

ASSESSMENT PROTOCOL – CHILD OCCUPANT PROTECTION

VERSION 3.0
MAY 2024

**ASEAN NCAP
PROTOCOL**

2026–2030

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Preface

During the test preparation, vehicle manufacturers are encouraged to liaise with the laboratory and to check that they are satisfied with the way cars are set up for testing. Where a manufacturer feels that a particular item should be altered, they should ask the laboratory staff to make any necessary changes. Manufacturers are forbidden from making changes to any parameter that will influence the test, such as dummy positioning, vehicle setting, laboratory environment etc.

It is the responsibility of the test laboratory to ensure that any requested changes satisfy the requirements of ASEAN NCAP. Where a disagreement exists between the laboratory and manufacturer, the ASEAN NCAP secretariat should be informed immediately to pass final judgement. Where the laboratory staff suspect that a manufacturer has interfered with any of the setup, the manufacturer's representatives should be warned that they are not allowed to do so themselves. They should also be informed that if another incident occurs, they will be asked to leave the test site.

Where there is a recurrence of the problem, the manufacturer's representatives will be told to leave the test site and the Secretariat should be immediately informed. Any such incident may be reported by the Secretariat to the manufacturer and the persons concerned may not be allowed to attend further ASEAN NCAP tests.

DISCLAIMER: ASEAN NCAP has taken all reasonable care to ensure that the information published in this protocol is accurate

and reflects the technical decisions taken by the organisation. In the unlikely event that this protocol contains a typographical error or any other inaccuracy, ASEAN NCAP reserves the right to make corrections and determine the assessment and subsequent result of the affected requirement(s).

In addition to the settings specified in this protocol, the following information will be required from the manufacturer of the car being tested in order to facilitate the vehicle preparation. A vehicle handbook should be provided to the test laboratory prior to the assessment.

ASSESSMENT PROTOCOL – CHILD OCCUPANT PROTECTION

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NEW CAR ASSESSMENT PROGRAM FOR SOUTHEAST ASIAN COUNTRIES (ASEAN NCAP)

ASSESSMENT PROTOCOL – CHILD OCCUPANT PROTECTION

1 INTRODUCTION

ASEAN NCAP has performed the child occupant safety assessment since its very first test to ensure that manufacturers take responsibility for the children travelling in their vehicles. Further, ASEAN NCAP has published a child occupant protection rating to provide clearer information for consumers about the results of such tests. In the previous protocol, ASEAN NCAP utilized 18-month-old and 3-year-old sized dummies for assessment. However, there is a proposed modification to the protocol, aiming to transition to the use of 10-year-old and 6-year-old sized dummies. This adjustment is intended to provide a more comprehensive evaluation of impact tests, alongside a thorough examination of the clarity of instructions on the child seat and vehicle, as well as the installation of the seat in the vehicle. The objective is to ensure the safe and secure fitting of the child seat in accordance with updated standards.

Since 2017, ASEAN NCAP has required the availability of child seats in at least 3 ASEAN markets. In 2023, the assessment of child safety installation was expanded to improve the ‘CRS reference list’ by adding Vietnam to the current 3 ASEAN countries. This expansion reflects a commitment to enhancing

child safety measures and evaluating the effectiveness of child seat installations in an extended regional context. The assessment now considers the vehicle's ability to safely and correctly accommodate CRS range available in ASEAN market. Manufacturer-recommended child seats must score installation assessment points within the range of performance of the reference list, which is published on ASEAN NCAP's website and undergoes review every 2 years.

This protocol contains several references to i-Size seating positions. Vehicles may qualify for any i-Size related rewards provided the relevant i-Size specifications detailed in Regulation UNECE129 are met. Also, UNECE14 and 16, and UNECE94 are considered further in this protocol.

2 CHILD PROTECTION ASSESSMENT

This protocol shall define how protection for children is assessed in ASEAN NCAP. There are four areas of Child Protection that are assessed; the requirements for each are detailed in the following sections. All contribute to the overall child protection rating, and the assessments are:

- Installation of child restraints (Section 3)
- Dynamic performance (Section 4)
- Vehicle based assessments (Section 5)
- CPD (Section 6)

A number of child seats available in the 4 ASEAN countries will be used to assess vehicle to CRS compatibility by preferably using the ASEAN NCAP Manikin representing 6-year-old (105

-135cm) and 10-year-old (≈ 135 cm). If the ASEAN NCAP Manikins are not available, it is allowed to use Q6, Q10 or equivalent.

Child dummy response data will be recorded in the frontal impact and side impact tests. Two Q series crash dummies, representing a 6-year-old and 10-year-old child are placed in CRS recommended by the vehicle manufacturer. The dynamic assessment remains focused on head, neck and chest only.

During a post-crash vehicle inspection, the car will be assessed on aspects such as labelling, airbag disabling, ISOFIX usability, i-Size readiness and more. The protocol applies to all classes of vehicles currently assessed by ASEAN NCAP, including vehicles where there is no rear bench or where there is limited space for carrying CRS on the rear seats.

Child Presence Detection (CPD) assessment has been divided into two methods. The 1st method is the door logic (indirect sensing) assessment. The 2nd method is the direct sensing child detection where the vehicle needs to detect sleeping baby in the vehicle. CPD doll will be used to represent the sleeping baby's condition.

The scores achieved in the four main categories (fitment of CRS, dynamic performance, vehicle-based assessments and CPD) are combined to calculate the total Child Occupant Protection Score.

Cars with limited or no rear space such as two-seaters do not

allow a typical dynamic assessment using dummies in the rear. For these classes of vehicles, special provisions have been made to the protocol.

2.1 Manufacturer's Recommendation

The principle behind the Child Occupant Protection assessment is that children should be as equally well protected as adults in the event of a crash. The overall responsibility of the vehicle manufacturer is reflected in the recommendation that the vehicle manufacturer must make regarding the CRS to be used in the full-scale tests at the start of the process.

2.1.1 The vehicle manufacturer must recommend two CRS to be used in dynamic assessments. Of those two recommended seats, vehicle manufacturers recommend suitable CRS for each weight group and/or size range. The compatibility of the recommended CRS with the vehicle will be separately assessed as part of the installation check. In order to be used in the dynamic tests, both CRS must meet the installation requirements detailed in Section 3 on the two rear outboard seating positions.

2.1.2 The vehicle manufacturer is given the choice to choose appropriate seats from the CRS reference list of pre-selected seats used for the installation check (see Section 3.2), using the installation mode identified on the list. Alternatively, the vehicle manufacturer may recommend different seats, as long as their performance is in the same range as those on the reference list. In both cases, the following preconditions must be met for the manufacturer-recommended CRS to be accepted:

2.1.3 The CRS must be recommended by the vehicle manufacturer, to their customers, in all countries that cover ASEAN NCAP, where the vehicle is sold.

2.1.4 Where the recommended CRS are not on the “CRS reference list”, the CRS must be available for purchase by the public.

2.1.5 For CRS recommended by the vehicle manufacturer not on the “CRS reference list”, it is the vehicle manufacturer’s responsibility to provide the sources to sponsor the recommended CRS in an ASEAN NCAP test in order to demonstrate acceptable performance.

2.1.6 Where there is an ‘OEM rebranded’ CRS covering for 6-year-old and one for 10-year-old children readily available in the market, the said CRS will be used in the dynamic tests. The ‘OEM rebranded’ CRS will be used even if they are offered as accessories equipment. In an unavoidable circumstance, the manufacturer shall submit application to ASEAN NCAP with supporting documents for exemption approval.

2.1.7 Recommendation of ‘OEM rebranded’ CRS that are already on the reference list can be accepted with evidence that the rebranded seat will score in the same level of the listed seats. Information will be added to the results to highlight the equivalency between original references listed seat and ‘OEM rebranded’ seats to the consumer.

2.1.8 Where a vehicle is equipped with an integrated seat(s) covering 6-year-old and one for 10-year-old children on the rear outboard test positions, the integrated seat will be used in the dynamic tests. Integrated seats will be used even if they are optional equipment.

2.1.9 Where a vehicle is equipped with only one integrated restraint on either outboard position covering both or only one of two child ages, the integrated seat will be used only where applicable. An alternative installable CRS must be recommended for the case where the integrated seat is not suitable for the age of the dummy of choice.

2.1.10 Where no appropriate recommendation is provided, for example where the requirements of Section 3 are not met, ASEAN NCAP will select possible seats from the “CRS reference list” or any CRS determined by ASEAN NCAP. Additional preconditions exist for vehicles equipped with two seats or have limited space in the rear. Refer to Section 7 for further details.

3 INSTALLATION OF CHILD RESTRAINT

ASEAN NCAP rewards vehicles that can accommodate a broad variety of child seats available in the ASEAN NCAP market. For this purpose, a limited number of child seats available in the ASEAN markets are installed in the vehicle. All CRS selected for the ASEAN NCAP CRS reference list are available in at least 4 ASEAN countries when they were selected. The groups and recommended installation modes of the CRS selected to

represent those available in the 4 big markets, including some universal and semi-universal seats. This “reference list” of CRS, and how it is compiled and updated is explained in Section 3.2.5 below.

3.1 Reference List and Recommended Seats

3.1.1 The child seats on the “CRS Reference List” are detailed in ANNEX 1. This list contains child seats available in the 4 big markets. The list will be checked on a regular basis to confirm availability to consumers. ASEAN NCAP does not assess or rate the child seats individually.

3.1.2 All CRS on the “CRS Reference List” will be considered for installation in the vehicle. Where the vehicle manufacturer has recommended CRS for dynamic testing that are not on the above list, these will also be included in the fitment assessment using the installation mode used in dynamic testing. The preconditions for acceptance of CRS are listed in Section 3.2.5.

