Ministry of Transportation and Communications

Taiwan New Car Assessment Program (TNCAP)

Second Version

2.2 Assessment Protocol – Child Occupant Protection

V2.1
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TABLE OF CONTENTS

2.2.1 Vehicle Based Assessment

All vehicle based assessments will be only performed on vehicles that meet the relevant fitment requirements at the time of assessment. 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 optional seat rows and/or floor storage compartments, the assessment will be based on the worst performing configuration.

2.2.1.1 Preconditions

2.2.1.1.1 Provision of Three-point Seat Belts

If any passenger seat is not equipped with (at least) three-point lap and diagonal seatbelts, 0 points shall be awarded for the vehicle based assessment.

2.2.1.1.2 Vehicle Handbook Information

Consumers must be able to rely on the information given in the vehicle handbook to determine which CRS suits them and their children best. The information provided shall clearly state what is, and moreover, what is not possible in terms of installing child restraint systems on the different seating positions in the vehicle.

The vehicle handbook must detail, either in tabular format or with the use of pictograms, the CRS categories (Universal, ISOFIX and i-Size as defined in the Vehicle Safety Testing Directions "48-2, Seat Belt Anchorages") that are suitable or not suitable for installation for each passenger seating position. The information must explicitly state which CRS weight and size groups can be installed on each passenger seating position. Where a seating position can accommodate all Universal categories (group 0, 0+, I, II and III), U may be used. For seating positions that do not cover all CRS groups, the handbook must indicate which groups are and are not covered. Where any of the applicable information is not present, the CRS installation and vehicle based assessments will not be performed and 0 points shall be awarded in these areas. It is acceptable for the information to be annexed in the vehicle handbook or provided on a permanent website provided that clear references are provided in the vehicle handbook.

Where the CRS information is provided according to the current Vehicle Safety Testing Directions "48-2, Seat Belt Anchorages," it must be clear which CRS weight and size groups can be installed on each passenger seating position beyond the first row.

Where the table is used for Universal, ISOFIX and i-Size CRS, Section 2.2.1.1.2.1 to 2.2.1.1.2.3 must be met.

2.2.1.1.2.1 Universal (Belted) CRS Table

The Universal CRS table must clearly detail on which seating positions a Universal CRS can be installed (and not installed) using the vehicle's seatbelt. This is to be done for every Universal CRS weight group, using the following key of letters to be used in the table:

U: Suitable for "Universal" category restraints approved for use in this weight group. U(*) or U(R) will also be permitted provided that there is an accompanying key.

UF: Suitable for forward-facing "Universal" category restraints approved for use in this weight group.

L: Suitable for particular child restraints given on attached list. These restraints may be of the "Specific vehicle", "Restricted" or "Semi-universal" categories.

B: Built-in restraint approved for this weight group.

X: Seat position not suitable for children in this weight group.

2.2.1.1.2.2 ISOFIX CRS Table

The ISOFIX CRS table must clearly detail which seating positions can be used (and not used) for installing an ISOFIX CRS. This is to be done for every ISOFIX CRS size class and/or type of fixture using the following key of letters to be used in the table:

IUF: Suitable for ISOFIX forward child restraints systems of Universal category approved for use in the weight group.

IL: Suitable for particular ISOFIX child restraint systems (CRS) given in the attached list. These ISOFIX CRS are those of the "specific vehicle", "restricted" or "semi-universal" categories. IL-SU will also be permitted provided that there is an accompanying key.

X: ISOFIX position not suitable for ISOFIX child restraint systems in this weight group and/or this size class.

2.2.1.1.2.3 i-Size CRS Table

The must clearly detail which seating positions can be used for installing an i-Size CRS using the following key of letters to be used in the table:

i-U / i-UF: Suitable for i-Size "universal" CRS forward and/or rearward facing.

X: Seating position not suitable for i-Size "universal" CRS.

2.2.1.1.2.4 Airbag Disabling

(1) Where a passenger frontal airbag is fitted (both front and rear seats if applicable) all CRS tables in the vehicle handbook must clearly indicate that when these passenger airbags are active the seat is NOT suitable for any rearward facing CRS. This is to be done with the use of either two

separate columns in the relevant tables, Universal, ISOFIX and i-size where appropriate. One column shall indicate the CRS installation options with the airbag ON and the second column with the airbag OFF. Alternatively, pictograms may be used to indicate the airbag status and equivalent readiness of the passenger seat for accommodating CRS providing the pictograms meet the requirements of Section 2.2.1.5.

Table example:

	Rear Outboard Seats		Center Rear Seats
	Airbag Activated	Airbag Deactivated	
Group 0	X	U	U
Group 0+	X	U	U
Group I	X	U	U
Group II	U	U	U
Group III	U	U	U

(2) Where a vehicle is equipped with a low risk deployment frontal airbag, it is not necessary to deactivate the airbag but there must be information in the handbook indicating that this airbag can remain active when installing a RWF CRS. A clear explanation as to why it is safe for the airbag to remain enabled must also be provided in the handbook. The vehicle manufacturer must provide convincing data to TNCAP to show that the frontal airbag can indeed be considered as low risk.

2.2.1.2 Gabarit Installation on All Passenger Seats

Where the 2nd row outboard seats are in compliance with the requirements in the Vehicle Safety Testing Directions "48-2 Seat Belt Anchorages" 7.2.1 and meet the additional requirements specified below, 1 point shall be awarded. Where, in addition, all other passenger seats comply, excluding those in the first row, an additional 1 point shall be awarded. For gabarit installations on the 3rd row seats, it is acceptable to move or fold the 2nd row seats to enable installation provided the vehicle handbook instructs the user to do so.

