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**EUROPEAN NEW CAR ASSESSMENT PROGRAMME
(Euro NCAP)**

CHILD PROTECTION ASSESSMENT PROTOCOL

Version 1.0c
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CHILD PROTECTION ASSESSMENT PROTOCOL

1. INTRODUCTION

This protocol defines how protection for 1½ year old and 3 year old children is assessed in Euro NCAP, using P Series dummies for dynamic performance. The protocol is not suitable for use with vehicles, where there is no provision for carrying Child Restraints (CRS) in the rear seats.

2. PRECONDITIONS

- 2.1. The CRS must be recommended by the vehicle manufacturer, to their customers, in all 25 countries of the European Union, where the vehicle is sold.
- 2.2. The CRS must be available for purchase by the public, in all 25 countries of the European Union, where the vehicle is sold.
- 2.3. The CRS must be formally approved to UN ECE Regulation 44.03 or later, for the vehicle being assessed.

3. CHILD PROTECTION RATING

The Child Protection Star Rating for the vehicle is based on the total points scored in the assessment as follows:

Points	Star Rating
0	0
1 – 12	1
13 – 24	2
25 – 36	3
37 – 48	4
49 – 60	5

Currently, the maximum number of points that can be awarded is 49. However, if there are further developments, the Star Rating system allows for further points to be awarded in the future.

Points are awarded in the following categories:

The maximum possible score in each category is given in brackets

- 4. Dynamic Assessment **(12 points/CRS)**
 - 4.1. Ejection
 - 4.2. Head Contact with the Vehicle
 - 4.3. Frontal Impact
 - 4.3.1. Head Contact with the CRS
 - 4.3.2. Head Excursion (Forward Facing CRS)
 - 4.3.3. Head Exposure (Rearward Facing CRS)
 - 4.3.4. Neck Tension (Rearward Facing CRS)
 - 4.3.5. Chest
 - 4.4. Side Impact
 - 4.4.1. Head Containment
 - 4.4.2. Head Contact with the CRS

- 5. CRS Based Assessment
 - 5.1. CRS Marking **(4 points/CRS)**
 - 5.1.1. Additional Marking Requirements (ISOFIX CRS)
 - 5.1.2. Additional Marking Requirements (Vehicle Specific CRS)
 - 5.2. CRS to Vehicle Interface **(2 points/CRS)**
 - 5.2.1. Additional Interface Requirements (Universal CRS)
 - 5.2.2. Additional Interface Requirements (ISOFIX and other CRS)

- 6. Vehicle Based Assessment
 - 6.1. Use of CRS on the Front Seat
 - 6.1.1. Airbag Warning Marking **(2 points)**
 - 6.1.2. Airbag Disabling **(3 points)**
 - 6.2. Provision of Three-point Seat Belts **(1 point)**
 - 6.3. Gabarit **(1 point)**
 - 6.4. All Passenger Seats Suitable for Universal CRS **(1 point)**
 - 6.5. ISOFIX
 - 6.5.1. Usability **(1 point)**
 - 6.5.2. Three or More Positions for Universal ISOFIX **(1 point)**
 - 6.5.3. Two or More Positions for Largest ISOFIX **(1 point)**
 - 6.6. Integrated CRS
 - 6.6.1. Two or more integrated CRS **(1 point)**
 - 6.6.2. One or more for Groups I – III **(1 point)**

4. DYNAMIC ASSESSMENT

4.1. Ejection

If the child dummy is ejected or partially ejected from the CRS, that CRS is awarded zero points for its dynamic performance. Otherwise, points are awarded as given below.

4.2. Head Contact with the Vehicle

If there is head contact with any part of the vehicle, the CRS containing that dummy is awarded zero points for its head and neck performance, in that test. Otherwise, points are awarded as given below.

4.3. Frontal Impact

4.3.1. Head Contact with the CRS

Contact is defined by either:

- a) Direct evidence of contact
- b) Peak resultant acceleration > 80 g

In the absence of contact:

- P1½ is awarded 2 points
P3 is awarded 4 points

In the presence of contact, the score is based on the Head Resultant Acceleration, 3 msec exceedence.

