

A young child with light brown hair is seated in a grey car seat, smiling and looking out the window. The car seat has a grey patterned fabric and a black harness with a red buckle. A small rainbow-colored object is visible on the seat's surface.

Lower tether anchorages Status of the development of a standard

F.Bendjellal on behalf of ISO LTA task force

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What lower tethers and their anchorages are?

» Lower tether (LT):

Type of anti-rotation device intended to limit the rearward rotation of a rearward-facing CRS.

It usually comprises a tether strap or other hardware attached near the back or base of the CRS that connects to a lower tether anchorage. It incorporates a device to enable it to be connected to such an anchorage.



Figure 1 - RWF CRS using lower tethers

» Lower tether anchorage (LTA):

An anchorage located on the vehicle floor (on the seat track or in the vicinity of the seat track) to which a lower tether can be attached.



Figure 2 - Example of LTA's

ISO Resolutions regarding Lower tether anchorages

» Resolution 344 – Project lead

With reference to WG 2 resolution 336, and noting that the work on LTA was now registered as a preliminary work item, WG 2 confirmed Farid Bendjellal to lead the work on this part.

Experts interested in participating in the LTA work are asked to contact the WG 2 secretary (peter.claeson@sis.se).

» Resolution 345 – Further work on ISO/WD 13216-4

Reviewing the latest draft (N 1160), WG 2 agreed with the general approach for the specifications. The following items are suggested for the next version:

- Review the introduction to explain the objectives;
- Further work is needed to determine the reference point of the LTA zones. Preferably we should apply an established method (e.g. the determination of the support leg zone in UN R129);
- The LTA zones proposed (Figures 1, 2a and 2b) should be checked by vehicle manufacturers within WG 2. Feedback should be sent to Farid Bendjellal (farid.bendjellal@britax.com) and the secretary (peter.claeson@sis.se);
- Strength requirements: The method should be further explored, e.g. application of the FMVSS 225, AS/NZ 1754 and ADR standards used for top tether strength testing;
- A test run by Britax (rear impact UN R44 with P6, no rebound bar) suggests that we may need to raise the strength requirements;
- Visibility, marking, easy access and potential aggressiveness of anchorages should be considered.

It is intended to hold a WebEx meeting in the near future.

ISO 13216 – Four parts of this standard

ISO 13216-1: Seat bight anchorages and attachments (ISOFIX)

Defines a direct connection between the vehicle structure and a child restraint system. It comprises the configuration of the attachments at the CRS and the anchorages on the vehicle as well as their positioning.

This standard is state of the art and is included in UN ECE R14 (Seat belt anchorages) as well as in both European CRS regulations (UN ECE R44 & UN ECE R129)

ISO 13216-3: Classification of child restraint dimensions and vehicle space

A classification system is provided which makes it possible to assess if a CRS of a specific type fit into a specific vehicle.

This standard is state of the art and is included in UN ECE R16 (Seat belts)

ISO 13216-2: Top tether anchorages and attachments

Complements the ISOFIX requirements with the definition of the anchorages and attachments of the top tether as one of the possible anti-rotation devices to be used with ISOFIX.

This standard is state of the art and is included in UN ECE R14 (Seat belt anchorages) as well as in both European CRS regulations (UN ECE R44 & UN ECE R129)

DRAFT - ISO/WD 13216-4: Lower tether anchorages

Defines anchorages at the vehicle which are specifically designed accommodate lower tethers.

This standard is planned to be included to UN ECE R14 on a voluntary basis to include a consistent standard for lower tether anchorages.

Historical references of lower tethers

- » Rearward facing CRS's are available on the market since the late 1960's. In Scandinavian countries they are mainly used for children up to a age of about 4 years.
- » Most of the larger rearward facing CRS's use lower tethers to secure the CRS in specific situations. This is an attachment method used for more than 40 years for example in Sweden.
- » Lower tethers limit the CRS displacement in case of a rear impact and also minimize the rebound of such a seat in case of a frontal impact.
- » The lower tether anchorages are located in front of the used seating positions and are comparable to the known top tether anchorages.
- » Lower tethers are only an additional installation feature and intended to be used together with the vehicle belt and a support leg.