2.2.1.2.1 Additional Requirements for Gabarit Installation

(1) Once the belt is correctly routed around the Gabarit fixture, it shall be possible to draw a further 150mm of belt webbing from the reel.

(2) 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 2.2.1.5 need not be met to qualify for this award, but the airbag disabling equipment must be standard and the requirements of 2.2.1.1.2.4 (1) must also be met.

(3) In the case of an adult seat belt that is capable of being switched from an

emergency locking retractor (ELR) to an automatic locking retractor (ALR), clear advice, obvious to the user, about how the ALR feature shall be used needs to be present on any labels attached to the seat belt (information given in the handbook is not sufficient as reading of the handbook cannot be assumed for all users).

2.2.1.3 i-Size and Top Tether Marking

2.2.1.3.1 Preconditions

Where i-Size seating positions are offered, they will be assessed on variants fitted with optional floor storage compartments and need to comply with the following requirements to be eligible for scoring the available points specified below.

(1) The location of each i-Size anchorage must be marked.

(2) The location of each top tether anchorage must be marked and include both text and a pictogram.

(3) The i-Size markings must show the relevant i-Size pictogram detailed in the Vehicle Safety Testing Directions “48-2, Seat Belt Anchorages.” It is allowed to add the word ISOFIX adjacent to the i-Size pictogram.

(4) All markings must be of conspicuous design and both the text and pictogram must have colors which contrast with their background.

(5) All markings must be permanently visible. Flag type labels are not acceptable.

(6) All markings must be permanently attached to the vehicle.

(7) The presence of floor storage compartments, optional or otherwise, must not preclude the installation of i-Size CRS or require the user to check compatible vehicle lists.

(8) Floor storage compartments must satisfy the requirements of the Vehicle Safety Testing Directions “48-2, Seat Belt Anchorages.” They shall be tested with the lid in the closed position. No preparatory actions are permitted, such as opening the lid or the additional of storage space fillers.

2.2.1.3.2 i-Size Availability

Where the vehicle offers two or more i-Size seating positions that are able to accommodate the ISO/B2 i-size fixture, defined in the Vehicle Safety Testing Directions “48-2, Seat Belt Anchorages,” 2 points are awarded.

2.2.1.3.3 Two i-Size Seating Positions

Where the vehicle is provided with two fully independent, correctly marked i-Size seating positions (Section 2.2.1.3.1) that can correctly accommodate i-Size CRS including top-tether (2.2.1.3.2), 1 point shall be awarded. It will not be acceptable for any anchorages and the top-tether to be shared between seating

positions.

2.2.1.4 Two or More ISO/R3 Positions

Where two or more seating positions are suitable for fully independent use with the largest size of rearward facing (Class C) ISOFIX CRS, Fixture (CRF) ISO/R3, 1 point shall be awarded. The vehicle handbook must inform the user that the vehicle is capable of accommodating the ISO/R3 fixture.

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.

2.2.1.5 Passenger Airbag Warning Marking and Disabling

If the vehicle is fitted with a passenger's frontal protection airbag as standard or optional, it must be marked with a permanent airbag warning label that meets the requirements of the Vehicle Safety Testing Directions "Vehicle Specifications" to be eligible for scoring points under this section. For automatic switches, 4 points will be awarded when the below requirements in sections 2.2.1.5.1 and 2.2.1.5.3 are met. For manual switches, 2 points will be awarded when requirements for manual switches in sections 2.2.1.5.1 and 2.2.1.5.2 are met. For vehicles not equipped with an airbag switch, 2 points will also be awarded. If no passenger airbag is available on the entire model range, 2 points will be awarded.

2.2.1.5.1 General Requirements for Automatic and Manual Switches

(1) Any text, labelling and instructions in relation to airbag disabling must be permanently attached to the vehicle.

(2) The information provided must be clear, without reference to the vehicle's handbook or other source.

(3) The information and warnings must be provided in such a way that they are visible for both the driver and front seat passenger, showing the status of the airbag.

(4) 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. Supplementary warnings will be ignored.

(5) The AIRBAG ON pictogram must conform to the warning label requirements for seats other than the front row seats, as set out in the Vehicle Safety Testing Directions "Vehicle Specifications," as shown below:

(6) The AIRBAG OFF pictogram must be based upon that detailed in the Vehicle Safety Testing Directions "Vehicle Controller Symbol" requirements, as shown below:

(7) Slight alterations to the ON/OFF pictograms above are acceptable provided that the basic geometry of the pictogram remains the same. Mirroring and monochrome colors are acceptable.

(8) If the information to indicate that the airbag is enabled is provided by a visual signal, the signal is only required to be shown for a period of 60 seconds after the ignition is switched on.

(9) Information to indicate that the airbag is disabled must be permanently displayed, when the ignition is on and the seat is occupied.

(10) 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.

2.2.1.5.2 Additional Requirements for Manual Switches Only

(1) Where a manual switch is used, it must be labelled with the words ‘Passenger AIRBAG OFF/ON’ and the same pictograms detailed above indicating ON and OFF.

(2) The individual switch positions must be marked with the same pictograms that are used to indicate the airbag status. The two positions must be marked with the text ON & OFF along with the corresponding pictogram.

(3) Where the two switch positions are marked not on the switch but on an adjacent label, the label must be sufficiently close to the switch, such that the user clearly associates one with the other.

(4) Where a hardware switch is used, it must be accessible and clearly visible when installing CRS. For example, where a switch is located in the glove box, the presence of the switch must be clearly highlighted either by switch itself or an additional, permanent, label when the lid is open. For example, the switch may not be located on the driver’s side of the vehicle.