P1½	2 points ≤ 72 g,	0 points ≥ 88 g
P3	4 points ≤ 72 g,	0 points ≥ 88 g

Note: Between limit values, a sliding scale will be used, for this and other parameters.

4.3.2. Head Excursion (Forward Facing CRS)

Where possible the maximum forward excursion of the head, relative to the Cr point, is estimated. If the forward excursion cannot be estimated, it will be deemed to be ≤ 549 mm. Otherwise, the points will be based on the following:

P1½	2 points ≤ 549 mm,	0 points ≥ 550 mm
P3	4 points ≤ 549 mm,	0 points ≥ 550 mm

If in future a more precise method of measuring head excursion is developed, a sliding scale may be introduced. Again, in future, consideration may be given to basing the limits on internal geometry of the vehicle.

4.3.3. Head Exposure (Rearward Facing CRS)

Where the following requirements are complied with, the P1½ will be awarded 2 points and the P3 will be awarded 4 points.

- a) No compressive loads shall applied to the top of the head.
- b) The head must remain fully contained within CRS shell, during the forward movement of the dummy (i.e. The top of the head must not be exposed to the possibility of direct contact with parts of the vehicle)

4.3.4. Neck Tension (Rearward Facing CRS)

As a surrogate for neck tension, the score is based on the Head Vertical Acceleration, 3 msec exceedence.

P1½ (only) 2 points \leq 20 g, 0 points \geq 40 g

Note: With the neck transducer now available, forces will be measured directly and may be used in the future.

4,3.5. Chest

The chest score is based on the worst scoring of the two parameters, as detailed below.

Chest resultant acceleration, 3 msec exceedence

P1½ and P3 4 points \leq 41 g, 0 points \geq 55 g

Absolute value of chest vertical acceleration, 3 msec exceedence

P1½ and P3 4 points \leq 23 g, 0 points \geq 30 g

The Overall Dynamic Score for the Frontal Impact =
The worst score from {Head Contact with the CRS
{Head Excursion
{Head Exposure
Plus the score from Neck Tension
Plus the score from Chest

4.4. Side Impact

4.4.1. Head Containment

If the head is not contained within the shell of the CRS, the CRS containing that dummy is awarded zero points. Otherwise, points are awarded as given in 4.4.2. below.

Note: “Contained” requires that some energy absorbing section of the side wing remains between the head and a virtual intruding vertical plane, representing the side structure of the vehicle. There must also be no fracturing of the CRS which might compromise the performance of the side wing of the CRS.

4.4.2. Head Contact with the CRS

Contact is defined by either:

- a) Direct evidence of contact
- b) Peak resultant acceleration > 80 g

In the absence of contact:

P1½ and P3 are awarded 4 points

In the presence of contact, the score is based on the Head Resultant Acceleration, 3 msec exceedence.

P1½ and P3 4 points ≤ 72 g, 0 points ≥ 88 g

5. CRS BASED ASSESSMENT

5.1. CRS Marking

If the markings on the CRS fully comply with the following “CRS Marking Requirements” and the relevant “Additional CRS Marking Requirements,” that CRS will be awarded 4 points. Otherwise it will be awarded zero points.

Where a CRS, or part of a CRS, is approved for use in different configurations, Euro NCAP will assess the marking for each configuration. Points will only be awarded if the requirements are met for all approved configurations.

The CRS markings must fully comply with the following requirements of *UN ECE Regulation 44.03, Revision 1 and amendments 1 to 5*. As these requirements are updated, so consideration will be given to updating the Euro NCAP requirements with the aim of avoiding conflict.

Note: The paragraph numbers below are those of the UN ECE Regulation 44.03 its Amendments and Draft Supplements.