Figure 3 – Installation of a RWF CRS using lower tethers

Currently used methods to attach lower tethers to the vehicle

- » Some vehicle manufacturers already provide LTA that are mostly located on the rails of the front seat. (Figure 2 on slide 3)
- » Most cars don't provide LTA. In that case the lower tethers are attached to the seatback of the front seat. (Figure 4)
- » There is a potential risk of misuse installations and/or interaction with vehicle components located on (or under) the vehicle seat. (Figure 5)
- » To improve the use of such seats and minimize the potential risks highlighted above a standard to define LTA's is needed.

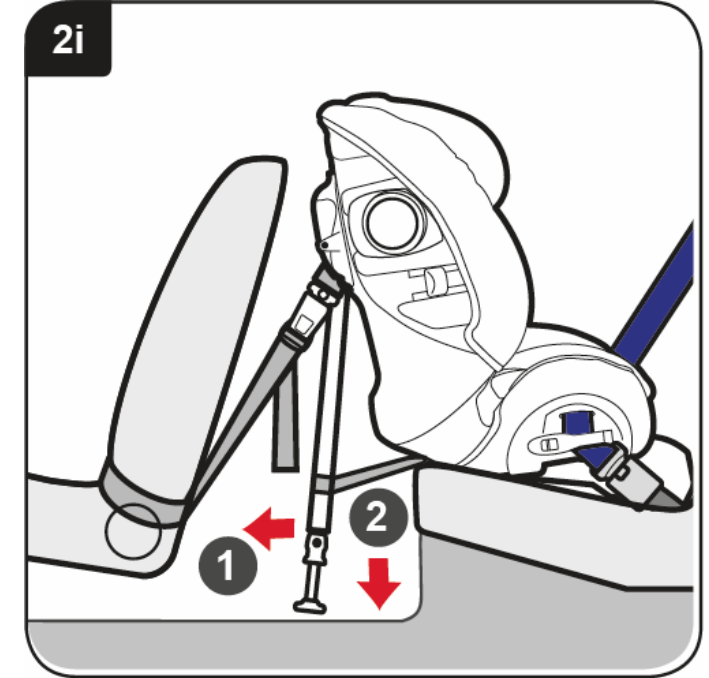


Figure 4 – Example of installation LT's routed through the seat back



Figure 5 – Example for wire routing at a front vehicle seat

Implementing lower tethers & anchorages in regulations R129 & RXX (R14)

1. Starting point: ISO work as described in WD 13216-4 2017

2. In R129 define the lower tethers and how they are attached to the CRS and to the vehicle.

3. In R14 (XX) establish the location of the lower tether anchorages in the vehicle and the corresponding strength requirements.



Video 1 – Example of a rear impact test according to R44 with a RWF CRS using LT's

Positioning of lower tether anchorages ISO/WD 13216-4:2017(E)

» A zone was defined within which the two lower tether anchorages for the respective seating position need to be located in.