(5) It must not be possible for a rearward facing child; restrained on the front

passenger seat; to operate the switch at any time.

(6) Where a software based switch is used, clear instructions detailing 'Passenger AIRBAG OFF/ON' (no abbreviations) must be presented in the menu at the same time as the corresponding pictograms used for the status indicator.

(7) If, with the ignition on and with engine running or not, the airbag status can be changed, the system must react correctly to the change immediately. Systems will be checked once the vehicle diagnostics/system checks have been completed.

2.2.1.5.3 Additional Requirements for Automatic Switches Only

(1) The system must ensure that the airbag is OFF for ANY rearward facing CRS and obviate any risk associated with airbag deployment.

(2) If, with the ignition on and with engine running or not, the airbag status can be changed, the entire system must immediately react to the change correctly. Up to 10 seconds will be permitted from the change of occupant status to the corresponding signal from the airbag status indicator. Systems will be checked once the vehicle diagnostics/system checks have been completed.

(3) The system must automatically re-activate the airbag when the seat is occupied by a person who is not required to use a child restraint.

(4) The method for assessing automatic systems is detailed in following procedure

(A) The technical service must check if the minimum requirements are followed:

(a) Airbag is OFF when using a Rearward Facing CRS

(b) Airbag is ON for a 5th occupant and above

The rest (forward facing CRS + child alone) is the responsibility of the OEM and there are different strategies. The following requirements and test matrix aim to cover a variety of possible occupant sizes and installation modes.

(B) Requirement for Airbag Status

	Requirement for Airbag Status					Can it be done by technical service?	
Occupant	Rearward-facing CRS (Group 0/0+/1/2)	Forward-facing CRS (=Group 1)	High-back booster seat (=Group 2/3)	Booster cushion (=Group 3)	No CRS	The system does not need a real human being	The system needs a real human being

new born	OFF	forbidden	forbidden	forbidden	forbidden	Yes	No
1.5 yo	OFF	?(1)	forbidden	forbidden	forbidden	Yes	No
3 yo	OFF	?(1)	?(1)	forbidden	forbidden	Yes	No
6 yo	OFF	?(1)	?(1)	forbidden	forbidden	Yes	No
10 yo	N/A*	N/A	?(1)	?(1)	forbidden	Yes	No
5th					ON	Yes	Yes
50th					ON	Yes	Yes
95th					ON	Yes	Yes

Note:

Shaded area = Mandatory minimum requirements

N/A*: in theory it is possible to have a group 3 rwd facing CRS but none are known at present to exist.

(1) It is the decision from the OEM. There is no mandatory status requirement, however if strategy is airbag ON OEM shall show that this does not lead to higher risk than with airbag OFF.

For CRS installations involving a child the weight range for the various groups for which the CRS is approved will be adhered to.

(C) Test Matrix

	Installation to checks				
Occupant	Rearward-facing CRS (Group 0/0+/1/2)	Forward- facing CRS (=Group 1)	High-back booster seat (=Group 2/3)	Booster cushion (=Group 3)	CRS-free
new born	#1 - JOIE I-JEMINI (Installed with Seat Belt)	forbidden	forbidden	forbidden	forbidden

1.5 yo	#1 - JOIE I-JEMINI (Installed with Seat Belt) #2 - JOIE I-HARBOUR (Installed with ISOFIX + Support Leg) (If front row seats fitted with ISOFIX)	#3 - Chicco Eletta Comfort All Stages Car Seat	forbidden	forbidden	forbidden
3 yo		#3 - Chicco Eletta Comfort All Stages Car Seat #4 - Chicco Seat 4 Fix ISOFIX Car Seat (Installed with ISOFIX + Top Tether) (If front row seats fitted with ISOFIX)	#5 - PERO Luce90 (Installed with Seat Belt) #6 - TOYOTA/LEXUS JUNIOR SEAT2 (Installed with Seat Belt + ISOFIX) (If front row seats fitted with ISOFIX)	forbidden	forbidden

	Installation Inspection				
Occupant	Rearward-facing CRS (Group 0/0+/1/2)	Forward-facing CRS (=Group 1)	High-back booster seat (=Group 2/3)	Booster cushion (=Group 3)	CRS-free

6 yo			#5 - PERO Luce90 (Installed with Seat Belt) #6 - TOYOTA/LEXUS JUNIOR SEAT2 (Installed with Seat Belt + ISOFIX) (If front row seats fitted with ISOFIX)	#7 - TOYOTA/LEXUS JUNIOR SEAT2 cushion (Installed with Seat Belt)	forbidden
10 yo	not tested	not tested	#5 - PERO Luce90 (Installed with Seat Belt) #6 - TOYOTA/LEXUS JUNIOR SEAT2 (Installed with Seat Belt + ISOFIX) (If front row seats fitted with ISOFIX)	#7 - TOYOTA/LEXUS JUNIOR SEAT2 cushion (Installed with Seat Belt)	forbidden

	Installation Inspection				
Occupant	Rearward-facing CRS (Group 0/0+/1/2)	Forward-facing CRS (=Group 1)	High-back booster seat (=Group 2/3)	Booster cushion (=Group 3)	CRS-free
5th					real human
50th					real human
95th					real human

Installation of CRS listed in the table above and settings are done according to "Installation of TNCAP CRS Listed Child Restraint Systems" in the Testing Protocol – child occupant protection.