4.3. If the restraint is to be used in combination with an adult safety belt the correct routing of the webbing shall be clearly indicated by means of a drawing permanently attached to the restraint. If the restraint is held in place by the adult safety-belt, the routes of the webbing shall be clearly marked on the product by colour coding. The colours for the safety-belt route to be used when the device is installed forward facing shall be red and when installed rear-facing shall be blue. The same colours shall also be used on the labels on the device that illustrate the methods of use. (*UN ECE Regulation 44.03*)

There must be a clear differentiation between the intended routes for the lap section and the diagonal section of the safety belt. Indication such as colour coding, words, shapes etc. shall distinguish each section of the safety belt. (*UN ECE Regulation 44.03, Amendment 5*)

In any illustration of the belt route on the product, the orientation of the child restraint relative to the vehicle must be clearly indicated. Belt route diagrams that do not show the vehicle seat are not acceptable. (*UN ECE Regulation 44.03, Amendment 5*)

The marking defined in this paragraph shall be visible with the restraint in the vehicle. For group 0 restraints, this marking shall also be visible with the child in the restraint. (*UN ECE Regulation 44.03*)

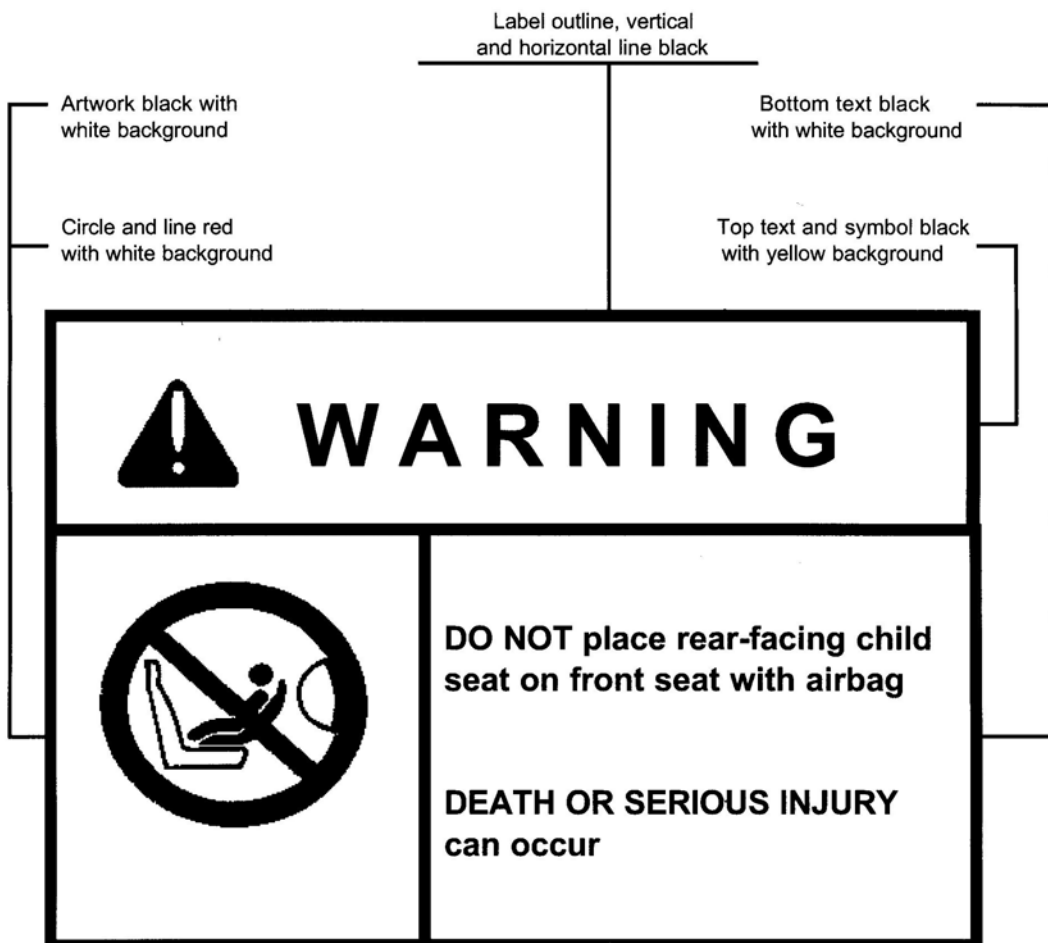
4.4. On the visible inner surface (including the side wing beside the child's head) in the approximate area where the child's head rests within the child restraint, rearward facing restraints shall have the following label permanently attached (the text information shown is a minimum).(*UN ECE Regulation 44.03, Amendments 1 & 5*)

This label shall be provided in the language(s) of the country where the device is sold.