■ LTA zone – side view

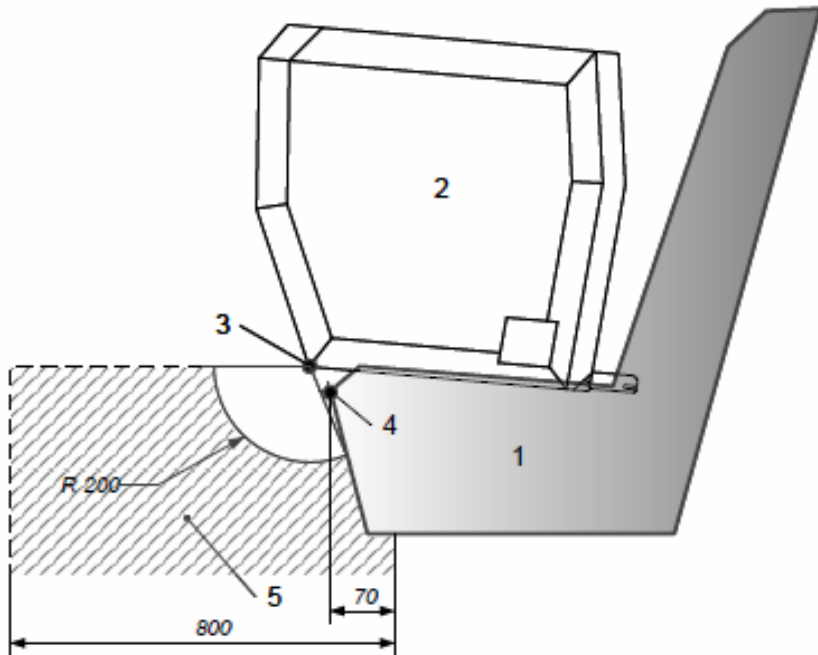


Figure 6 - Front seating position

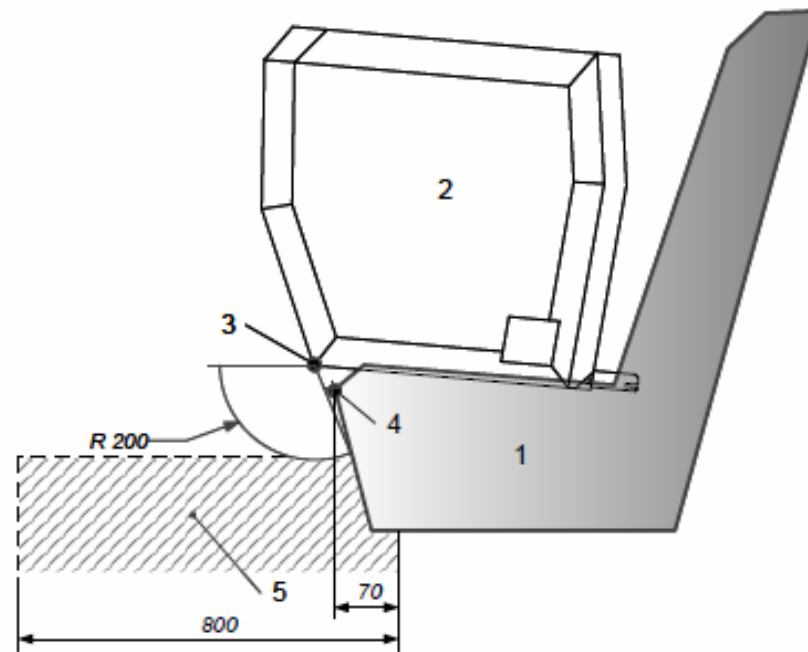


Figure 7 - Rear seating position

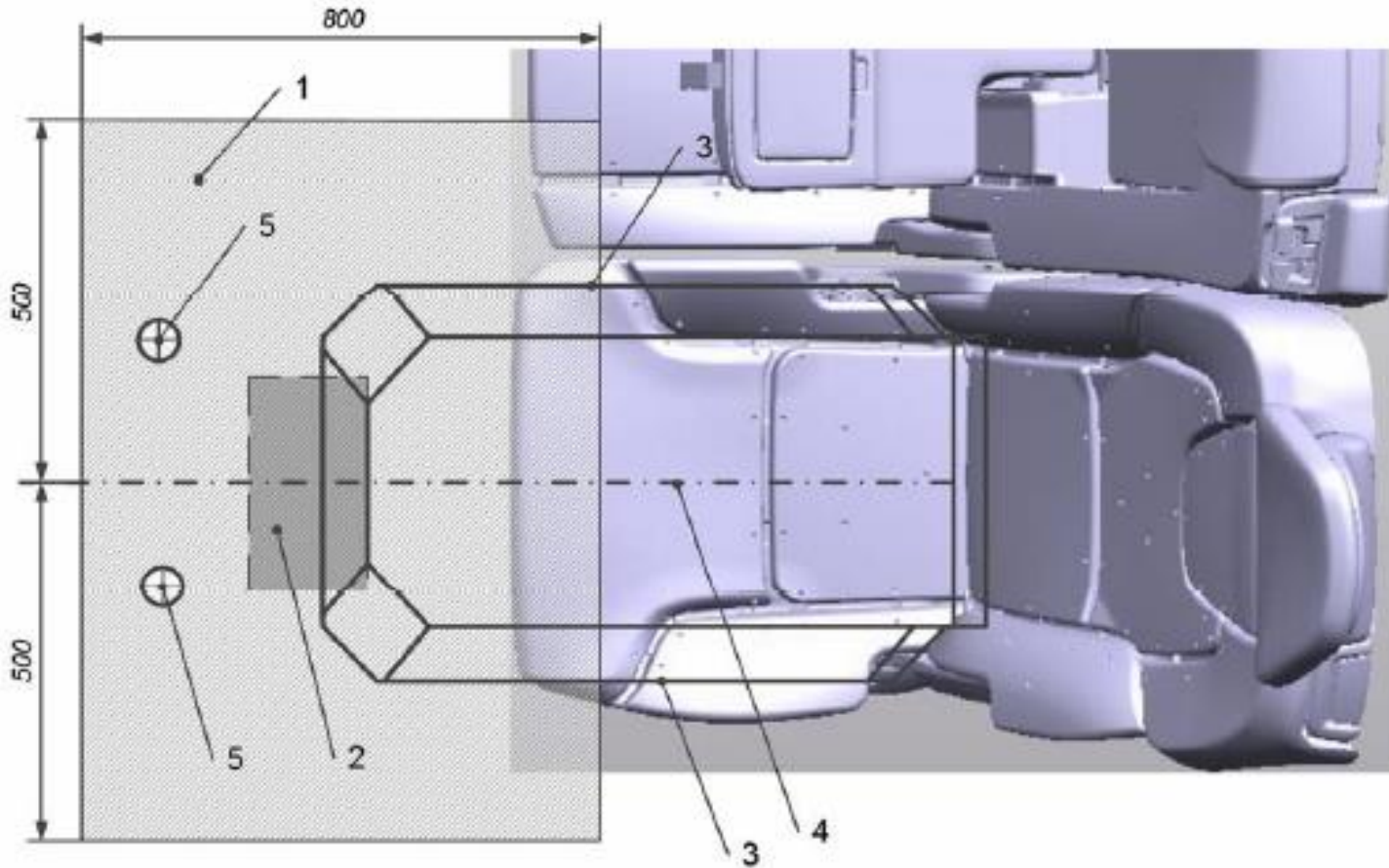
Key

- Vehicle seat
- 1 illustration (seating positions)
- ISO/R2 envelope installed in related vehicle seating position
- 2
- Reference point on ISO/R2 envelope for LTA zone measurements
- 3
- Foremost seat cushion reference point
- 4
- Lower tether anchorage zone in side view, with upper limitation