3.1.3 In addition to the above, selected seats available in the 4 big markets that were accepted to be used, its fitment assessment results will also be published. Placing these added seats on the “CRS Reference List” is exclusively done at the request of the sponsor at the time of nomination of the vehicle and does not contribute toward the score. This is for information only.

3.1.4 To be eligible for assessment and scoring, all semi-Universal and vehicle specific CRS on the “CRS Reference List” must be detailed on the approved vehicle list. Where this is not

the case, no award will be given for CRS installation of these seats. Exemptions are based solely on the information in the vehicle handbook. Information in other documents, such as the CRS approved vehicle list, will not be considered.

3.2 Installation Matrix

3.2.1 The score for Installation of Child Seats is based on the CRS from the full CRS Reference List that can be successfully installed in the vehicle considering all eligible seating positions. Hence, before the assessment starts, the total number of passenger seating positions in the vehicle must be identified including 1st, 2nd and 3rd row if available. Where a vehicle is available with an optional 3rd row on any variant, the installation assessment will be based on a vehicle fitted with the optional seats.

3.2.2 Provided that the CRS can be placed in the vehicle without problems (Section 3.3.1), each CRS on the CRS Reference List (including those recommended by the vehicle manufacturer) will be fitted on each seating position, using the installation modes identified in ANNEX 1. Semi-universal CRSs for which the car model is not identified on the CRS Reference List at the time of the one-to-one meeting will be included in the assessment but are not eligible for scoring (Section 3.1.4).

3.2.3 In an unavoidable circumstance, manufacturer shall submit the application to ASEAN NCAP with supporting documents for exemption approval regarding any seating position or CRS combination. Subsequently, all approved exemptions must be

clearly stated in the vehicle handbook.

3.2.4 Applying the above, the installation matrix is defined as shown in Table 1.

3.2.5 In practice, for the purpose of assessing the vehicle to child seat compatibility, it may not be necessary to verify each eligible CRS-seating position combination. For example, where for a given passenger seating position an integrated CRS is available (optional or standard fit), no installation check is required with the CRS of the age group covered by the integrated CRS.

Table 1: CRS Reference List

| CRS Installation Assessment | | | | | |
|-----------------------------|-------------|---------------------------------|--|-----------|-----------|
| Reference List | Category | CRS | | Direction | Interface |
| | <85cm | Joie i-Gemm 3 | | Rwd | B _ _ _ |
| | <85cm | Joie i-Gemm 3 + Joie i-base 2 | | Rwd | _ I L _ |
| | 40-105 cm | Joie Steadi | | Rwd | B _ _ _ |
| | 76-105 cm | Joie Steadi | | Fwd | B _ _ _ |
| | 76-150 cm | Joie Elevate | | Fwd | B _ _ _ |
| | 40-105 cm | Nuna Todl Next + Nuna Base Next | | Rwd / Fwd | _ I L _ |
| | 40-105 cm | Recaro Salia | | Rwd / Fwd | _ I L _ |
| | 40-105 cm | Chicco Seat 3 Fit i-Size Air | | Rwd / Fwd | _ I L _ |
| | 40-125 cm | Joie i-Spin Grow | | Rwd / Fwd | _ I _ S |
| | 100-150 cm | Cozy N Safe Augusta i-Size | | Fwd | B I _ _ |
| | 100-150 cm | Recaro Mako Elite 2 | | Fwd | B I _ _ |
| OEM | <85 cm | XXXX | | | |
| | 76 - 105 cm | XXXX | | | |
| | Q 6 | XXXX | | | |
| | Q 10 | XXXX | | | |

B = Belted, I = ISOFIX, L = Support leg, S = Strap/Top-tether

3.3 Assessment of Problem-Free Installation & Requirements for all CRS

All combinations of CRS and vehicle seat position will be subsequently checked by installing the CRSs on all seating positions. If any outboard seating positions are identical (adult belts, anchorages, etc) then installation may be performed on one side only, all other positions will be assessed. Where there is any asymmetry in a vehicle, including sliding doors, B-pillar position etc. then all seating positions must be assessed individually.

CRS that use more than one installation mode or are equipped with anti-rotation devices must meet the requirements of all applicable sections for a successful installation. For example, a CRS using the adult belt AND ISOFIX must meet the full requirements of both Sections 3.4 and 3.5 for a successful installation. A CRS that uses the adult belt AND a support leg must meet the full requirements of Section 3.4 and Section 3.6.

The vehicle seating position is compatible with the CRS fitted as long as the following conditions are met:

3.3.1 Ease of installation in car

This assessment is of the vehicle's ability to allow for easy installation of a range of different CRS by evaluating its provision of sufficient space and access. This does not include fastening the CRS to the vehicle, only positioning on the rear or front seat in preparation for fastening.

3.3.1.1 Initial vehicle settings

Installations on the rear seat:

- The front row seats shall initially be set in the ASEAN NCAP Frontal ODB impact test position unless clearly instructed otherwise in the vehicle handbook.
- If the vehicle has only 3 doors, then it is acceptable to utilise any ‘easy entry’ function to move the front seat forward and allow access to the rear seats.
- Vehicles with adjustable rear seats shall have the seat back angle and fore/aft set to the mid in-use position and are to be used, unless clearly instructed otherwise in the vehicle handbook. The flat folded position of a seat is not considered as an in-use position. If the mid position cannot be obtained due to notched adjustments, the next most vertical position for the seat back or the next rearward position for fore/aft shall be used.
- Head restraints shall be in the lowest/not in use position, unless clearly instructed otherwise in the vehicle handbook.
- Movable arm rests shall be set to the position recommended in the vehicle handbook. Where there is no recommendation, they shall be positioned so as not to interfere with the CRS installation.
- Where the front seat interacts with the steering wheel, for example with easy entry functions, the steering wheel shall be set to mid/mid.

Installations on the front seat:

- The front seat(s) shall initially be set in the ASEAN NCAP Frontal ODB impact test position unless instructed otherwise

in the vehicle handbook.

- The front seat adjustments shall remain the same for all further assessments. Where the vehicle handbook contains details of alternative front seat positions for individual CRS, this alternative position will be used.
- Head restraints shall be in the lowest position, unless clearly instructed otherwise in the vehicle handbook.
- Movable arm rests shall be set to the not in use position or fully vertical.

3.3.1.2 CRS placement

Procedure:

- Where necessary, ready the CRS for installation by lengthening straps and top-tethers so they are accessible once the CRS is in place.
- Pass the CRS through the nearest occupant entry door. Vehicles with moveable roofs shall have the roof closed during this assessment. No other access routes shall be used, such as the rear hatch/boot.
- If the CRS cannot be easily placed in the vehicle due to the position of the front seat, adjust the front seat to allow CRS placement. Following this, the front seat should then be repositioned back to the handbook/initial position.
- For CRSs that allow the child to be carried in the seat the orientation of the CRS may be changed by up to 40 degrees about its axes (x, y,) is acceptable to enable the CRS to fit into the vehicle. For CRSs that are not intended as carry-cots then any orientation may be used to place the CRS in the vehicle.
- Where the CRS contains multiple parts, e.g. base and seat,

then both items may be installed sequentially and assessed in the same way.

- For CRS that do not allow installation with the child in the CRS, there must be sufficient space within the vehicle to allow an adult to place and child in the CRS. This will be assessed using the appropriate size child dummy.

The vehicle meets the requirements if all of the following are met:

- The CRS can be placed on the rear seats without excessive force, difficulty or interaction with the door aperture.
- After adjustment of the front seat, it does not prevent or interfere with correct placement of the CRS. An easy entry function may be used.
- Where applicable, the easy entry function allows the front seat to return and lock in the same seating position after placement of the CRS. If the easy entry function does not return the front seat to the position mentioned in the handbook, it will be adjusted to and assessed in the handbook position.
- If there is sufficient space within the vehicle for a child to be correctly placed in the CRS and the child is not prevented from sitting normally in the CRS.

The vehicle would not meet the requirements if any of the following occur:

- The child seat or base does not individually fit through the door aperture.
- The CRS cannot be placed in the vehicle.
- The CRS must be rotated more than the permissible amount

to enable placement or where applicable.

- An easy entry system does not allow the front seat to return and lock in the position detailed in the handbook.
- Vehicle structures prevent a child from being placed correctly in the CRS.
- There is insufficient space within the vehicle to allow the child to occupy the CRS as normal.

3.4 Requirements for seat belt mounted CRSs

3.4.1 Use of 3-point belts

3.4.1.1 Ease of fastening seatbelt

Procedure:

- Once placed in the vehicle, the CRS shall be positioned along the centreline of the chosen seating position.
- Route the adult seatbelt around the CRS in accordance with the instructions on the CRS.
- Engage the buckle tongue into the buckle.
- If necessary, some small movement of the CRS is permitted to expose the seat belt buckle. This is limited to rotation of up to 20 degrees about the x and z-axes or 50 mm lateral movement from the seat centreline.
- For CRS that are not equipped with integral harnesses, an **appropriate size manikin** (ANNEX II) shall be placed in the CRS during this procedure.
- The preferable manikin to use are C6 & C10 manikin, however, in the event that these are unavailable, the Q6 or

Q10 dummy, or equivalent may be used as an alternative.

The vehicle meets the requirements if all of the following are met:

- The tongue can be engaged in the buckle with the use of only one hand and without the need to reposition the CRS to enable access to the buckle, or the tongue can be engaged using two hands to insert the buckle, where one supports the buckle, and the other is used to insert the tongue.
- The adult seat belt adjacent to the assessed seating position does not prevent installation of the CRS or lead to any instability. In the case of centre seat, both left and right adult seat belt must be considered.
- With the CRS installed, the three-point belt on adjacent seating position in that same row, should be capable of restraining another adult occupant. In the case of centre seat, both left and right three-point belt must be considered.