Label minimum size: 60 x 120 mm

The label shall be stitched to the cover around its entire perimeter and/or permanently bonded to the cover over its entire back surface. Any other form of attachment that is permanent and not liable to removal from the product or to becoming obscured is acceptable. Flag type labels are specifically prohibited.

If sections of the restraint or any accessories supplied by the child restraint manufacturer are able to obscure the label an additional label is required. One warning label shall be permanently visible in all situations when the restraint is prepared for use in any configuration.
(UN ECE Regulation 44.03, Amendments 1 & 5)



4.5. In the case of child restraints that can be used forward and rear-facing, include the words:

"IMPORTANT - DO NOT USE FORWARD FACING BEFORE THE CHILD'S WEIGHT EXCEEDS (Refer to instructions)" (*UN ECE Regulation 44.03 & Amendments 1 & 5*)

4.6. In the case of child restraints with alternative belt routes, the alternative load bearing contact points between the child restraint and the adult safety-belt must be permanently marked. This marking shall indicate that it is the alternative belt route, and shall conform with the above coding requirements for forward and rearward facing seats. (*UN ECE Regulation 44.03, Amendments 2 & 5*)

4.7. If the child restraint offers alternative load bearing contact points, the marking required in paragraph 4.3. shall include an indication that the alternative belt route is described in the instructions. (*UN ECE Regulation 44.03, Amendments 2 & 5*)

In addition, Euro NCAP has the following requirements:

- a) The markings must be permanently marked on the CRS.
- b) These markings must be easily visible to a user installing the CRS from either side of the CRS. Any relevant information must be easily visible, at the time an installation action is to be performed.
- c) These markings must show how all the required CRS components are used for each size of child.

5.1.1. Additional Marking Requirements (ISOFIX)

- a) The markings on the CRS, must show how the ISOFIX attachments should be used.
- b) These markings must indicate how the seat should be prepared for installation. This must include information on how the ISOFIX latch system is extended.
- c) These markings must indicate the position, function and meaning of any "tell tales."
- d) These markings must indicate the position and method of use of the "top tether" or other means of limiting CRS rotation.
- e) These markings must indicate how the ISOFIX latch system, top tether or other means of limiting CRS rotation are to be adjusted.

- f) The markings must also meet the requirements for “vehicle specific” child restraints.
- g) For Universal ISOFIX, the markings must indicate the following:
 - That the CRS should only be used on seats provided with a top tether and be approved for use with three point Universal ISOFIX.
 - That use on seats without a top tether should be avoided.
 - That the top tether is an essential part of the restraint system.
- h) For Semi-universal ISOFIX, the markings must indicate the following:
 - That the CRS should only be used in combination with an “anti-rotation device” and be approved for use with an anti-rotation device.
 - Advice on how to use and adjust the anti-rotation device.
 - That the anti-rotation device is an essential part of the restraint system.

5.1.2. Additional Marking Requirements (Vehicle Specific and Semi-universal ISOFIX)

- a) Seats approved as Vehicle Specific or Semi-universal ISOFIX must have the following additional information clearly and permanently displayed on the seat. The content is important, the specific wording of the second and third items is not:
 - Attention: This child seat is only approved for use in certain models of vehicle.
 - A list of suitable models of vehicle is contained in or attached to the instruction manual for the CRS.
 - Information on how to obtain the latest information regarding suitable vehicles. (e.g. web site address, telephone or fax number.)
- b) The vehicle specific list, current at the time of production, must be contained in or attached to the instruction manual for the CRS.
- c) The text must be in at least one of the languages of the country in which the CRS is sold.