- 5

All dimensions in mm

Positioning of lower tether anchorages ISO/WD 13216-4:2017(E)

■ LTA zone, top view:



Key

- 1 Lower tether anchorage zone, top view
- 2 Support leg zone (to be avoided)
- 3 ISO/R2 envelope installed in related vehicle seating position
- 4 Centerline of ISO/R2 and ISOFIX anchorage positions
- 5 Lower tether anchorage, example positions

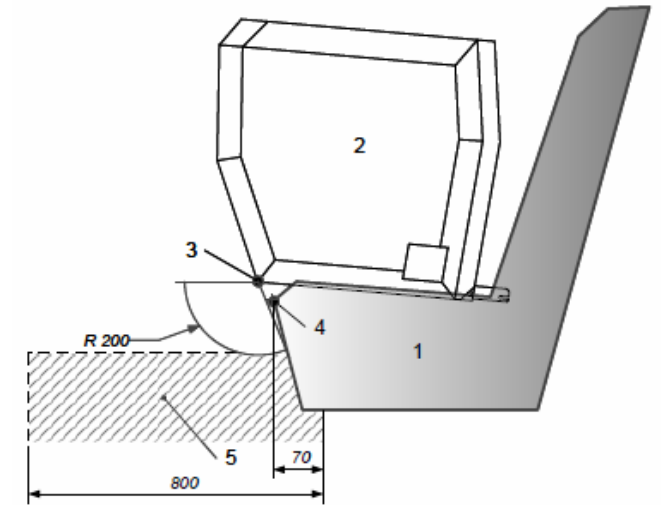
Figure 8 - Front and rear passenger seating position