The vehicle would not meet the requirements if any of the following occur:

- The belt cannot be buckled due to insufficient belt length.
- The belt length is such that the CRS is not in the correct position on the seat.
- The CRS has to be moved or rotated more than prescribed above to allow access to the buckle, e.g. the buckle is positioned underneath the CRS.
- The installation of the CRS prohibits two adult occupants from occupying adjacent seating positions, such as due to limited space or interference with the adult belt system.

3.4.1.2 Ease of tightening belt (Ease of operating the lock-off clip)

This assessment is of the vehicle's ability to be able to correctly restrain the CRS using the adult belt systems.

Procedure:

- With the seat belt buckled and the belt routed correctly around the CRS, tension shall be introduced into the adult seatbelt by pulling on the diagonal section of the belt in the direction of the reel.
- Tension in the lap section is established by pulling the diagonal section of the belt with no more than 150 N force. The tension shall be applied to the diagonal part of the belt before it passes through any upper belt guide or lock off.
- Seatbelt load cells will be required for this installation.
- For seats that do not have an integral harness, a child dummy of the appropriate size shall be placed in the CRS during this process.

The vehicle meets the requirements if all of the following are met:

- When 150N is applied to the diagonal section of the adult belt, the slack in all parts of the lap section is removed.
- The CRS is held firmly against the seat back and seat base by the adult belt.
- Any movement of the CRS base or back must result in increasing tension within the belt system, e.g. with forward movement of the CRS. The belt reel shall be prevented from spooling out during this check.
- Where applicable, the seat belt must restrain the dummy and

the seat correctly.

The vehicle would not meet the requirements if any of the following occur:

- When slack has been removed from the belt system, the buckle tongue stops interfere with the belt lock off.
- It is not possible to remove the slack in any part of the lap section.

3.4.2 Additional tethers and/or support leg

Where the chosen CRS is equipped with an additional tether or support leg apply the relevant assessment outlined in Section 3.6 before moving on to the next section.

3.4.3 Obstruction & Stability of the CRS

Procedure:

- The CRS shall be installed in the vehicle with the seat belt buckled and any tethers or support legs attached as per the previous steps. The largest appropriate manikin shall also be installed in the CRS.
- Any comfort adjustments on the CRS shall be changed e.g. incline, recline etc.
- Check any contact points between the CRS, dummy and vehicle.
- The CRS shall be rocked from side to side about the x axis over a 10° to 15° arc. No other restraint shall be placed on the CRS during rocking.
- The CRS shall be pulled toward the front of the vehicle and twisted about the z axis.

- The CRS shall be returned to the initial position with the belt tightened as per Section 3.4.1.2 and a force of 100N shall be applied perpendicular to the CRS in the Y direction at the shoulder level of the dummy. This assessment will not be applied to the baby carrier (<85 cm) CRS.
- The CRS shall be returned to the initial position with the belt tightened as per Section 3.4.1.2 and a force of 100 N shall be applied perpendicular to the CRS in the y direction at a small distance above the vehicle seat. This assessment will not be applied to the baby carrier (<85 cm) CRS.

The vehicle meets the requirements if all of the following are met:

- The vehicle interior can accommodate installation of the CRS in all orientations and adjustments without interaction with other parts of the vehicle. E.g. booster seats with adjustable head restraints must not be restricted by the rear head restraints or C-pillars.
- The presence of head restraints does not prevent correct installation of the CRS and does not lead to significant forward rotation of the CRS or create lateral instability.
- Contact between the CRS and vehicle interior is permitted provided that the CRS is correctly installed, stable and is not rotated by more than 5 degrees.
- The measured backrest angle of the CRS does not exceed 90 degrees. This can be measured using the device described in ANNEX II.
- The vehicle interior provides stable support for the CRS in the selected installation modes and adjustments. E.g. the CRS back or base tensioning system must be in contact with the

vehicle seat base and seat back cushions.

- The CRS sits flat on the seat base cushion and, for forward facing CRS, is supported by the seat back and/or head restraint.
- With the load applied to the CRS the rotation about the X axis does not exceed 20 degrees and the CRS remains secured and tends to return back to the original position.
- As any load is applied, the tension in the belt system increases with the displacement of the CRS.

The vehicle would not meet the requirements if any of the following occur:

- The CRS does not sit correctly on the seat base cushion or is not supported by the seat back including head restraint.
- The vehicle interior can accommodate installation of the CRS with only limited adjustments of the CRS i.e. tilt or adjustable backrests cannot be used due to interference from the vehicle.
- The vehicle interior encroaches into the space in which the child dummy sits resulting in any contact between the dummy's head and legs. For example, where the roof is too low or the knees or tibia are against the back of the front seat. Contact with the toes or feet is acceptable.
- Any part of the vehicle interior, including bolsters, arm rests, pillars obstruct the CRS or prevents a particular adjustment from being made. E.g. C-pillar, roof or rear head restraints prevent correct installation of CRS.
- With the appropriate child dummy installed, the size of the car limits the possible age groups that can be installed and exclusions are not made clear in the vehicle handbook.

- There is limited support offered to the CRS through lack of contact with the supporting structures, e.g. large side bolsters prevent the CRS from sitting flat on the seat base; or where applicable, poor or inadequate support is provided to CRS support legs.
- When load is applied to the CRS it can move more than the allowed amount or the CRS can move without increasing tension on the belt system.

3.5 Requirements for ISOFIX CRS

3.5.1 Insert and locking ISOFIX probes (only)

This is an assessment of the ease of which the CRS ISOFIX probes can be engaged with the vehicle ISOFIX anchorages. It does not include assessment of any other tethers, straps or supports.

Procedure:

- The position and orientation of the vehicle anchorages shall be identified and prepared for CRS attachment. Simple, preparatory actions such as sliding a seat belt away from the anchorage, lifting a dedicated flap or covering to expose the anchorage are permissible. Plastic guide funnels supplied with CRS will NOT be used.
- The CRS shall be placed on the seat centreline, the CRS ISOFIX probes shall be made ready for attachment to the vehicle.
- The CRS and probes shall be pushed toward the anchorages until they are engaged, keeping the CRS on the vehicle seat

cushion. Lifting of the CRS from the seat base is not allowed, but some rotation/tilting of the CRS is permissible provided there is still contact with the seat cushion. Separate support frames and bases (if available) may be lifted.

- If necessary, 50 mm of lateral movement of the CRS is permitted to allow engagement with the ISOFIX anchorages. Where the CRS has movable ISOFIX probes, they may be adjusted to facilitate engagement provide the CRS remains on the vehicle seat.
- Where the adult belt prevents engagement with the ISOFIX anchorages, it is permissible to reposition the belt to improve access, provided the belt does not have to be held in that position.

The vehicle meets the requirements, once preparatory steps have been performed, if all of the following are met:

- Each vehicle ISOFIX anchorage can be easily engaged. For example, the anchorages are easily accessible, or they are equipped with permanent guidance (plastic funnel, fabric slit, etc) which helps the CRS ISOFIX probes align with the vehicle anchorages avoiding any obstruction from the seat, such as the fabric or cushion etc.
- For CRS where the probes are attached to the shell, the CRS can be attached to the vehicle by simply pushing it toward the anchorages, with some tilting but without any other actions that are not described on the CRS itself.
- If the CRS uses a separate support frame, the frame can be easily engaged onto the ISOFIX anchorages without removing fabric, etc.

- With the CRS installed, the three-point belt on adjacent seating position in that same row, should be capable of restraining another adult occupant. In case of centre seat, both left and right three-point belt must be considered.

The vehicle would not meet the requirements if any of the following occur:

- If the anchorages cannot be engaged without further actions. For example, where the seat cushions have to spread apart by hand in order to create access to the anchorages.
- The CRS has to be lifted off the seat cushion to allow engagement with the anchorages. Lifting of separate support frames is permissible.
- Any part of the seat or cushion prevents attachment of the CRS.
- Where the CRS probes are clearly misaligned with the ISOFIX anchorages.
- Where physical guidance is required, such as plastic funnels, they are not permanently attached to the vehicle.

3.5.2 Additional tethers and/or support leg

Where the chosen CRS is equipped with an additional tether or support leg apply the relevant assessment outlined in Section 3.6 before moving on to the next section.

3.5.3 Obstruction & Stability of the ISOFIX CRS

Procedure

- The CRS shall be installed in the vehicle with ISOFIX and

any tethers or support legs attached. A child dummy of the appropriate size shall also be installed in the CRS.

- Any comfort adjustments on the CRS shall be changed e.g. incline, recline etc.
- Check any contact points between the CRS and vehicle.
- The CRS shall be pulled toward the front of the vehicle and twisted about the z-axis.

The vehicle meets the requirements if all of the following are met:

- The vehicle interior can accommodate installation of the CRS in all orientations and seat adjustments without interaction with other parts of the vehicle. E.g. booster seats with adjustable head restraints must not be restricted by the rear head restraints or C-pillars.
- The presence of head restraints must not lead to significant forward rotation of the CRS or create lateral instability.
- Contact between the CRS and vehicle interior is permitted provided that the CRS is correctly installed, stable and is not rotated by more than 5 degrees.
- The measured backrest angle of the CRS does not exceed 90 degrees. This can be measured using the device described in ANNEX II.
- The vehicle interior provides stable support for the CRS and its attachments with the vehicle in all installation modes and adjustments.
- There is little or no rotation of the CRS about all axes.

The vehicle would not meet the requirements if any of the following occur:

- The vehicle interior can accommodate installation of the CRS with only limited adjustments of the CRS i.e. tilt or adjustable backrests cannot be used due to interference from the vehicle.
- The vehicle interior encroaches into the space in which the child dummy sits resulting in any contact between the dummy head and legs. For example, where the roof is too low or the knees or tibia are against the back of the front seat. Contact with the toes or feet is acceptable.
- Any part of the vehicle interior, including bolsters, arm rests, and pillars, obstructs the CRS or prevents a particular adjustment from being made. E.g. C-pillar or rear head restraint prevents correct installation of CRS.
- The size of the car limits the possible age groups that can be installed and insufficient exclusions are not made clear in the vehicle handbook.
- There is limited support offered to the CRS through lack of contact with the supporting structures. E.g. poor or inadequate support is provided to CRS support legs or the support legs cannot be correctly positioned.