5.2. CRS to Vehicle Interface

For the outboard rear seating positions, compatibility is assessed for all combinations of CRS and vehicle adjustment unless they are specifically excluded, as indicated by permanent markings on the seat or on the vehicle. Such markings must be clearly visible to the user installing the CRS. Currently, this assessment does not assess space requirements.

Where there are no compatibility issues, the CRS is awarded two points. Otherwise, zero points are scored.

5.2.1. Additional Interface Requirements (Universal CRS)

Examples of incompatibility:

- a) Adult belt hardware which is loaded in bending, due to the interaction between the buckle and seat belt contact point.
- b) Adult belt geometry where the belt anchorage is forward of the seat belt contact point. This allows excessive forward movement of the CRS, before tension is generated in the adult belt.

5.2.2. Additional Interface Requirements (ISOFIX and other CRS)

Examples of incompatibility:

- a) Inadequate support provided for a leg used to supplement restraint of the CRS.
- b) ISOFIX seats where predictable mis-latching situations are identified. Mis-latching may be related to the ISOFIX interface attachments or any latching between the CRS seat and its mounting frame or support leg.

To avoid mis-latching:

- i) The CRS markings must include instructions to physically check that the latches are engaged e.g. by pulling on the CRS.

and

- ii) A visual tell tale or tell tales must indicate when the latches are correctly locked. The tell tale(s) must be easily visible to a user installing the CRS.

6. VEHICLE BASED ASSESSMENT

6.1. Use of CRS on the Front Seat

6.1.1. Airbag Warning Marking

If the vehicle is fitted with a front seat passenger's frontal protection airbag and an airbag warning marking exists which fully complies with the following requirements, 2 points are awarded to the Child Protection score. If no airbag is fitted to the model variant tested by Euro NCAP but it is available as an option, the assessment will be carried out on a vehicle with the optional airbag fitted. If no airbag is available the 2 points will be awarded to the Child Protection score, irrespective of the presence of a warning label.

- a) The label must contain text and a pictogram warning of the hazard associated with the use of a rearward facing CRS on a seat equipped with a frontal protection airbag. The ISO pictogram is preferred as it should be used on the CRS.
- b) The text must be in at least one of the languages of the country in which the vehicle is sold.
- c) The text must refer to "death and serious injury" as a possible consequence of ignoring the advice.
- d) The label must be of conspicuous design and it must be permanently visible.
- e) The label must be permanently attached to the vehicle but not to the windscreen, which may be replaced during the life of the vehicle.

6.1.2. Airbag Disabling Requirements

If the vehicle is equipped with a system which automatically detects the presence of ANY rearward facing CRS and obviates any risk associated with airbag deployment, 3 points are awarded to the Child Protection score. Such a system must re-activate the airbag when the CRS is removed.

If no front seat passenger's frontal protection airbag is fitted to any variant in the model range, 2 points are awarded to the Child Protection score. If the airbag is optional, the assessment will be based on a vehicle fitted with the optional airbag.

If a front seat passenger's frontal protection airbag is fitted and either of the following requirements is complied with, 2 points are awarded to the Child Protection score.

- a) Dealer disconnect is available
- b) The airbag can be de-activated by a manual or automatic switch meeting the following requirements:
Easily visibly information and warnings must be provided for the driver and front seat passenger, showing the status of the airbag. If the information to indicate that the airbag is enabled is provided by an illuminated signal, the signal is only required to be illuminated for a period of 60 seconds, after the ignition is switched on. Information to indicate that the airbag is “disabled” must be permanently displayed, when the ignition is on.
 - The information must be explicit about the suitability of the seat for use by a child in a rearward facing CRS or for use by an adult.
 - Any text must be in at least one of the languages of the country in which the vehicle is sold.
 - The information provided must be clear, without reference to the vehicle’s handbook or other source.
 - There must be no possibility of the users being given false information.
 - If, with the ignition on and with engine running or not, the switch position can be changed, the system must react correctly to the change.

Note: If “dealer disconnect” is available for a car fitted with a “manual or automatic switch,” the requirements for the switch must also be met for the points to be awarded.