All dimensions in mm

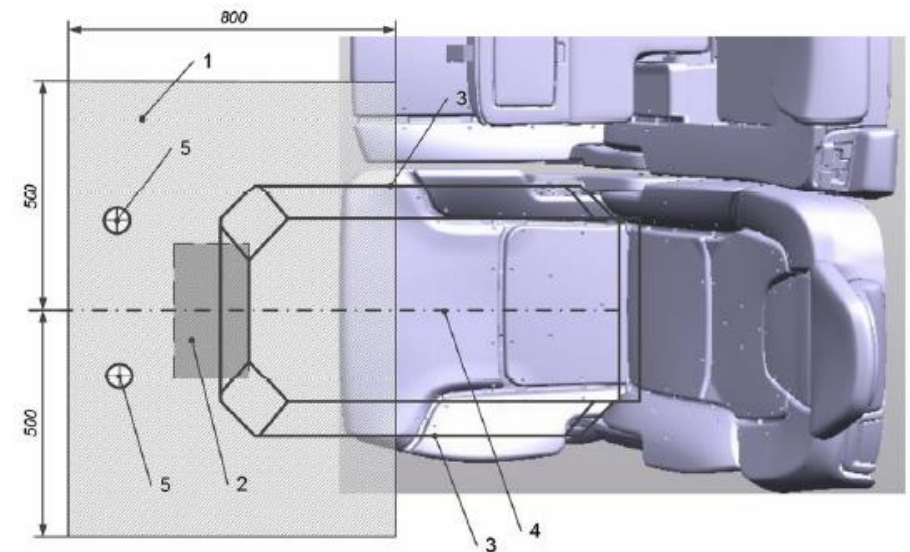
Positioning of lower tether anchorages

Apart from being located in this zone the following specifications also need to be fulfilled:

- » A reference point for measurements is obtained by installing the ISO/R2 envelope (or physical fixture) in the vehicle seat; (Key 3 in upper figure)
- » The distance between both LTA's of the respective seating position shall be at least [280mm].
- » Both LTA's do not need to be positioned symmetrically with respect to the centerline through the envelop/fixture, however:
 - Both LTA's shall not positioned on the same side of the centerline
 - Offset of centerline between the anchorages and the envelope/fixture shall not be more than [200mm]
- » The zone intended for support legs shall not be used for lower tether anchorages. (Key 2 in the lower figure)
- » Lower tethers can interact with vehicle interior, but its function or that of vehicle components shall not be affect.



Rear seating position



Front and rear passenger seating position

Lower tether anchorage dimensions

- » Lower tether anchorages shall have an open and clearance space to allow the attachment of the standard top tether connector (Figure 8, ISO 13216-2)

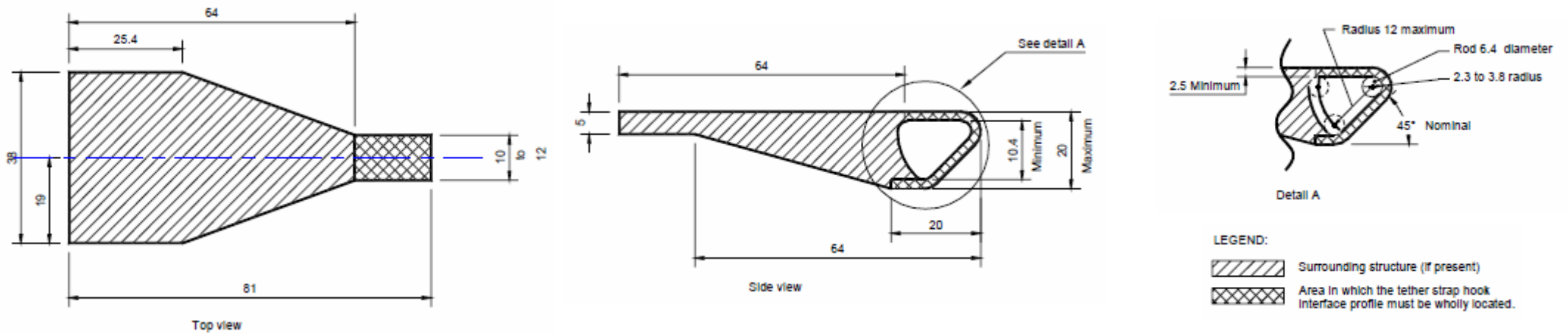


Figure 9 – Top tether connector (hook type) dimensions

- » If a anchorage is intended to be used for two adjacent CRS positions the opening and clearance space shall allow the simultaneous attachment with two standard top tether connectors.