3.6 CRS Installed Using Additional Tethers, Straps and Support Legs

3.6.1 Ease of use of tethers & straps

This is an assessment of the ease of which the additional tether anchorages such as top tethers can be engaged with the vehicle, where applicable.

Procedure:

- Once the CRS has been attached to the vehicle with the belt or ISOFIX, any additional tethers, straps and corresponding anchorages or brackets shall be readied. Simple, preparatory actions such as lifting a dedicated flap or covering to expose the attachment point are permissible.
- The removal or repositioning of a parcel shelf or tonneau cover is allowable. It must be possible to replace these parts once the CRS installation has been completed.
- Head restraints may be repositioned or removed for CRS installation if instructed in the vehicle handbook.

The vehicle meets the requirements if all of the following are met:

- The top tether can be engaged and tightened easily, without having to carry out any further actions other than already mentioned.
- Where equipped, any additional tethers can be easily attached to the anchorage and tightened, for example the front seat rail or any other attachment points.

The vehicle would not meet the requirements if any of the following occur:

- The strap(s) or tether(s) cannot be engaged without any further actions of vehicle adjustments, e.g. it would not be acceptable to tilt the rear seat forward to be able to engage the tether.
- The strap(s) or tether(s) pass through luggage or occupant space and prevent the use of other parts of the vehicle, including rear seats. Top tether straps that remain above the

top of the vehicle seat back are acceptable.

- The strap(s) or tether(s) obstruct the function or movement of other parts of the vehicle, such as the front seats or luggage space.

3.6.2 Ease of use of support legs

This is an assessment of the vehicle's ability to provide adequate support to any support legs, where applicable.

The vehicle meets the requirements if all of the following are met:

- The vehicle provides sufficient space to allow stable placement of any support legs.
- The support leg must be installed in the intended positions, for example fully locked out.
- The area upon which support rests must also be capable of providing adequate restraint during an impact as described in ECE-TRANS-WP29-2012-53e and Regulation No 14.

The vehicle would not meet the requirements if any of the following occur:

- Poor or inadequate support is provided to CRS support legs or where the support leg cannot be positioned correctly due to interference from the front seat or other vehicle structures.
- The support leg cannot be fully locked out, or cannot provide the intended level of support for any reason, such as due limited space.

3.7 CRS Installation Scoring

3.7.1 Each eligible CRS-seating position combination from the Installation Matrix will be deemed successful when the requirements of Section 3 are met. Where an integrated seat is provided for a similar age group as the respective CRS on the CRS Reference List, the case will be treated as if the CRS-seating combination meets the requirements of Section 3. Where the requirements of Section 3 are not met, the CRS-Seating position combination is considered as a fail.

3.7.2 The score for each individual CRS on the installation matrix will be calculated by dividing the number of successful installations in the vehicle by the total number of eligible positions in which it was fitted.

$$\text{The installation score CRS}_i = \sum \frac{T_i - F_i}{T_i}$$

T_i = Total number of eligible positions in the vehicle for the CRS_i ,

F_i = Number of failed installations, and where $i = 1, \dots, M$; the total number of CRS on the top pick list (with or without manufacturer's additions).

3.7.3 Where the total number of eligible seating positions for any CRS equals zero, this CRS will not be considered in the assessment and will be shown as 'Exempt'.

3.7.4 Separate points will be given for fitment of the CRS from each category as follows:

| | |
|---------------------|------------------|
| CRS Reference List | 10 points |
| OEM Recommended CRS | 2 points |

3.7.5 The CRS Reference list CRS score is calculated by taking the average of the CRS_i scores of all reference seats on the original reference list (excluding those exempted for all seating positions) and applying the percentage to 10 points. The OEM Recommended CRS score is calculated by taking the average of the CRS_i scores of the two recommend seats and applying the percentage to 2 points. The calculation is performed regardless of whether the recommended CRS are taken from the original CRS Reference List or not.

3.7.6 The resulting point scores are expressed as numbers, with 3 decimal points. The total score for CRS installation is the sum of the points for fitment of Universal, Semi-universal and Recommended CRS.

3.7.7 The maximum available score for the installation assessment will be **12 points** and is independent on the number of seats on the CRS Reference List and the division between universal, semi-universal and recommended seats.

3.7.8 If there is no recommendation for CRS, the maximum available score for CRS fitment will be **10 points**.

Table 2: Example of CRS installation scoring

| CRS Installation Assessment | | | | Seating Position | | | | | | | SCORING | | | | |
|--|------------|---------------------------------|-----------|------------------|---------|--------|--------|---------|--------|-------|---------|------|--------|-------|---------|
| | | | | Front | 2nd row | | | 3rd row | | | | | | | |
| | | | | Pass | Left | Centre | Right | Left | Centre | Right | Pass | Fail | Exempt | Score | |
| Reference List | Category | CRS | Direction | Interface | | | | | | | | | | | |
| | <85cm | Jole i-Gemm 3 | Rwd | B _ _ _ | Exempt | Pass | Pass | Pass | N/A | N/A | N/A | 3 | 0 | 1 | 100.00% |
| | <85cm | Jole i-Gemm 3 + Jole i-base 2 | Rwd | _ I L _ | Exempt | Pass | Exempt | Pass | N/A | N/A | N/A | 2 | 0 | 2 | 100.00% |
| | 40-105 cm | Jole Steadi | Rwd | B _ _ _ | Exempt | Pass | Pass | Pass | N/A | N/A | N/A | 3 | 0 | 1 | 100.00% |
| | 76-105 cm | Jole Steadi | Fwd | B _ _ _ | Exempt | Pass | Pass | Pass | N/A | N/A | N/A | 3 | 0 | 1 | 100.00% |
| | 76-150 cm | Jole Elevate | Fwd | B _ _ _ | Pass | Pass | Pass | Pass | N/A | N/A | N/A | 4 | 0 | 0 | 100.00% |
| | 40-105 cm | Nuna Todl Next + Nuna Base Next | Rwd / Fwd | _ I L _ | Exempt | Pass | Exempt | Pass | N/A | N/A | N/A | 2 | 0 | 2 | 100.00% |
| | 40-105 cm | Recaro Salla | Rwd / Fwd | _ I L _ | Exempt | Pass | Exempt | Pass | N/A | N/A | N/A | 2 | 0 | 2 | 100.00% |
| | 40-105 cm | Chicco Seat 3 Fit i-Size Air | Rwd / Fwd | _ I L _ | Exempt | Pass | Exempt | Pass | N/A | N/A | N/A | 2 | 0 | 2 | 100.00% |
| | 40-125 cm | Jole i-Spin Grow | Rwd / Fwd | _ I _ S | Exempt | Pass | Exempt | Pass | N/A | N/A | N/A | 2 | 0 | 2 | 100.00% |
| | 100-150 cm | Cozy N Safe Augusta i-Size | Fwd | B I _ _ | Pass | Pass | Pass | Pass | N/A | N/A | N/A | 4 | 0 | 0 | 100.00% |
| | 100-150 cm | Recaro Mako Elite 2 | Fwd | B I _ _ | Pass | Pass | Pass | Pass | N/A | N/A | N/A | 4 | 0 | 0 | 100.00% |
| | OEM | <85 cm | XXXX | | | Exempt | Pass | Exempt | Pass | N/A | N/A | N/A | 2 | 0 | 2 |
| 76 - 105 cm | | XXXX | | | Exempt | Pass | Exempt | Pass | N/A | N/A | N/A | 2 | 0 | 2 | 100.00% |
| Q 6 | | XXXX | | | Pass | Pass | Pass | Pass | N/A | N/A | N/A | 4 | 0 | 0 | 100.00% |
| Q 10 | | XXXX | | | Pass | Pass | Pass | Pass | N/A | N/A | N/A | 4 | 0 | 0 | 100.00% |
| | | | | | | | | | | | | | | | |
| SUMMARY | | | | | | | | | | | | | | | |
| Reference List assessment (Max 10 points) | | | | 10.000 | | | | | | | | | | | |
| OEM assessment (Max 2 Points) | | | | 2.000 | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| TOTAL INSTALLATION ASSESSMENT | | | | 12.000 | | | | | | | | | | | |

4 DYNAMIC ASSESSMENT

The protection offered by the combination of vehicle and recommended CRS in the event of a crash is assessed by Q-series of child dummies in the full-scale front and side impact test. Both Q6 and Q10 dummy shall be seated on CRS with high back booster seat (with backrest), as selected by the vehicle manufacturer.

This section is only applicable to vehicles equipped with rear seats; vehicles without rear seats shall be assessed according to Section 6.

4.1 Point calculation

A sliding scale system of points scoring is used to calculate points for each measured criterion where a higher and lower performance limit exists. Where a value falls between the two limits, the score is calculated by linear interpolation. If only a lower performance limit is available for a criterion, this limit is used as a “Pass”/ “Fail” criteria.

4.2 Precondition

If the restraint system is unable to keep the child dummy restrained, that dummy will be penalised for its dynamic performance in the impact in which the issue occurred.

4.2.1 Restraint

- a) During the forwards movement of the dummy only, the diagonal belt slips off the shoulder. Where this occurs **zero** will be awarded to the dummy. Slipping of the shoulder is when the belt moves below the shoulder joint down the upper arm.
- b) During the forwards movement of the dummy only, the diagonal belt moves into the gap between the clavicle and upper arm with folding of the belt webbing. Where this occurs **a penalty of -4 points** will be applied to the overall dummy score of the impact in which it occurs.
- c) At any time throughout the impact either the pelvis of the dummy submerges beneath the lap section of the belt or the lap section does not prevent the dummy from moving upwards

during rebound and is no **points** longer restraining the pelvis. Where this occurs **zero points** will be awarded to the dummy.