List of child seats needed	CRS on the CRS list?
#1 –JOIE I-JEMINI (Installed with Seat Belt)	Yes
#2 –JOIE I-HARBOUR (Installed with ISOFIX + Support Leg)	Yes

#3 –Chicco Eletta Comfort All Stages Car Seat (Universal)	Yes
#4 –Chicco Seat 4 Fix ISOFIX Car Seat (Installed with ISOFIX + Top Tether)	Yes
#5 - PERO Luce90 (Installed with Seat Belt)	Yes
#6 - TOYOTA/LEXUS JUNIOR SEAT2 (Installed with Seat Belt + ISOFIX)	Yes
#7 - TOYOTA/LEXUS JUNIOR SEAT2 cushion (Installed with Seat Belt)	Yes

ISOFIX CRS (#3, #4, #6) only if ISOFIX on Front seat

2.2.1.6 Integrated CRS

If the vehicle is fitted with integrated CRS as standard, except for the front row seats, 3 points shall be awarded.

2.2.2 Installation of Child Restraints

TNCAP rewards vehicles that can accommodate a broad variety of child restraints available on the Taiwanese market. For this purpose, a limited number of popular CRS are installed in the vehicle. The groups and recommended installation modes of the CRS selected represent those commonly most observed on the market, including some Universal, ISOFIX and i-Size seats. The TNCAP CRS List (hereafter the CRS List), how it is compiled and updated is explained in section 2.2.2.1. Where a vehicle is available with optional seat rows on any variant, the installation assessment will be based on a vehicle fitted with the optional seats.

2.2.2.1 CRS List and Recommended CRS

2.2.2.1.1 TNCAP CRS List

2.2.2.1.1.1 Procedure for Selection of TNCAP CRS List

(1) Manufacturers of CRS participating in the TNCAP CRS selection process must ensure the continuous availability of their products in the domestic market until the end of the subsequent year. Validation certificates must remain valid until the end of the following year.

(2) The TNCAP executive agency will select CRS that have successfully passed product inspection according to CNS (Chinese National Standards) and are available in the domestic market. This selection will be based on the weight group and size group specified in the Euro NCAP CRS List. Domestic CRS manufacturers are encouraged to actively engage in the selection process to contribute to the establishment of the CRS List.

(3) Participating CRS manufacturers must complete the "Taiwan New Car Assessment Program (TNCAP) Child Restraint Systems Selection Application and Consent" form and the "Testing/Calibration Service Application Form" provided by the Automotive Research and Testing Center (ARTC). They are obligated to actively apply to both the technical service and the TNCAP executive agency. Subsequently, the

technical service will retrieve and compute the following test data for evaluation by the implementing body. In the case of i-Size CRS, manufacturers must additionally provide evidence of compliance with UN R129 to participate in the i-Size CRS selection process.

- Chest acceleration (resultant 3ms acceleration)
- Chest Z-axis acceleration (resultant 3ms acceleration)
- Buckle release force difference (difference between pre- and post-dynamic impact test)
- Length adjustment force of the length adjustment device
- Energy absorption

(4) In accordance with the following selection method, the TNCAP executive agency evaluates and calculates the score rate of each product based on the test data provided by the technical service, rounding each score and score rate to the first decimal place.

<table>
<tr><td rowspan="2">No.</td><td rowspan="2">Assessment Item</td><td colspan="2">Score Assignment</td><td colspan="2">Weighted Score (Score × Weight)</td></tr>
<tr><td>Performance</td><td>Score</td><td>Forward Installation</td><td>Rearward Installation</td></tr>
<tr><td rowspan="2">1</td><td rowspan="2">Chest acceleration (resultant 3ms acceleration)</td><td><41g</td><td>5</td><td rowspan="2">100
(5×20)</td><td rowspan="2">60
(5×12)</td></tr>
<tr><td>41-55g</td><td>Linear Interpolation</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">Chest Z-axis acceleration (resultant 3ms acceleration)</td><td><11g</td><td>5</td><td rowspan="2">20
(5×4)</td><td rowspan="2">60
(5×12)</td></tr>
<tr><td>11-30g</td><td>Linear Interpolation</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">Buckle release force difference (difference between pre- and post-dynamic impact test)</td><td><10N</td><td>5</td><td colspan="2" rowspan="2">10
(5×2)</td></tr>
<tr><td>10-40N</td><td>Linear Interpolation</td></tr>
<tr><td rowspan="2">4</td><td rowspan="2">Length adjustment force of the length adjustment device</td><td><1kgf</td><td>5</td><td colspan="2" rowspan="2">5
(5×1)</td></tr>
<tr><td>1-5.1kgf</td><td>Linear Interpolation</td></tr>
<tr><td rowspan="2">5</td><td rowspan="2">Energy absorption</td><td><10g</td><td>5</td><td colspan="2" rowspan="2">5
(5×1)</td></tr>
<tr><td>10-60g</td><td>Linear</td></tr>
<tr><td colspan="6">Score Rate = (Total of weighted scores for each category / Total weighted score) × 100%</td></tr>
</table>

(5) In accordance with the TNCAP CRS selection mechanism, the CRS with the highest score rate within each weight/size group is chosen and added to the TNCAP CRS list. This list is incorporated into the TNCAP

protocols and disclosed on the TNCAP website. In instances where the same score rate is achieved, the sales volume declared by the applicant manufacturers of those products for that year may serve as a reference for CRS List selection.

(6) The TNCAP executive agency conducts regular annual reviews of the effectiveness of the CRS List to ensure that the listed CRS remain available in the domestic market until the end of the following year and that their validation certificates remain valid until the subsequent year's end. If any discrepancies are identified regarding the fulfillment of the aforementioned criteria, the manufacturers will be ineligible for participating in TNCAP CRS selection and inclusion in the CRS List.