Strength test method

- » All interior components shall be assembled for the test
- » Adjustable seats shall be positioned in a middle position (as defined for...)
- » A force of [2500 N] shall be applied to every LTA by means of a representative lower tether strap
- » To anchorages which are designed to be used for two adjacent CRS positions the double force of [5000 N] shall be applied.
- » The direction of the force is defined through two points:
 - A Force Direction Reference Point (Key 3 in figure 10) including a tolerance of [± 20 mm] in all directions
 - The LTA position (Key 4 in figure 10)
- » The force shall be attained within [30] s with a rate of not more than [135 000] N/s and shall be maintained for at least [1] s.

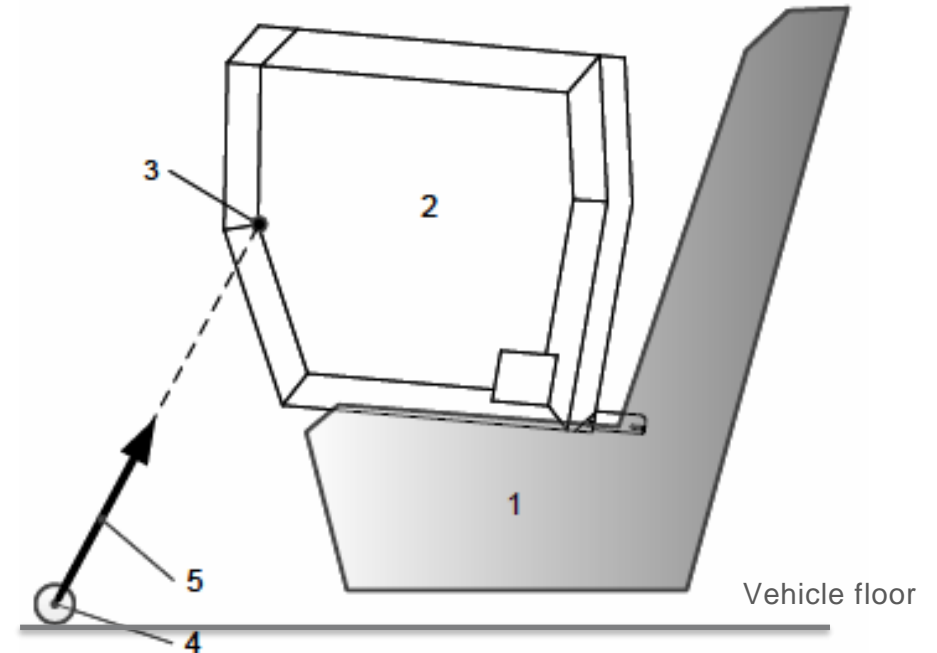


Figure 10 - Test force direction

Key

- 1 Vehicle seat illustration
- 2 ISO/R2 envelope installed in related vehicle seating position
- 3 Force Direction Reference Point (FDRP)
- 4 Example of actual LTA position in vehicle
- 5 Test force direction

Note: Lateral position of FDRP is coincident w centerline of ISO/R2 envelope.

Strength requirements

When tested according to the test method previously described the excursion shall be limited to [XX mm] and permanent deformation including partial rupture or breakage of a lower tether anchorage, or surrounding area shall not constitute failure if the required force is sustained for the specified time.

Next steps

- » Implement definition and requirements for lower tethers in R129-03 series of amendments (ref CLEPA proposal XXX (Okke draft)
- » Implement definition of lower tether anchorages and associated requirements in R14 or [XX] in coordination with car manufacturers