4.2.2 Ejection

Dummy ejection will be evaluated at any time throughout both the front and side impacts.

a) The dummy pelvis does not remain in the booster seat or on the booster cushion and is not correctly restrained by the lap section of the seatbelt.

b) The CRS does not remain within the same seating position or is no longer correctly restrained by the adult belt. It must not be displaced onto the floor or any other part of the rear seat/occupant compartment.

4.2.3 Failure of restraint system components

Failure of the restraint system components will be evaluated at any time throughout both the front and side impacts.

a) There is any breakage or fracturing of load-bearing parts of the belt system including buckles, webbing and anchorage points.

b) There is any breakage or fracturing of any seat belt lock-offs, tethers, straps, ISOFIX anchorages, backrest to booster cushion connections or any other attachments which are specifically used to anchor the CRS to the vehicle fail.

CONCEPT: *The child should be held securely in the restraint*

and not be ejected from the restraint.

4.3 Frontal Impact

4.3.1 Head Contact

If there is no hard contact seen on the highspeed film, the score is based on the Resultant 3ms acceleration only.

In the presence of hard contact, the score is based on the HIC_{15} values and Resultant 3ms acceleration. Hard contacts occurring during the head rebound will not be considered. The points will be based on the following:

Higher limit

Q6 4 points $a_{3ms} \leq 60 \text{ g}$; $HIC_{15} \leq 500$

Q10 4 points $a_{3ms} \leq 60 \text{ g}$; $HIC_{15} \leq 500$

Lower limit

Q6 0 points $a_{3ms} \leq 80 \text{ g}$; $HIC_{15} \leq 700$

Q10 0 points $a_{3ms} \leq 80 \text{ g}$; $HIC_{15} \leq 700$

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

4.3.2 Head Excursion (Forward Facing CRS or booster seat)

Where possible the maximum forward excursion of the head, relative to the CR point, is estimated. The head score is reduced for excessive forward excursion. Where the head of the Q6 exceeds the 550mm forward excursion line a **4-point modifier** is applied. For the Q10 a stepped modifier is used, where the Q10 head exceeds the 450mm or 550mm forward excursion line, a 2- or 4-point

modifier respectively is applied; otherwise, the points will be based on the following:

Q6 **-4 points**(modifier) > 550 mm

Q10 **-2 points**(modifier) > 450 mm

-4 points(modifier) > 550 mm

4.3.3 Neck Tension

The neck tension assessment is based on the parameters detailed below. Neck tension occurring during the neck rebound will not be considered.

Upper neck Fz

Q6 and Q10 **2 points** ≤ 1.70 kN; **0 points** ≥ 2.62 kN

Upper neck My

Q6 **0 points** ≥ 36 Nm

Q10 **0 points** ≥ 49 Nm

4.3.4 Chest

The chest score (T4) is based on the chest resultant acceleration and deflection, as detailed below. Chest acceleration peaks caused by the firing of seatbelt pretensioners early in the loading event will be ignored.

The chest score is reduced for excessive chest deflection. Where the chest of the Q10 exceeds 56mm a **2-point modifier** is applied; otherwise, the points will be based on the following:

- Q10 **2 points** $a_{3ms} \leq 41 \text{ g}$;
 0 points $a_{3ms} \geq 55 \text{ g}$; deflection $\geq 56 \text{ mm}$
- Q6 **2 points** deflection $\leq 30 \text{ mm}$;
 0 points deflection $\geq 42 \text{ mm}$

4.3.5 Overall Dynamic Score for Frontal impact

The Overall Dynamic Score for the Frontal Impact is calculated as:

Worst score from

$$\left(\begin{array}{l} \text{Head Contact with the CRS (Section 4.3.1)} \\ \text{Head Excursion (Section 4.3.2)} \end{array} \right) \quad \mathbf{4 \text{ points}}$$

+ Score from Neck Tension (Section 4.3.3) **2 points**

+ Score from Chest (Section 4.3.4) **2 points**

4.4 Side Impact

4.4.1 Head Contact with the **CRS**

Head contact

If there is no hard contact seen on the highspeed film, the score is based on the Resultant 3ms acceleration only.

In the absence of contact, Q6 and Q10 are awarded **2 points**.

In the presence of contact, the score is based on the HIC_{15} and Head Resultant Acceleration, 3 msec exceedance. Hard contacts

occurring during the head rebound will not be considered.

Higher limit

Q6 **2 points** $a_{3ms} \leq 60 \text{ g}$; $HIC_{15} \leq 500$

Q10 **2 points** $a_{3ms} \leq 60 \text{ g}$; $HIC_{15} \leq 500$

Lower limit

Q6 **0 points** $a_{3ms} \leq 80 \text{ g}$; $HIC_{15} \leq 700$

Q10 **0 points** $a_{3ms} \leq 80 \text{ g}$; $HIC_{15} \leq 700$

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

4.4.2 Neck Tension

The neck tension assessment is based on the parameters detailed below. Neck tension occurring during the neck rebound will not be considered.

Upper neck Fz

Q6 **1 points** $< 2.4 \text{ kN}$ **0 points** $\geq 2.4 \text{ kN}$

Q10 **1 points** $< 2.2 \text{ kN}$ **0 points** $\geq 2.2 \text{ kN}$

4.4.3 Chest

The chest score (T4) is based on the chest resultant acceleration, as detailed below.

Chest resultant acceleration, 3msec exceedance

Q6 **1 points** $\leq 67 \text{ g}$; **0 points** $> 67 \text{ g}$

Q10 **1 points** $\leq 67 \text{ g}$; **0 points** $> 67 \text{ g}$

Chest resultant acceleration occurring during the rebound will not be considered. Chest resultant acceleration peaks caused by the firing of seatbelt pretensioners early in the loading event will be ignored.

Table 3 and 4 show the scoring for COP dynamic assessment for frontal and side impact test, Q6 and Q10.

Table 3: Frontal impact criteria, limits and available points per body region for Q6, Q10

| | Criteria | Performance Limits | | | Available points |
|-------------------|---|--------------------|------------------|----------|------------------|
| | | Higher | Lower | Capping | |
| Head Score | HIC15 (with hard contact) | 500 | 700 | 800 | 4 points |
| | Resultant 3 ms acceleration | 60 g | 80 g | 80 g | |
| | Head excursion Q6 Q10 | NA 450 mm | 550 mm 550 mm | NA NA | |
| Upper Neck | Tension Fz | 1.7 kN | 2.62 kN | NA | 2 points |
| | Extension My (with head to interior contact) Q6 Q10 | NA NA | 36 Nm 49 Nm | NA NA | |

| | | | | | |
|--------------|---|-------------|----------------|------------|-----------------------|
| Chest | Resultant 3ms acceleration* Q6 Q10 | NA 41 g | NA 55 g | NA 55 g | 2 points |
| | Deflection – max Dres, upper and lower Q6 Q10 | 30 mm NA | 42 mm 56 mm | NA NA | |
| TOTAL | | | | | 8 points/dummy |

Table 4: Side impact criteria, limits and available points per body region for Q6, Q10

| | Criteria | Performance limits | | | Available points |
|-------------------|------------------------------|--------------------|------------------|---------|-----------------------|
| | | Higher | Lower | Capping | |
| Head Score | HIC15 (with hard contact) | 500 | 700 | 800 | 2 points |
| | Resultant 3ms acceleration | 60 g | 80 g | 80 g | |
| Upper Neck | Resultant Force Q6 Q10 | NA NA | 2.4 kN 2.2 kN | NA | 1 point |
| Chest (T4) | Resultant 3ms acceleration | | 67 g | NA | 1 point |
| TOTAL | | | | | 4 points/dummy |

5 VEHICLE BASED ASSESSMENT

All vehicle-based assessments will be only performed on vehicles that meet the relevant fitment requirements at the time of assessment.

5.1 Provision of Three Point Seat Belts

If the vehicle equipped with three-point lap and diagonal seat belts in all seating position and they all meet UNECE regulations, **1 point** shall be awarded for the Child Protection Score.

CONCEPT: *All forward or rearward facing seats should be equipped with a three-point automatic belt that meets a technical standard.*

5.2 Gabarit Installation on all Passenger Seats

Where the 2nd row outboard seats are in compliance with the requirements in Section 5.2.2 which are based on UNECE Regulation 16.05 [2], **1 point** shall be awarded to the Child Protection score. Where all other passenger seats are also in compliance with the requirements, an additional **1 point** shall be awarded to the Child Protection Score.

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

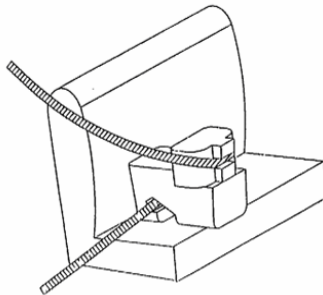
CONCEPT: *All possible seating positions should be capable of providing a good interface with a Universal child seat, secured by an adult seat belt.*

5.2.1 To assess compliance, the Gabarit, as specified in ANNEX IV, shall be installed on all passenger seats according to the following procedure:

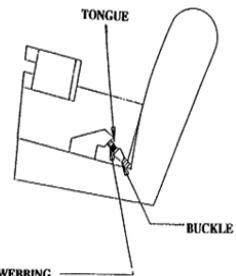
- Adjust the seat to its fully rearward and lowest position, the seat back to an angle of 25 degrees from the vertical or nearest fixed position and the upper seat belt anchorage to its lowest position. Adjustable rear seats shall be set fully rearward.
- If alternative seat, seat-back or safety-belt anchorage adjustments are to be used for either front or rear seats when installing CRS, information about the alternative position must be included in the Vehicle Handbook giving the information required in 5.2f). Where this information is provided, set the seat to this position.
- Place a cotton cloth on the seat-back and cushion.
- Place the Gabarit on the vehicle seat.
- Arrange the safety-belt strap around the fixture in approximately the correct position as shown in Figures 1 and 2, and then latch the buckle.
- Ensure that the fixture is located with its centreline on the apparent centreline of the seating position ± 25 mm with its centreline parallel with the centreline of the vehicle.
- Ensure that all webbing slack is removed. Use sufficient force to remove the slack, do not attempt to tension the webbing.
- Push rearwards on the centre of the front of the fixture with a force of $100\text{ N} \pm 10\text{ N}$, applied parallel to the lower surface, and remove the force.