(7) The TNCAP executive agency and technical service are prohibited from utilizing the data obtained in this operation for purposes beyond the scope of the original authorization and consent.

2.2.2.1.1.2 CRS List

To assess whether vehicles are capable of accommodating CRS of different weight/size groups, the CRS List established using the CRS selection procedure is utilized to evaluate the vehicle's compatibility with various types of CRS installations.

Universal Belted CRS

CRS	Group	Installation		Type
JOIE I-JEMINI	Group 0+	Belt mounted	B_ _ _	U
Chicco Eletta Comfort All Stages Car Seat	Group I	Belt mounted	B_ _ _	U/UF
PERO Luce90	Group II/III	Belt mounted	B_ _ _	U/UF

ISOFIX CRS

CRS	Group	Installation		Type
JOIE I-HARBOUR	Group 0+	ISOFIX mounted with base & support leg Rearward facing	_ I L _	ISO/R1
Chicco BI-SEAT	Group 0+/I	ISOFIX mounted with base & support leg Rearward facing	_ I L _	ISO/R3
Chicco Seat 4 Fix ISOFIX Car Seat	Group I	ISOFIX with Top tether mounted	_ I _ S	ISO/F2X

TOYOTA/LEXUS JUNIOR SEAT2	Group II/III	ISOFIX mounted Forward facing	B I _ _	Vehicle List

i-Size CRS

CRS	Size	Installation		Type
JOIE I-HARBOUR	67cm-105cm ≤18kg	ISOFIX mounted with base & support leg Rearward facing	_ I L _	i-Size
	>15 months- 105cm ≤18kg	ISOFIX mounted with base & support leg Forward facing		
JOIE I-PIVOT 360	61cm-105cm ≤18kg	ISOFIX mounted with base & support leg Rearward facing	_ I L _	i-Size ISO/R2
Nuna AACE lx	100cm-135cm	ISOFIX mounted, without side bumpers	_ I L _	i-Size ISO/B2

2.2.2.1.1.3 CRS List Updating Procedure

(1) The implementing body conducts regular annual reviews of the CRS List's effectiveness. If any CRS listed is no longer available in the domestic market, it undergoes re-evaluation based on the associated weight/size group. The one with the highest score rate replaces the original CRS. The updated CRS List is intended to apply to the vehicle models assessed by TNCAP in the following year.

(2) Shall there be revisions to TNCAP protocols involving additions or removals of weight groups or size groups in the CRS List for child restraint systems, the implementation timeline for the CRS List aligns with the effective date of the new protocols.

2.2.2.1.2 Manufacturer’s Recommendation

The overall responsibility of the vehicle manufacturer for safe transport of children is also reflected in the recommendation that the vehicle manufacturer shall make regarding the CRS to be used in the vehicle. Hence, besides ensuring that vehicles that can accommodate a broad variety of CRSs, TNCAP rewards vehicle manufacturers that recommend suitable CRS for each mass group and/or size range.

For CRS recommended by vehicle manufacturers, the implementing body will conduct subsequent tests related to child protection, based on the equipment matrix table. The costs of these tests shall be covered by the assessed vehicle manufacturers.

Any recommended CRS must meet the following requirements:

(1) The CRS must be recommended by the vehicle manufacturer, and information about the recommended CRS shall be included in the vehicle handbook. This information must include, at the very least, the weight group and/or size group of the recommended CRS, the brand, model, and commercial name of the product.

(2) Where the recommended CRS are not on the CRS List, the CRS must be available for purchase by the public from both vehicle dealers and independent retail outlets, or other designated locations specified by vehicle manufacturers. If purchased from a dealer, the CRS system must be available to the public within 15 working days of an order being made.

(3) The recommended CRS must undergo inspection by the CNS. However, integrated CRS may alternatively comply with the testing reports of UN R44 or UN R129.

(4) TNCAP verifies the problem-free installation of manufacturer's recommended CRS for Q6 and Q10 on the 2nd row rear outboard positions only. The installations will be performed using the CRS installation mode and settings/adjustments recommended by the vehicle manufacturer for dynamic testing in the same way as it does top pick list seats but a separate score will be attributed (see section 2.2.2.3). The other recommended CRS will not be installed.

2.2.2.1.3 CRS for dynamic tests

(1) The Q6 dummy shall be seated in an appropriate CRS for a six year old child or a child with a stature of 125cm. This will be the CRS recommended by the vehicle manufacturer in the vehicle handbook. If there is no recommendation made in the vehicle handbook for a six year old child a suitable CRS will be chosen from the CRS List.

(2) The Q10 dummy shall be seated on a booster cushion only. This will be the booster cushion recommended by the vehicle manufacturer in the vehicle handbook. Where the vehicle manufacturer recommends, in the vehicle handbook, a high back booster seat with detachable backrest, it will be used without the backrest. If there is no recommendation made in the vehicle handbook or a booster seat with a non-removable backrest is recommended, a suitable booster cushion will be randomly selected from the market. Booster cushions will be accepted for use in the tests provided that when the Q10 dummy is seated on the booster, no part of the head is higher than 800mm vertically above the Cr-point. If the booster cushion is approved under CNS 11497, then this limit will not be applicable. Booster cushions

that have CNS 11497 approval will not need to meet this requirement.

(3) Where a vehicle is equipped with an integrated CRS covering the Q6 and/or Q10 on the rear outboard 2nd row test positions, the integrated CRS will be used in the dynamic tests. Integrated CRS will be used even if they are optional equipment. Where a vehicle is equipped with only one integrated CRS on either outboard position covering both or only one of two child ages, the integrated CRS will be used only where applicable. If only one integrated CRS is present, the vehicle manufacturer shall recommend a suitable CRS to accommodate the other child dummy. Where this is not the case the steps detailed in (1) and/or (2) will be followed.

