EXPLANATORY PRESENTATION TO CLEPA NECK LOAD LIMITS PROPOSAL

Submitted by the experts from CLEPA

68th session of GRSP, 07 - 11th December 2020
BACKGROUND

• ECE/TRANS/WP.29/GRSP/2019/19 proposed chest vertical acceleration limits for Q0, Q1 and Q1.5 dummies
  – Justification was potential for increased neck loading in rear-facing CRS with a supine seating position
  – R129 requires **tensile neck force** and **flexion moment** to be measured for monitoring only

• GRSP deferred discussion to allow analysis of neck loads collected during R129 type-approvals
  – Data provided by **UK(VCA), Spain** and **CLEPA**
ANALYSIS METHOD

Overview

1. UK, Spain and CLEPA samples combined: 49 CRS = 471 tests
2. Data separated for each dummy by impact direction and CRS orientation
3. Worst-case condition identified for each dummy
4. Statistical analyses carried out (95th percentile; Mean+2SD)
5. Limits proposed based on statistical analyses and outliers
ANALYSIS METHOD

Caveats

• SAE J211 sign convention may not have been used in all tests in VCA sample (especially flexion moment)

• Timing of peak value is unknown and may have been generated in rebound (especially flexion moment)

• UK, Spain and CLEPA samples may not be representative of the wider CRS market

• Any limits are pragmatic and their relationship to real-world injury risk is unknown
**PROPOSAL**

**Tensile neck force**

<table>
<thead>
<tr>
<th>Dummy</th>
<th>95th %ile</th>
<th>Mean + (2*SD)</th>
<th>Limit proposal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q0</td>
<td>720</td>
<td>670</td>
<td>[700] N</td>
</tr>
<tr>
<td>Q1</td>
<td>905</td>
<td>1018</td>
<td>[950] N</td>
</tr>
<tr>
<td>Q1.5</td>
<td>2,122</td>
<td>2,443</td>
<td>[2,300] N</td>
</tr>
</tbody>
</table>

With upper outliers removed*:

| Q1.5  | 1,931     | 2,261         | [2,000] N      |

* CLEPA-Japan discussion – 26.11.20
# PROPOSAL

## Neck flexion moment

<table>
<thead>
<tr>
<th>Dummy</th>
<th>95^{th} \text{ %ile}</th>
<th>Mean + (2*SD)</th>
<th>Limit proposal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q0*</td>
<td>13.0</td>
<td>10.8</td>
<td>[10] Nm</td>
</tr>
<tr>
<td></td>
<td>8.7</td>
<td>8.8</td>
<td></td>
</tr>
<tr>
<td>Q1</td>
<td>23.7</td>
<td>23.3</td>
<td>[20] Nm</td>
</tr>
<tr>
<td>Q1.5</td>
<td>28.3</td>
<td>29.5</td>
<td>[30] Nm</td>
</tr>
</tbody>
</table>

* Worst-case is unclear for Q0 dummy

![Graph showing mean and limit proposal for neck flexion moment](image)

- **Q0**
  - Mean: 13.0 Nm
  - Proposal Limit: 10 Nm

- **Q1**
  - Mean: 23.7 Nm
  - Proposal Limit: 20 Nm

- **Q1.5**
  - Mean: 28.3 Nm
  - Proposal Limit: 30 Nm

- **n** values: 86, 71, 62, 54
• The analysis and limits presented here are work-in-progress based on samples from UK, Spain and CLEPA only (49 CRS)

• Can other Contracting Parties provide their anonymised monitoring data to support our analysis and confirm the proposed limits?

• CLEPA proposes to defer a decision until May 2021 with the understanding that further monitoring data will be provided
MANY THANKS FOR YOUR ATTENTION

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