When the technology is generally available to provide “auto-sensing” of any rearward facing CRS the other options will be deleted.

6.2. Provision of Three-point Seat Belts

If all forward or rearward facing passenger seats are equipped with three-point seatbelts, 1 point is awarded to the Child Protection score.

6.3. Gabarit

Where both outboard rear seats, used by a CRS in the crash tests, are in compliance with the following requirements, which are **based on** UN ECE Regulation 16.04, 1 point shall be awarded to the Child Protection score.

- a) With correct routing of the adult seat belt around the Gabarit, the base of the Gabarit shall contact both the forward and rearward parts of the seat cushion upper surface. If such contact does not occur due to the belt

access gap in the Gabarit, this gap may be covered in line with the bottom surface of the Gabarit. (*UN ECE Regulation 16.04, Annex 17, Appendix 1, Paragraph 3.1*)

- b) The lap portion of the belt shall touch the fixture on both sides at the rear of the lap belt path. (*UN ECE Regulation 16.04, Annex 17, Appendix 1, Paragraph 3.2*)
- c) With nothing placed within the adult belt system and with the buckle fastened, it must be possible to establish a tension of at least 50 N in the lap section of the belt by external application of tension in the diagonal section of the belt in the direction of the upper seat belt guide. (*UN ECE Regulation 16.04, Paragraph 8.2.2.5.2.*)

6.4. All Passenger Seats Suitable for Universal CRS

Where the following requirements are complied with, 1 point shall be awarded to the Child Protection score.

- a) The Vehicle Handbook indicates that all the passenger seats are suitable for use with a Group 0 and Group 1 Universal CRS (U). (*UN ECE Regulation 16.04 and Draft Supplement 15, Annex 17, Appendix 3.*)
- b) All passenger seats meet the requirements detailed in the “Gabarit” section 6.3. above.
- c) If an alternative seat, seat-back or safety-belt anchorage adjustment is used for the Gabarit check, information about the alternative position must be included in the Vehicle Handbook table giving the information required in 6.4. a). (*UN ECE Regulation 16.04 and Draft Supplement 15, Annex 17, Appendix 3, Paragraph 3.3*)

6.5. ISOFIX

6.5.1. Usability

Where two passenger seats are in compliance with the following requirements, 1 point shall be awarded to the Child Protection score.

- a) Each seat which is equipped with ISOFIX anchorages must be marked. It must be clear which pairs of ISOFIX anchorages should be used together.
- b) The location of each ISOFIX anchorage must be marked.
- c) The location of each top tether anchorage must be marked.
- d) The markings must include both text and a pictogram.

- e) The markings must be of conspicuous design and both the text and pictogram must have colours which contrast with their background.
- f) The markings must be permanently visible. Flag type labels are not acceptable.
- g) The marking must be permanently attached to the vehicle.
- h) Each ISOFIX anchorage must be equipped with permanent guidance which physically helps the ISOFIX latches to line up with the anchorages.
- i) It must be possible to fit the top tether easily, without having to carry out any preparatory actions on the vehicle other than the **simple** opening of a cover over the top tether anchorage, or adjustment of the head restraint position. For example, it would not be acceptable to have to remove the head restraint.

6.5.2. Three or More Positions for Universal ISOFIX

Where the vehicle is in compliance with the following requirements, 1 point shall be awarded to the Child Protection score.

- a) Three or more passenger seats are suitable for simultaneous use with a Universal ISOFIX CRS, equipped with a top tether.
- b) All these passenger seats meet the requirements detailed in the “ISOFIX Usability” section above.

6.5.3. Two or More Positions for Largest ISOFIX

Where the vehicle is in compliance with the following requirements, 1 point shall be awarded to the Child Protection score.