2.2.2.2 Installation Matrix

The Vehicle Based Assessment (Section 2.2.1) determines the eligibility for scoring for the combinations of CRS's and seating positions in the vehicle. The following provides an overview of the relationship between the Vehicle Based Assessments and the Installation Matrix.

2.2.2.2.1 Universal (Belted) CRS

Seating positions must meet the extended Gabarit check (Section 2.2.1.2) to be included in the Installation Matrix for the Universal CRS's. In addition, these seating positions must be marked with 'U' or 'UF' in the Universal CRS table. A combination of Universal CRS group and seating position that do not meet these requirements will automatically fail the CRS installation assessment for Universal CRS of that group on the CRS List. Where a vehicle can be equipped with optional inflatable seatbelts or other advanced adult restraint systems, this equipment will not be assessed provided that the vehicle handbook clearly states that CRS cannot be installed when this equipment is present. The vehicle manufacturer is asked to contact TNCAP in advance of the vehicle assessment to confirm this exemption.

2.2.2.2.2 i-Size CRS

i-Size seating positions must meet the i-Size marking requirements (Section 2.2.1.3.1) to be included in the Installation Matrix for the i-Size/ISOFIX CRS's. In addition, these seating positions must be marked with 'i-U' in the i-Size CRS table ('i-UF' will be accepted only for seating positions equipped with airbags). A seating position that does not meet these requirements will automatically fail the CRS installation assessment for i-Size CRS on the CRS List.

2.2.2.2.3 ISOFIX CRS

ISOFIX seating positions must either meet the i-Size marking requirements (Section 2.2.1.3.1) or simply be labelled according to the ISOFIX marking requirements in Regulation 145 to be included in the Installation Matrix for the

ISOFIX CRS's. In addition, these seating positions must be marked with 'IL' or 'IUF' in the ISOFIX CRS table. A combination of ISOFIX size class and seating position that does not meet these requirements will automatically fail the CRS installation assessment for ISOFIX CRS of that size class on the CRS List.

ISO/R3 size class seats listed on the Top Pick list will be exempted from installation on any seating position when the CRF ISO/R3 cannot be installed according to section 2.2.1.4 and is clearly identified with an "X" in the ISOFIX CRS table as unsuitable for this size. When this is the case, the combination of ISO/R3 size class CRS given installation score on that seating position will be awarded the available points (see section 2.2.2.3).

2.2.2.2.4 Passenger Airbag Warning Marking and Disabling

Seating positions which have a frontal passenger airbag present must meet the requirements for Passenger Airbag Warning Marking and Disabling (Section 2.2.1.5) to be included in the Installation Matrix. A seating position that does not meet these requirements will automatically fail the CRS installation assessment for all rearward facing Universal belted, ISOFIX and i-Size seats on the CRS List for these seating positions.

2.2.2.2.5 Integrated CRS

Vehicle manufacturers are required to furnish assessment reports demonstrating compliance with either UN R44 or UN R129 standards. Where an integrated CRS is offered as standard and indicated as such in the vehicle handbook, this seating position will automatically pass the assessments and no installation check is required with the CRS List-CRS of the weight/size group covered by the integrated CRS.

2.2.2.3 CRS Installation Scoring

Each CRS-seating position combination from the Installation Matrix will be used for scoring. When all of the requirements are met for a given CRS-seating position, it is awarded the points available and is shown as a "Pass".

ISO/R3 size class exemptions (see section 2.2.2.2.3) will be treated as "Exemption" to calculate the installation score.

Where the vehicle based assessment result prevented scoring or where the requirements are not met and the requirements on which the CRS installation failed are considered to be safety critical, the CRS-Seating position combination is considered a "Fail". When a non-safety critical requirement is not met, it is considered to be a "Partial Fail" (P Fail). For both cases, "Fail" and "P Fail", no points are awarded for the CRS-seating position combination, however the results will be differently communicated.

The score for each individual CRS on the installation matrix, CRS_i, will be

calculated by dividing the number of successful installations in the vehicle by the total number of suitable passenger seating positions in the vehicle.

Table 1. Installation score for individual CRS on the CRS List

CRS_i	Installed in	CRS_i Installation Score
Universal	All passenger positions excluding first row	Number of "Pass" / All passenger positions (excluding first row)
ISOFIX	All ISOFIX or i-Size positions excluding first row	Number of "Pass" / All ISOFIX and/or i-Size positions (excluding first row)
i-Size	All i-Size positions excluding first row	Number of "Pass" / All i-Size positions (excluding first row)

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

Universal CRS 4 points

ISOFIX CRS 2 points

i-Size CRS 4 points

The score for each CRS category is calculated by taking the average of the CRS_i scores in the category and applying the percentage to the points allocated for this category of CRS.

Where the manufacturer recommends appropriate CRS for all child statures up to and including 135cm (section 2.2.2.1.2) 1 point will be awarded. An additional 1 point will be awarded where there is a recommended CRS for statures up to and including 150cm. If the recommended CRS are to be used in the dynamic tests they MUST meet the installation requirements on the 2nd row rear outboard positions.

The maximum available score for the installation assessment will be 12 points and is independent of the number of seats on the top pick list. If there is no recommendation for CRS, the maximum available score for CRS fitment will be 10 points.

2.2.2.3.1 Rounding

The resulting point scores per CRS is expressed as numbers, with 3 decimal points. The total score for CRS installation is the sum of the points for fitment all CRS's.

