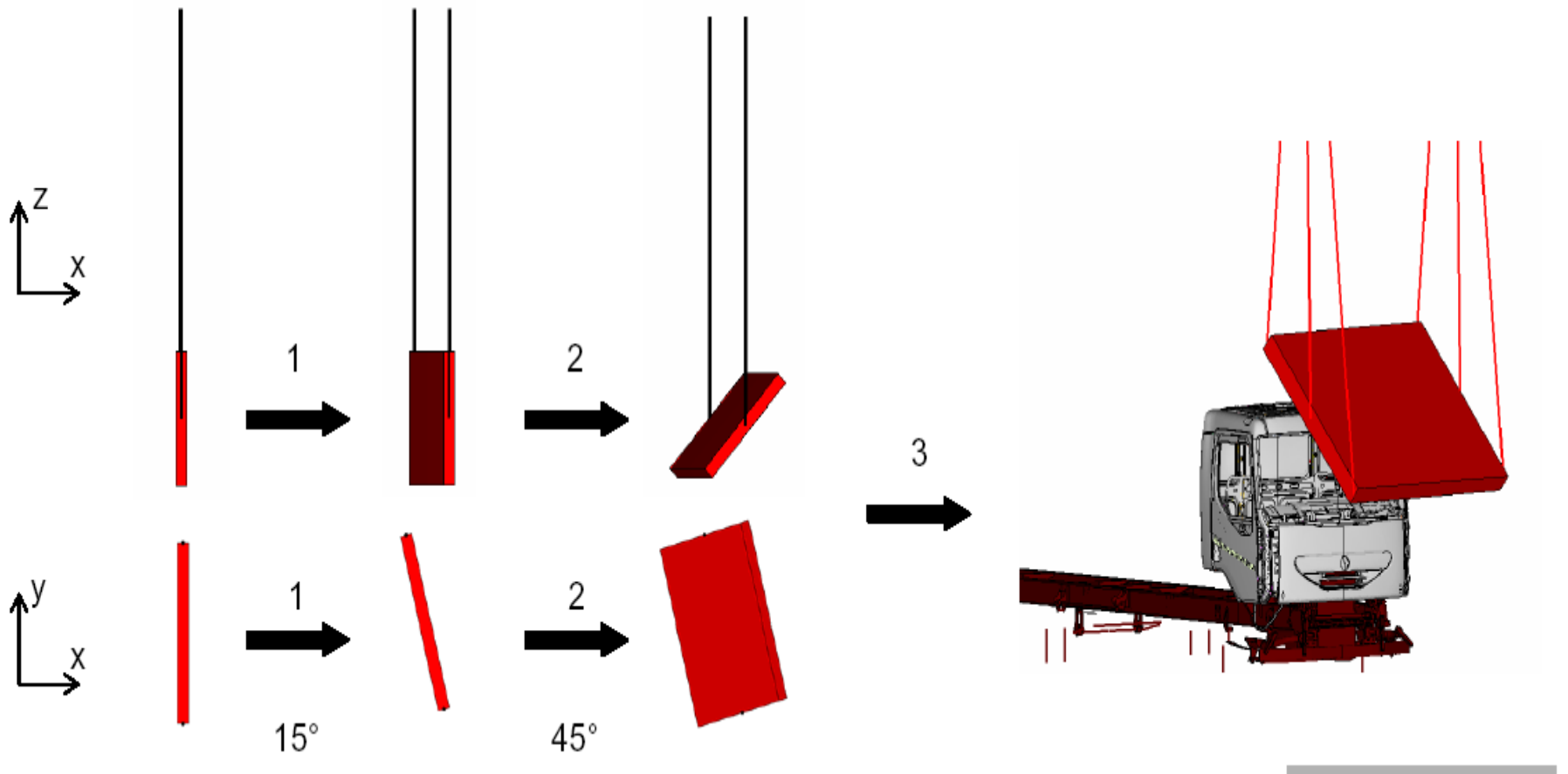


Based on Swedish test, with further improvements:

- Steel pendulum  $\geq 1,000$  kg
- Inclined  $45^\circ$  to vertical,  $15^\circ$  in horizontal XZ plane
- Impact direction:  $15^\circ$  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  $\geq$  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**