- Push vertically downwards on the centre of the upper surface of the fixture with a force of $100\text{ N} \pm 10\text{ N}$, and remove the force.

INSTALLATION OF FIXTURE ONTO VEHICLE SEAT



CHECK FOR COMPATIBILITY



Note: THE SEAT BELT WEBBING
MUST CONTACT THE CURVED EDGE
ON BOTH SIDES OF THE FIXTURE

LAP BELT ONLY SHOWN

Figure 1

Figure 2

5.2.2 Requirements:

- 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.
- The lap portion of the belt shall touch the fixture on both sides at the rear of the lap belt path.

- c) There shall be sufficient seat belt webbing to fit around the entire Gabarit while allowing the contact between the Gabarit and both the forward and rearward parts of the seat cushion upper surfaces.
- d) Once the belt is correctly routed around the fixture, it should be possible to draw a further 150mm of belt webbing from the reel.
- e) With the Gabarit in position and 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. This may result in movement of the lower anchorages and/or buckles from their anticipated 'design position'. For example, the tension may cause the lap section of the belt to slide between the rear of the seat base and the bottom of the seat back, hence shortening the length of the lap section. However, if this is considered to be achievable through 'normal use' then the assessment will be made with the anchorage/buckle in this position.

To achieve the **1 point** for all seating passenger positions, the following requirements must be met in addition to those detailed above:

- f) The Vehicle Handbook must indicate which passenger seats are suitable for use with a Group 0 and Group 1 Universal CRS (U). ([2], Annex 17, Appendix 3.)
- g) Where a passenger frontal airbag is fitted, the vehicle handbook must clearly indicate that when the passenger airbag is active the seat is NOT suitable for RWF CRS as

well as indicating that it is suitable for universal CRS when the airbag has been disabled.

- h) Where a passenger frontal airbag is fitted, it must be possible to activate and deactivate the passenger airbag, either automatically or manually. The requirements of Section 5.6 need not be met to qualify for this award, but airbag disabling equipment must be standard.

5.3 Two Simultaneous Use Seating Positions

CONCEPT: *Vehicles that provide two or more seating positions suitable for an i-Size CRS should be rewarded.*

5.3.1 Where the 2nd row outboard seats are provided with two seating positions that can simultaneously accommodate any combination of top pick CRS covering height limit 40cm until 150cm, **1 point** shall be awarded to the Child Protection score. A combination of two CRS will be used to assess this, which may be proposed by the vehicle manufacturer.

5.3.1.1 There must be sufficient space within the vehicle to accommodate simultaneously the CRS and relevant sized child dummies. For example, if the handbook recommends that the front passenger seat is moved fully rearward, it must not prevent the relevant CRS and child from being installed on the seating position behind.

5.3.2 Where the vehicle is provided with two seating positions that can simultaneously accommodate i-Size CRS, **1 point** shall

be awarded to the Child Protection score. A seating position is considered to be able to accommodate i-Size CRS if that seating position meets the geometric, strength testing, and labelling requirements of UN regulations No 14 & 16.

5.4 ISOFIX or I -Size Usability

Where two passenger seats are in compliance with the following requirements, **up to 2 points** shall be awarded to the Child Protection score. If the vehicle is a 2-seater then only the passenger seat(s) is required to meet the requirements.

CONCEPT: *The car must have ISOFIX according to UN regulation, 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.*

*A) When the ISOFIX system is present in the car and approved according to UNECE R14 **1 point** shall be awarded to the Child Protection Score.*

*B) When the requirement in A) is met and the car meets the following requirements, **1 more** point on top of the point given in A shall be awarded to the Child Protection Score.*

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

and a pictogram. I- Size markings only require the relevant i-Size pictogram detailed in regulation 16.

- e) All markings must be of conspicuous design and both the text and pictogram must have colours which contrast with their background.
- f) All markings must be permanently visible. Flag type labels are not acceptable.
- g) All markings must be permanently attached to the vehicle.
- h) ISOFIX/I-Size relevant information must be presented in the vehicle handbook.

5.5 Two or more largest ISOFIX Positions

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

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

- a) For vehicles with rear seats, 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.

Note: When checking a CRF behind the driver seat it may be adjusted longitudinally forward but not further than the mid position between its 95th 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. The full range of seat height adjustment can be used. All adjustments of

any passenger seats are permissible to install the fixture.

- b) For vehicles without rear seats, one or more passenger seats are suitable for simultaneous use with the largest size of rearward facing (Class C) ISOFIX CRS, Fixture (CRF) ISO/R3.
- c) This information must be presented in the vehicle handbook.

5.6 Passenger Airbag Warning Marking

If the vehicle is fitted with a serial or optional front seat passenger's frontal protection airbag, is marked with a permanent airbag warning label that meets either the requirements of the Child protection protocol version 1.0 or Regulation 94 and the requirements of Section 5.6.2 are met, a maximum of **5 points** will be awarded. Alternatively, **2 points** will be awarded where a label meets the above requirements.

CONCEPT: *A warning regarding the hazard posed by a frontal protection airbag 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.*

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

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.

Where ASEAN NCAP refers to the airbag deactivation components as ‘the system’, this refers to the switch, airbag status indicator, airbag and any other components associated with the deactivation of the airbag.

5.6.1 If the vehicle is equipped with a system which automatically switches the airbag off for ANY rearward facing CRS and obviates any risk associated with airbag deployment, **5 points** will be awarded:

- a) The General and Airbag status indicator requirements detailed in Section 5.6.2 are met.
- b) If, with the ignition on and with engine running or not, the airbag status can be changed, the entire system must react correctly to the change immediately. Systems will be checked once the vehicle diagnostics/system checks have been completed.
- c) The system must automatically re-activate the airbag when an adult occupant occupies the seat.

5.6.2 The general and airbag status requirements are as following:

General requirements:

- a) Any text, labelling and instructions in relation to airbag disabling must be permanently attached to the vehicle.
- b) The information provided must be clear, without reference to the vehicle’s handbook or other source.
- c) There must be no possibility of the users being given false information.

Airbag status indicator requirements:

- d) Easily visible information and warnings must be provided for the driver and front seat passenger, showing the status of the airbag.
- e) The status indicator must be labelled with the words 'Passenger AIRBAG OFF/ON'. Abbreviations such as 'Pass', 'AB' or any other combination is NOT acceptable.
- f) The AIRBAG ON pictogram must be based upon that of the sun visor label (ECE R94) as shown here:



- g) The AIRBAG OFF pictogram must be based upon that detailed in ECE R121 as shown below:



- h) Slight alterations to the ON/OFF pictograms above are acceptable provided that the basic geometry of the pictogram remains the same. Mirroring and monochrome colours are acceptable.
- i) 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.

- j) Information to indicate that the airbag is disabled must be permanently displayed, when the ignition is on.
- k) If at any time the airbag is switched from the OFF position to the ON position, the status indicator showing that the airbag is ON must signal this immediately after checking period for at least 60 seconds, regardless of the length of time the ignition has been switched on, or until the ignition is switched off again.

6 CHILD PRESENCE DETECTION

The assessment will be conducted on the vehicle equipped with child presence detection technology. The points will be given based on the following criteria:

| No | Criteria | | Point |
|----|---|------------------|-------|
| 1 | Detection of all passengers - Rearward Facing, Forward Facing | Direct sensing | 5.00 |
| 2 | Detection of passengers - Forward Facing | Direct Sensing | 4.00 |
| 3 | Reminder System - Alert | Indirect Sensing | 2.50 |

6.1 Detection Subject Classification and CRS Installation

Detection subjects are classified according to the age group as detailed in the following table:

| Detection Subject Classification | Age Group | CRS Direction |
|----------------------------------|----------------------|-----------------------|
| Classification 1: Young Infant | Birth to 2 years | Rearward Facing (Rwd) |
| Classification 2: Toddler | > 2 years to 5 years | Forward Facing (Fwd) |

6.1.1 Specific system requirements

Systems may use a range of parameters either individually or in combination to establish occupancy and/or categorisation. For systems that detect occupant respiration in sleeping condition, the individual parameters to be proven by the OEM are as follows:

6.1.2 Respiration

The following respiration rates shall be used for sleeping children:

- Birth to 2 years 22-30 bpm
- > 2 years to 5 years 18-20 bpm

6.2 System Deactivation

6.2.1 Temporary deactivation of the CPD system by the driver for a single journey is permitted.

6.2.2 Deactivation must be more complicated than a short push of a button to avoid deactivating the system inadvertently. This must be a different process to that required for delay and cancellation of a signal (Section 4.2.4 & 4.2.5).