Table 2. Example of TNCAP CRS List installations

CRS Installation Assessment					Seating Position							Scoring			
					Front	2nd Row			3rd Row						
					Right	Left	Center	Right	Left	Center	Right	Pass	Fail	Exempt	Score
					ISOFIX	i-Size	Belt	i-Size	Belt	N/A	Belt				
Universal	Group 0+	JOIE I-JEMINI	B_ _ _	U	N/A	Pass	Fail	Pass	Pass	N/A	Pass	4	1		80.0%
	Group I	Chicco Eletta Comfort All Stages Car Seat	B_ _ _	U/UF	N/A	Pass	Pass	Pass	Fail	N/A	Fail	3	2		60.0%
	Group II/III	PERO Luce90	B_ _ _	U/UF	N/A	Pass	P Fail	Pass	Fail	N/A	Fail	2	3		40.0%
ISOFIX	Group 0+	JOIE I-HARBOUR	_ I L_	ISO/R1	N/A	Pass	N/A	Pass	N/A	N/A	N/A	2	0		100.0%
	Group 0+/I	Chicco BI-SEAT	_ I L_	ISO/R3	N/A	Pass	Exempt	Pass	N/A	N/A	N/A	2	0	1	100.0%
	Group I	Chicco Seat 4 Fix ISOFIX Car Seat	_ I_ S	ISO/F2X	N/A	Pass	N/A	Pass	N/A	N/A	N/A	2	0		100.0%
	Group II/III	TOYOTA/LEXUS JUNIOR SEAT2	B I_ _	VEHICLE LIST	N/A	Pass	N/A	Pass	N/A	N/A	N/A	2	0		100.0%
i-Size	67-105cm	JOIE I-HARBOUR	_I L_	i-Size	N/A	Pass	N/A	Pass	N/A	N/A	N/A	2	0		100.0%
	>15 months -105cm				N/A	Pass	N/A	Pass	N/A	N/A	N/A	2	0		100.0%
	61-105cm	JOIE I-PIVOT 360	_I L_	i-Size	N/A	Pass	N/A	Pass	N/A	N/A	N/A	2	0		100.0%
	100-135cm	Nuna AACE lx	_I L_	i-Size	N/A	Pass	N/A	Pass	N/A	N/A	N/A	2	0		100.0%

CRS Installation Assessment					Seating Position							Scoring			
					Front	2nd Row			3rd Row						
					Right	Left	Center	Right	Left	Center	Right	Pass	Fail	Exempt	Score
OEM	Group 0+	Maxi Cosi Carbriofix	_I L_	ISO/R1											
	Group I	Maxi Cosi Pearl & FamilyFix	_I L_	ISO/F2X											
	Group II	Takata Maxi Plus	B I_ _	VEHICLE LIST		Pass		Pass				2	0		1.000
	Group III	Takata Maxi Plus	B I_ _	VEHICLE LIST		Pass		Pass				2	0		1.000

Summary	
Universal assessment	2.400
ISOFIX assessment	2.000
i-Size assessment	4.000
OEM assessment	2.000
Total Installation Assessment	10.400

Legend:

Pass : CRS can be installed correctly

P Fail : CRS can be installed correctly but more actions are needed that do not meet the requirements of TNCAP and 0 points are awarded

Fail : safety critical issues exist, 0 points awarded

Exempt : Vehicle handbook or CRS Vehicle list exempt the CRS from being installed on that seating position

N/A : This combination of CRS and seating position is not applicable

2.2.3 Dynamic Assessment

The starting point for the dynamic assessment of child occupant protection is the dummy response data recorded in two different test configurations: frontal impact in offset and side impact. Initially, each relevant body area is given a score based on the measured dummy parameters. These scores can be adjusted after the test based on the defined modifiers.

From the information collected in the two test scenarios, individual test scores are computed for both the Q6 and Q10 dummy. Where a vehicle is available with optional 2nd seat row on any variant, the dynamic assessment will be based on a vehicle fitted with the optional seats.

2.2.3.1 Points 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.

Capping limits are applied to both child dummies and exceeding a capping limit generally indicates unacceptable high risk of injury. Where a dummy measurement has exceeded a capping limit, the score of that entire dummy will be 0 points in the impact in which the limit was exceeded.

2.2.3.2 Criteria and Limit Values

The basic assessment criteria used for frontal impact, with the upper and lower performance limits for each parameter, are summarized below. Where multiple criteria exist for an individual body region, the lowest scoring parameter is used to determine the performance of that region. Injury parameter assessments highlighted in Table 3 and Table 4 will not be evaluated during the rebound phase.

2.2.3.2.1 Precondition

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

2.2.3.2.1.1 Restraint

(1) During the forwards movement of the dummy only, the diagonal belt slips off the shoulder. Where this occurs zero points will be awarded to the dummy. Slipping of the shoulder is when the belt moves below the shoulder joint down the upper arm.

(2) 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.

(3) At any time throughout the impact either the pelvis of the dummy submarines beneath the lap section of the belt or the lap section does not prevent the dummy from moving upwards during rebound and is no longer restraining the pelvis. Where this occurs zero points will be awarded to the dummy.

2.2.3.2.1.2 Ejection

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

(1) 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.

(2) The CRS does not remain within the same seating position or in 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.

2.2.3.2.1.3 Failure of restraint system components

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

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

(2) 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.

2.2.3.2.2 Offset Frontal Impact

2.2.3.2.2.1 Head Contact

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

2.2.3.2.2.2 Head excursion modifier

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. The excursion will be measured from the H-point location of the 5th female occupant with the rear seats adjusted in accordance with the Frontal ODB test protocol.