- a) Two or more passenger seats are suitable for simultaneous use with the largest size of rearward facing (Class C) ISOFIX CRS, Fixture (CRF) ISO/R3. (*UN ECE Regulation 16.04, Draft Supplement 15 and Corrigendum 1 to Draft Supplement 15, Annex 17, Appendix 2, Paragraph 4*)
- b) When checking a CRF on a rear seat, the vehicle seat located in front of this rear seat may be adjusted longitudinally forward but not further than the mid position between its rearmost and foremost positions. The seat backrest angle may also be adjusted, but not to a more upright angle than corresponding to a torso angle of 15 degrees. (*UN ECE Regulation 16.04, Draft Supplement 15, Annex 17, Appendix 2, Paragraph 2.2.*)

8. CONCEPTS AND EXPLANATIONS BEHIND THE ASSESSMENTS

Ejection {4.1.}

Concept: *The child should be held securely in the restraint and not be ejected from the restraint.*

Explanation: *Ejection is an unusual and highly undesirable situation. The idea of “partial ejection” has been included to allow Euro NCAP to deal with situations where the dummy is only partly held within the restraint, such as: by a foot under the impact shield.*

Head Exposure (Rearward Facing CRS) {4.3.3.}

Concept: *The CRS shell must be in a position to provide some energy absorption between the child’s head and an intruding object at all times during the forward excursion of the dummy.*

Head Containment {4.4.1.}

Concept: *The CRS shell must be in a position to provide some energy absorption between the child’s head and an intruding vertical plane striking the seat from the struck side.*

CRS Marking {5.1.}

Concept: *The information provided on the child seat should be sufficient to allow the user to correctly install the restraint. Such information should be clear, always visible to the user and last the life of the seat.*

Concept: *Users of child seats that can be used rearward-facing should be clearly informed and reminded of the risks posed, by a frontal protection air bag, to the occupants of such seats.*

Additional Marking (Vehicle Specific) {5.1.2.}

Concept: *The user of a Vehicle Specific or Semi-universal ISOFIX restraint should be aware of the fact that the seat is only approved for use in a limited number of named vehicles.*

CRS to Vehicle Interface {5.2.}

Concept: *The child seat should be compatible with the methods of fixation in the vehicle recommended by the car manufacturer.*

Airbag Warning Marking {6.1.1.}

Concept: *A warning regarding the hazard posed by a frontal protection air bag to the occupant of a rearward-facing child restraint should be permanently and explicitly marked on the vehicle and be designed to last the lifetime of the vehicle.*

Airbag Disabling Requirements {6.1.2.}

Concept: *The vehicle should make provision for the safe carrying of a child in a rearward facing CRS in the front passenger seat, ideally without additional actions by the installer.*

Concept: *Where a manual switch is used to disable the airbag. Precautions should be taken to ensure that the switch cannot be operated by a child, without the knowledge of the driver.*

Provision of Three-point Seat Belts {6.2}

Concept: *All forward or rearward facing seats should be equipped with a three-point belt.*

Gabarit {6.3}

Concept: *The layout of the adult seat belt should ensure compatibility between the adult seat belt and a Universal CRS.*

All Passenger Seats Suitable for Universal CRS {6.4.}

Concept: *All possible seating positions should be capable of providing a good interface with a conventional Universal child seat, secured by an adult seat belt.*

Usability {6.5.1.}

Concept: *The user of a vehicle equipped with ISOFIX anchorages should be made aware of the existence and location of the anchorages, including any top tether anchorages. There should also be permanent guidance to facilitate the correct installation of the CRS.*

Three or More Positions for Universal ISOFIX {6.5.2.}

Concept: *Vehicles that provide three or more seating positions suitable for a Universal ISOFIX CRS equipped with top tether should be rewarded.*

Two or More Positions for Largest ISOFIX {6.5.3}

Concept: *Vehicles in which at least two ISOFIX positions are capable of accommodating the largest size of rearward-facing ISOFIX CRS should be rewarded.*

Two or More Integrated CRS {7.1.}

Concept: *Vehicles that provide, as standard, two or more integrated restraints should be rewarded.*

One or More Group I-III Integrated CRS {7.2.}

Concept: *Vehicles that offer at least one integrated restraint suitable for all age groups except the youngest children, who use portable restraint systems, should be rewarded.*