6.2.3 It is not permitted to deactivate individual parts of the system, e.g. escalation warning only.

6.2.4 The system must automatically re-arm at the commencement of the subsequent journey.

- 6.2.5 Long term deactivation of a CPD system with indirect sensing shall only be performed by a dealer.
- 6.2.6 An option to reactivate the system by the driver may be offered, but it must not be possible to reactivate the system inadvertently.
- 6.2.7 Over the air (OTA) deactivation by the dealer is permitted providing it is in response to a specific customer request for the system to be disabled.
- 6.2.8 For vehicles equipped with direct sensing systems, long term deactivation is not permitted.
- 6.2.9 If a system has been deactivated either temporarily or long term, the inactive status of the CPD system must be indicated by a dedicated visual signal icon that is clearly visible to the driver.
- 6.2.10 With long term deactivation, the visual signal icon is required for a duration of no less than 60 seconds from the start of the journey. The visual signal icon is also required for a duration of no less than 5 seconds after turning the ignition off.
- 6.2.11 With temporary deactivation, a visual signal icon duration of no less than 10 seconds is required. The visual signal icon is also required for a duration of no less than 5 seconds after turning the ignition off.

6.3 CPD Assessment Phase

The CPD assessment must be conducted by positioning the Subject in CRS on each position at rear passenger seats, and repeated until both Subjects are tested.

The CPD technology installed in vehicles shall undergo three phases of assessment:

6.3.1 Detection with 1st Notification

The CPD system should be able to detect child presence within 3 minutes of assessment. Detection must be indicated through any means of notification to the driver after the vehicle is being locked with the engine off. Example of trigger includes smartphone notification, etc.

6.3.2 2nd Notification

2nd Notification phase is immediately commenced after the third-minute of assessment, or after 1st notification of detection, whichever earlier. The vehicle must be able to repeat notification of child presence in vehicle before the fourth-minute of assessment.

6.3.3 3rd Notification

3rd Notification phase is immediately commenced after the fourth-minute of assessment, or after 2nd notification of detection, whichever earlier. The vehicle must be able to repeat notification of child presence in vehicle before the fifth-minute of assessment.

CPD assessment phases are summarised in the following table:

| Detection Phase | Timeline |
|------------------------------|----------------------|
| 1 st Notification | 0 to 3 minutes |
| 2 nd Notification | Before fourth-minute |
| 3 rd Notification | Before fifth-minute |

5 points will be awarded if the system is able to accomplish ALL three DETECTION phases for Classification 1 and 2.

4 points will be awarded if the system is able to accomplish ALL three DETECTION phases for Classification 2 only.

6.4 Reminder System

Reminder System Assessment is an alternative assessment conducted for non-CPD vehicles installed with Reminder System. The assessment methodology does not require placing CRS in position during assessment.

6.4.1 The Reminder System shall activate to remind the driver to check the back seat at the end of journey as per situation below:

6.4.1.1 Ignition/Engine ON between 10 minutes from rear door opening; and

6.4.1.2 Rear door opening during Ignition ON.

6.4.2 The notification system at the end of the journey shall remind the driver and meet one of the following condition:

6.4.2.1 Ignition Turn Off

The system needs to alert the driver through audio (warning sound- “pawp” for 1 sec) and visual display (word “Check Rear Seat”) at the car instrumentation panel, etc. that is easily perceptible by the driver.

6.4.2.2 Ignition Turn Off and Door Lock

The system needs to alert the driver through audio (warning sound - for 3 seconds).

2.5 points will be awarded if the system is able to accomplish only Alert criterion.

6.5 CPD Assessment Procedure

6.5.1 Classification 1: Young Infant Rearward-Facing

- (a) Set up vehicle and Detection Subject (Young Infant) for assessment.
- (b) Install CRS in rearward-facing position at LEFT-most rear passenger seat.
- (c) Secure Detection Subject in the CRS.

(d) Evaluator INGRESS vehicle, CLOSE all doors and windows.

(e) SWITCH ON engine for 5 minutes, do not turn on air-conditioning.

(f) SWITCH OFF engine, evaluator EGRESS vehicle, LOCK doors.

(g) Assessment STARTS, timer ON for DETECTION with 1st NOTIFICATION phase.

If the vehicle is able to notify the driver of child presence within 3 minutes – PASS; else FAIL.

If PASS, continue with step (h)
If FAIL, go to step (j)

(h) Immediately start 2nd NOTIFICATION phase upon accomplishment of 1st notification phase or after third-minute of assessment, whichever comes first.

If the vehicle is able to notify the driver of child presence before fourth-minute – PASS; else FAIL.

If PASS, continue with step (i)
If FAIL, go to step (j)

(i) Immediately start 3rd NOTIFICATION phase upon accomplishment of 2nd notification phase or after fourth-minute of assessment, whichever comes first

If the vehicle is able to give 3rd notification to the driver before fifth-minute – PASS; else FAIL.

(j) Change position of CRS to the remaining of rear passenger seats (if ALL positions have been tested, go to step (l)).

(k) Repeat steps (d) to (i).

(l) Assessment concluded.

6.5.2 Classification 2: Toddler Forward-Facing

(a) Set up vehicle and Detection Subject (Toddler) for assessment.

(b) Install CRS in forward-facing position at LEFT-most rear passenger seat.

(c) Secure Detection Subject in the CRS.

(d) Repeat assessment procedure based on 6.5.1 (d) to (l).

7 TWO SEATERS AND VEHICLES WITH LIMITED REAR SPACE

This Section details how protection for children is assessed by ASEAN NCAP in vehicles equipped with two seats and in vehicles where space is limited in the rear.

7.1 Vehicles with only Two Seats

7.1.1 CRS installation assessment

7.1.1.1 The top pick seats and any manufacturer recommended seats will be installed on the passenger seat as detailed in Section 3. Where the passenger seat is able to meet the requirements of Sections 3.3, 3.4 and 3.5 for Universal and Semi-Universal CRS the vehicle will be awarded **12 points**. The score will be calculated as described in Section 3.7.

7.1.1.2 All CRS groups must be represented by the top pick and manufacturer recommended CRS. Where this requirement is not met or the seating position is exempted, the CRS installation assessment will be **0 points**.

7.1.1.3 Where the manufacturer exempts the front passenger seat, **0 points** will be awarded for the CRS installation assessment.

7.1.2 Dynamic assessment

7.1.2.1 For two-seater sports cars there will be no dynamic

assessment, therefore the maximum number of points is 12+9.

7.1.2.2 To ensure that these vehicles are not penalised for having no dynamic assessment, the relative score weighting of the available assessments remains the same between the applicable assessments. The score out of 21 points for two seaters is scaled to be equivalent to any other vehicle that is assessed out of the full 49 points.

7.1.3 Vehicle based assessments.

The following vehicle-based assessments will be applied to two-seater vehicles:

“5.1 Provision of Three Point Seat Belts”

If the passenger seat is equipped with a three-point lap and diagonal automatic seatbelt that meets UNECE, **1 point** shall be awarded for the vehicle-based assessments.

“5.2 Gabarit Installation on all Passenger Seats”

Where the passenger seat is in compliance with the requirements in Section 5.2.2, **1 point** shall be awarded to the Child Protection score.

“5.4 ISOFIX Usability”

Where the passenger seat is in compliance with the requirements, **2 points** shall be awarded to the Child Protection score.

“5.5 Largest ISOFIX Positions”

Where the passenger seat is in compliance with the following

requirements, **1 point** shall be awarded to the Child Protection score:

“5.6 Passenger Airbag Warning Marking”

Where the vehicle is in compliance with the requirements, a maximum of **5 points** shall be awarded to the Child Protection score.

7.1.4 Two seater vehicles with passenger airbag that are not equipped with a passenger airbag deactivation switch will not be eligible to score in the vehicle based assessments. Where this is the case, the vehicle based assessment will be **0 points**.

7.2 Vehicles with Limited Rear Space

Vehicles will be considered as having limited rear space when the normal CRSs recommended by the manufacturer cannot be installed with the front seats in the ASEAN NCAP Frontal ODB impact test position. Where this is the case, the vehicle manufacturer should provide evidence showing that the CRS and/or child cannot be installed without interference from the vehicle.

7.2.1 CRS installation assessment

7.2.1.1 The CRS in CRS reference list and any manufacturer recommended seats will be installed on the passenger and rear seats as detailed in Section 3 using the front seat settings as specified in the vehicle handbook. Where the passenger seat is able to meet the requirements of Sections 3.3, 3.4 and 3.5 for

Universal and Semi-Universal CRS the vehicle will be awarded **12 points**. The score will be calculated as described in Section 3.7.

7.2.2 Dynamic assessment

7.2.2.1 Where a manufacturer wishes to avoid being awarded zero points for the CRS dynamic assessments, data from additional full-scale frontal and side impact tests may be provided by the manufacturer. These tests shall be performed using the appropriate CRS with the front seats positioned as required to allow for installation of the CRS. This front seat position should be mentioned in the vehicle handbook. The tests must be equivalent to the ASEAN NCAP front and side impact tests and contain an equivalent level of instrumentation. Adult dummies are not required. It is the responsibility of the vehicle manufacturer to ensure that adequate film coverage of the impact, and specifically child head excursion and head containment, is provided.

A “hybrid rating” would be produced using the adult data from the normal full-scale test (performed without CRS) and the child data from the additional tests. In the final vehicle rating, ASEAN NCAP will indicate that it was not possible to install the CRS with and adult in the normal ASEAN NCAP front seat test position. A maximum of **24 points** can be achieved.

7.2.3 Vehicle-based assessment

All vehicle-based assessments will apply as detailed in Section 5

and be assessed out of a maximum **13 points**.

7.2.4 All CPD will apply as detailed in Section 6 and be assessed out of a maximum **5 points**.

8 SCORING AND VISUALISATION

8.1 Scoring

Currently, the maximum number of points available for child protection in vehicles with rear seats is 49. For vehicles without rear seats, the maximum score is 22 points. The maximum points available in each assessment area are as follows:

| | with rear seats | without rear seats |
|---------------------------------------|--------------------|-----------------------|
| • Dynamic Assessment | 24 | 0 |
| • Installation of Child Restraints | 12 | 12 |
| • Vehicle Based Assessments | 13 | 10 |
| Child Presence Detection | 5 | 0 |

The child protection score will be the sum of all three areas.