2.2.3.2.2.3 Offset Frontal Impact Criteria

Table 3. Offset frontal impact criteria, limits and available points per body region for Q6, Q10

	Criteria		Performance Limits			Available Points
			Higher	Lower	Capping	
Head Score	HIC_{15} (with hard contact)		500	700	800	4 points
	Resultant 3ms acceleration		60g	80g	80g	
	Head excursion	Q6		550mm	NA	
		Q10	450mm	550mm	NA	
Upper Neck	Tension Fz		1.7kN	2.62kN	-	2 points
	Extension My (with head to interior contact)	Q6	NA	36Nm	NA	
		Q10	NA	49Nm	NA	
Chest (T4)	Resultant 3ms acceleration*	Q6	NA	NA	NA	N/A
		Q10	41g	55g	55g	2 points
	Deflection	Q6	30mm	42mm	NA	2 points
		Q10	-	-	NA	N/A
Pelvis	ASIS load		NA	NA	NA	
TOTAL						8 points/dummy

Note: *During impact, chest acceleration peaks caused by the firing of seatbelt pretensioners early in the loading event will be ignored.

2.2.3.2.3 Side Impact

2.2.3.2.3.1 Head contact

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

2.2.3.2.3.2 Side Impact Criteria

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	HIC_{15} (with hard contact)		500	700	800	2 points
	Resultant 3ms acceleration		60g	80g	80g	
Upper Neck	Resultant force	Q6		2.4kN	NA	1 points
		Q10		2.2kN		
Chest (T4)	Resultant 3ms acceleration*			67g	NA	1 points
TOTAL						4 points/dummy

Note: *During impact, chest acceleration peaks caused by the firing of seatbelt pretensioners early in the loading event will be ignored.

The contribution of the Dynamic Score to the Child Occupant Protection Score

is calculated by summing the body scores for the relevant body regions for the Q6 and Q10 in both front and side impact (24 in total).

2.2.4 Two Seaters and Vehicles with Limited Rear Space

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

2.2.4.1 Vehicles with only Two Seats

Per the Road Traffic Safety Rules, children are required to sit in the rear seats of passenger cars. Therefore, two-seater vehicles are exempt from child protection assessment.

2.2.4.2 Vehicles with Limited Rear Space

A vehicle will be deemed as having limited rear space as defined in Section 3.8.2.5 of the COP Testing protocol. Where this is the case, the technical service will confirm that child dummy cannot be installed in the frontal ODB and/or side MDB test without interference from the vehicle.

All assessments will be applied as normal, except the assessment of dynamic performance which will be based on Manufacturers data from test(s) with modified seating settings, as described in the Testing Protocol – COP. Where the manufacturer provides no data zero points will be awarded for the dynamic tests.

A “hybrid rating” would be produced using the adult data from the official full scale test (performed without CRS but with compensation for the reference mass) and the child data from the additional tests. In the final vehicle rating, TNCAP will indicate that it was not possible to install the CRS and/or child dummy with and adult in the normal TNCAP front seat test position.

2.2.5 Scoring & Visualization

2.2.5.1 Scoring

When evaluating vehicles equipped with rear seats, the maximum number of points available for child protection (including vehicles with limited rear space) is 49. The maximum points available in each assessment area is as follows:

	With rear seats
• Dynamic Assessment	24
• Installation of Child Restraints	12
• Vehicle Based Assessments	13

The child protection score will be the sum of all three areas. The tables below summarize the maximum possible score in each (sub) category.

2.2.5.1.1 Normal and Limited Rear Space Vehicles

Category	Total Points (49)

Dynamic Assessment	(24)
Frontal Impact	16
Side Impact	8
Vehicle Based Assessments	(13)
Gabarit Installation on all Passenger Seats	2
i-Size and Top Tether Marking	3
Two or more ISO/R3 Positions	1
Passenger Airbag Warning Marking and Disabling	4 or 2
Integrated CRS	3
CRS Installation Assessment	(12)
Universal seats	4
ISOFIX seats	2
i-Size seats	4
Recommended seats	2

2.2.5.2 Visualization

2.2.5.2.1 Dynamic Protection

The dynamic protection provided to children for each body region is presented visually using colored segments within body outlines. The color used is based on the points awarded for that body region (rounded to three decimal places), as follows:

Number of points available for body region		4 points	2 points	1 point
Green	Good	4.000	2.000	1.000
Number of points available for body region		4 points	2 points	1 point
Yellow	Adequate	2.670 – 3.999	1.335 – 1.999	0.667 – 0.999
Orange	Marginal	1.330 – 2.669	0.665 – 1.334	0.333 – 0.666
Brown	Weak	0.001 – 1.329	0.001 – 0.664	0.001 – 0.332
Red	Poor	0.000	0.000	0.000

2.2.5.2.2 CRS List Installation

The results of the CRS List CRS installation check will be shown in terms of “Pass”, “P Fail”, “Fail”, “Exempt” or “N/A” in tabular format.

2.2.5.2.3 Visualization of CRS List Installation

The website will present the installation results of each top pick CRS in a map of the vehicle. Four possible outcomes will be presented to indicate the following:

- Install without problem

The CRS could be installed on that seating position safely, easily and without any issues.

● Safety critical problem

The CRS could not be installed on that seating position. Issues arose that prevented the CRS from being installed correctly and safely.

● Install with care

The CRS could be installed on that seating position but it could not be done easily and without problems. The vehicle may not be on the list of approved vehicle for that particular CRS.

✖ Installation prohibited (Where X is in handbook)

It is prohibited to install a CRS on this seating position. The vehicle handbook indicated X for that particular seating position. Also, indicates there are no ISOFIX anchorages fitted to that seating position.