The following tables summarise the maximum possible score in each (sub) category for vehicles with limited rear space and for vehicles with no rear seats (such as two seaters).

8.2 Child Protection Assessment Points Table (Normal and Limited Rear Space)

| Section | Category | Total Point (54) |
|--------------|---|------------------|
| 4 | Dynamic Assessment | (24) |
| 4.2.1 | Restraint | switch |
| 4.2.2 | Ejection | switch |
| 4.2.3 | Head Contact with the Vehicle | switch |
| 4.3 | Frontal Impact | (16) |
| 4.3.1 | Head Contact with the CRS | 8 |
| 4.3.2 | Head Excursion (Forward Facing CRS) | |
| 4.3.3 | Neck Tension | 4 |
| 4.3.4 | Chest | 4 |
| 4.4 | Side Impact | (8) |
| 4.4.1 | Head Containment | switch |
| 4.4.2 | Head Contact with the CRS | 4 |
| 4.4.3 | Neck Tension | 2 |
| 4.4.4 | Chest | 2 |
| 3 | Installation of Child Restraint | (12) |
| | Reference List | 10 |
| | Recommended CRS | 2 |
| 5 | Vehicle Based Assessment | (13) |
| 5.1 | Provision of Three Point Seat Belts | 1 |
| 5.2 | Gabarit Installation on all Passenger Seats | 2 |
| 5.3 | Two Simultaneous Use Seating Positions | 2 |
| 5.4 | ISOFIX Usability | 2 |

| | | |
|------------|--------------------------------------|-----|
| 5.5 | Two or more largest ISOFIX Positions | 1 |
| 5.6 | Passenger Airbag Warning Marking | 5 |
| 6 | Child Presence Detection | (5) |

8.3 Child Protection Assessment Points Table (No Rear Seats)

| Section | Category | Total Point (22) |
|----------------|---|-------------------------|
| 3 | Installation of Child Restraint | (12) |
| | Reference List | 10 |
| | Recommended CRS | 2 |
| 5 | Vehicle Based Assessment | (10) |
| 5.1 | Provision of Three Point Seat Belts | 1 |
| 5.2 | Gabarit Installation on all Passenger Seats | 1 |
| 5.4 | ISOFIX Usability | 2 |
| 5.5 | Largest ISOFIX on front Passenger Seat | 1 |
| 5.6 | Passenger Airbag Warning Marking | 5 |

9 REFERENCES

UN ECE Regulation 44, Revision 2, “Uniform Provisions Concerning the Approval of Restraining Devices for Child Occupants of Power-Driven Vehicles ("Child Restraint System")”, 4 October 2023.

UN ECE Regulation No 129, “Uniform provisions concerning the approval of Enhanced Child Restraint Systems (ECRS) used on board of motor vehicles [2021/1806]”, 20 December 2023.

UN ECE Regulation 16 Revision 05 “Uniform Provisions Concerning the Approval Of: I. Safety-Belts, Restraint Systems, Child Restraint Systems and ISOFIX Child Restraint Systems for Occupants of Power-Driven Vehicles; II. Vehicles Equipped with Safety-Belts, Restraint Systems, Child Restraint Systems and ISOFIX Child Restraint Systems”, 24 February 2005.

UN ECE Regulation No 145, “Uniform provisions concerning the approval of vehicles with regard to ISOFIX anchorage systems ISOFIX top tether anchorages and i-Size seating positions [2019/2142]”, 20 Jun 2023

Euro NCAP Assessment Protocol – Child Occupant Protection, Version 8.0, 15th October 2021.

ANNEX I

CRS REFERENCE LIST

| CRS Installation Assessment | | | | | | |
|-----------------------------|-------------|---------------------------------|--|--|-----------|-----------|
| Reference List | Category | CRS | | | Direction | Interface |
| | <85cm | Joie i-Gemm 3 | | | Rwd | B _ _ _ |
| | <85cm | Joie i-Gemm 3 + Joie i-base 2 | | | Rwd | _ I L _ |
| | 40-105 cm | Joie Steadi | | | Rwd | B _ _ _ |
| | 76-105 cm | Joie Steadi | | | Fwd | B _ _ _ |
| | 76-150 cm | Joie Elevate | | | Fwd | B _ _ _ |
| | 40-105 cm | Nuna TodI Next + Nuna Base Next | | | Rwd / Fwd | _ I L _ |
| | 40-105 cm | Recaro Salia | | | Rwd / Fwd | _ I L _ |
| | 40-105 cm | Chicco Seat 3 Fit I-Size Air | | | Rwd / Fwd | _ I L _ |
| | 40-125 cm | Joie i-Spin Grow | | | Rwd / Fwd | _ I _ S |
| | 100-150 cm | Cozy N Safe Augusta i-Size | | | Fwd | B I _ _ |
| | 100-150 cm | Recaro Mako Elite 2 | | | Fwd | B I _ _ |
| OEM | <85 cm | XXXX | | | | |
| | 76 - 105 cm | XXXX | | | | |
| | Q 6 | XXXX | | | | |
| | Q 10 | XXXX | | | | |

ANNEX II

MANIKIN C6 AND C10

PRODUCT SPECIFICATION

ASEAN-C6

Consist of a head, torso assembly, upper and lower arms (left and right) and upper and lower legs (left and right).

Material : Thermoplastics and Stainless Steel
Age : 6 years old (ASEAN population)
Percentile : 50th Percentile

ASEAN-C6

| | |
|-----------------------------|--------------------|
| Weight | 19.60 kg \pm 1 |
| Stature Height | 114.50 cm |
| Sitting Height | 61.00 cm \pm 0.5 |
| Head Breadth | 15.00 cm \pm 0.5 |
| Head Length | 17.00 cm \pm 0.5 |
| Shoulder Breadth (Acromial) | 28.00 cm \pm 0.5 |
| Hip Breadth | 24.50 cm \pm 0.5 |
| Knee Length | 36.00 cm \pm 0.5 |

Reference: Aschul Zaki, et al., 2020; Alhammad Saqidin et al., 2021

Reference:
Rahmad Sidi, et al., 2020. Anthropometric Data of ASEAN Adults and Children for ASEAN NCAP. ACCT Smart Solutions (SI-BRO). ISBN: 979-100-45940-0-0.
Alhammad Saqidin et al., 2021. Development of Anthropometric Child Manikin Using Anthropometric Data CITA. And. Development ASEAN Children. Journal of The Society of Automotive Engineers Malaysia, 5(2), 166-175.



ASEAN CHILDREN ANTHROPOMORPHIC TEST MANIKIN

PRODUCT SPECIFICATION

ASEAN-C10

Consist of a head, torso assembly, upper and lower arms (left and right) and upper and lower legs (left and right).

Material : Thermoplastics and Stainless Steel
Age : 10 years old (ASEAN population)
Percentile : 50th Percentile

ASEAN-C10

| | |
|-----------------------------|--------------------|
| Weight | 30 kg \pm 1.5 |
| Stature Height | 137.00 cm |
| Sitting Height | 70.50 cm \pm 0.5 |
| Head Breadth | 16.00 cm \pm 0.5 |
| Head Length | 17.50 cm \pm 0.5 |
| Shoulder Breadth (Acromial) | 33.50 cm \pm 0.5 |
| Hip Breadth | 30.00 cm \pm 0.5 |
| Knee Length | 45.00 cm \pm 0.5 |

References: Mohd Zaki, et al., 2020; Ahmad Tajudin et al., 2021

References:
Mohd Zaki, et al., 2020. Anthropometric Data of ASEAN Adults and Children for ASEAN NCAP. ACTT Smart Systems Sdn Bhd. ISBN: 978-602-43622-0-0.
Ahmad Tajudin et al., 2021. Development of Regional Child Restraints using Anthropometric Data of 4- and 10-year-old ASEAN Children. Journal of the Society of Automotive Engineers Malaysia. 3(2): 164-175.



ASEAN CHILDREN ANTHROPOMORPHIC TEST MANIKIN

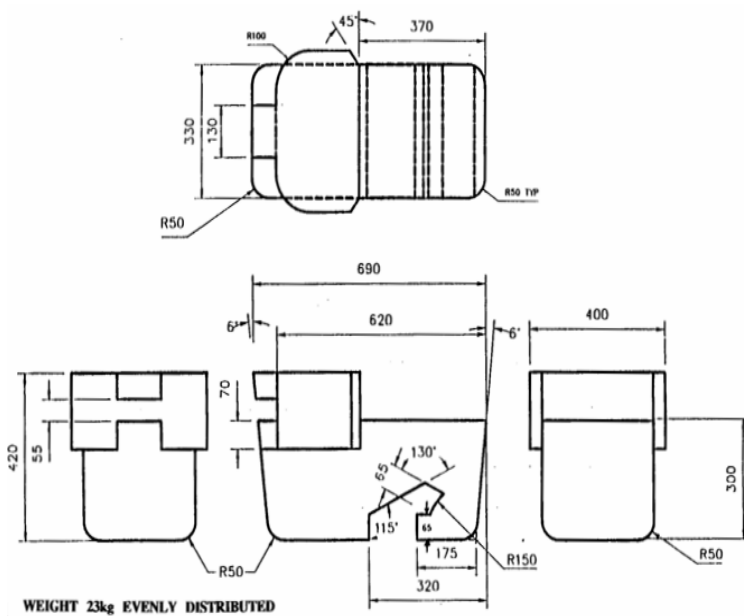
ANNEX III

ANGLE MEASURING DEVICE

A 9 kg articulated steel device used to measure the angle between the seat and the backrest. Extract taken from pr EN1888:2012: Child care articles - Wheeled child conveyances – Safety requirements and test methods.

ANNEX IV

GABARIT SPECIFICATION



All dimensions are in mm

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