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Road vehicles — Methods and criteria for usability evaluation of child restraint systems and their interface with vehicle anchorage systems —

Part 4: Securing of child in child restraint system and daily handling aspects

Véhicules routiers — Méthodes et critères pour l'évaluation de la facilité d'utilisation des systèmes de retenue enfants et leurs interfaces avec les systèmes d'ancrage dans le véhicule —

Partie 4: Sécuriser l'enfant dans les systèmes de retenue pour enfant, et aspects de manipulation quotidienne

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 36, *Safety and impact testing*.

A list of all parts in the ISO 29061 series can be found on the ISO website.

Introduction

The usability of a child restraint system (CRS) in terms of ease of:

— installation of child restraint systems in various vehicles; and

— day-to-day use with a child (e.g. securing, harnessing, adaption for a growing child, etc.)

is of utmost importance to ensure that a child restraint system is used properly in accordance with the manufacturer's intentions, and to ensure that it will provide maximum protection in a crash situation. An international agreement on usability criteria and measurements is beneficial for both consumers and manufacturers.

The aim of this document is to develop and validate a usability evaluation system for installation of child restraint systems with vehicle seat belts to promote improved design for an easy and correct use.

It provides child restraint and vehicle manufacturers with a tool for the assessment of the usability of new and current systems. At the same time, it provides consumers (parents and caregivers) with usability information on the key features related to the proper use of the attachment system, and assist them in selecting child restraints and vehicles that are easy to use properly.

The ISO usability evaluation system has been developed with participation from, and considering the experiences from, usability rating systems of Canada (Transport Canada and ICBC), USA (NHTSA), EU (NPACS and consumer rating programmes, such as ICRT, ADAC).

Road vehicles — Methods and criteria for usability evaluation of child restraint systems and their interface with vehicle anchorage systems —

Part 4: Securing of child in child restraint system and daily handling aspects

1 Scope

This document provides criteria for judgement of usability of child restraint systems (CRS) with regard to the securing of a child in the child seat and other daily handling aspects.

The document provides criteria for judgement of:

— ease of availability of instructions;

— clarity of instruction manual and labelling; and

— the ease of use of design related features of the CRS related to securing the child or child dummy in a CRS installed in vehicle.

This document can be used in conjunction with either ISO 29061-1 or ISO 29061-3 for making a complete usability evaluation of child restraint systems attached to the vehicle with ISOFIX/LATCH or vehicle seat belts.

NOTE Booster system usability evaluation, including securing of a child in the booster system, is covered by ISO 29061-5.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 29061-1, *Road vehicles — Methods and criteria for usability evaluation of child restraint systems and their interface with vehicle anchorage systems — Part 1: Vehicles and child restraint systems equipped with ISOFIX anchorages and attachments*

ISO 29061-3, *Road vehicles — Methods and criteria for usability evaluation of child restraint systems and their interface with vehicle anchorage systems — Part 3: Installation of child restraint systems using vehicle seat belts*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

3.1
audible
capable of being heard in normal environmental conditions

3.2
child restraint system
CRS
free-standing device intended to provide child vehicle occupants with an approved restraint

Note 1 to entry: CRSs comprise various categories such as car beds, infant restraints, toddler seats (forward and rearward-facing), booster cushions, and booster seats. Combination products may cover two or more of these product categories.

3.3
support leg
anti-rotational device comprising a permanent attachment to a *child restraint system* (3.2), or a base of a child restraint system, creating a compressive load path between the child restraint and a vehicle structure (for example, the vehicle floor) to prevent or reduce forward rotation of the child restraint

Note 1 to entry: A support leg may be adjustable.

3.4
top tether
tether strap attached at or near the top of a *CRS* (3.2), incorporating a device to enable it to be connected to a vehicle *top tether anchorage* (3.4.1)

3.4.1
top tether anchorage
device, such as a ring, bar, bracket, or webbing loop, and its underlying structure, either user-ready or aftermarket-installed, to which a *top tether* (3.4) can be attached

3.4.2
top tether strap
webbing strap which extends from the top of a *CRS* (3.2) to the top tether anchorage and which is equipped with an adjustment device, a tension-relieving device and a top tether connector

3.5
usability
extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use

Note 1 to entry: Interpretation of the generic definition for the purpose of this document: the extent to which a *CRS* (3.2) is capable of being used and is convenient and practical in use (separately or in combination with a vehicle).

[SOURCE: ISO 9241-11:1998, 3.1, modified — a new Note 1 to entry has been added.]

4 Usability evaluation procedure and scoring principles

4.1 Evaluation procedure

This document provides a procedure to evaluate the usability related to the securing of child in child restraints, and other daily handling aspects. It shall be used in conjunction with ISO 29061-1 or ISO 29061-3 for a complete usability evaluation of child restraint systems attached to the vehicle with ISOFIX/LATCH or vehicle seat belts.

The procedure evaluates ease of availability of instruction, clarity of instruction manual and labelling, and the ease of use of design-related features of the CRS related to the securing of child in the CRS and daily handling aspects.

The assessment is done in two steps:

— a separate assessment of the child restraint system; and

— a usability assessment when securing a child or child dummy, with the CRS installed in a vehicle, or in a simulated vehicle setup.

The usability protocol is intended to be objective and repeatable.

The evaluation is most easily accomplished using a team of two people having basic knowledge of child restraints and being familiar with the technical terms used. The procedure for all aspects of the process takes about 30 min.

The materials necessary include:

— the usability evaluation form (in either paper or electronic format);

— the child restraint manual, including the instruction video if applicable; and

— a screwdriver, or a simple prying/turning tool.

A copy of the terms and definitions from this document may also be helpful.

Initially, the child restraint should be in the condition as supplied to the consumer. The evaluation process includes all the steps, including assembly, to complete the installation. The process should preferably be carried out by a person unfamiliar with the CRS and vehicle.

Unpacking the CRS, removing the box and plastic protections, detaching the handbook, etc., should be disregarded in the evaluation, but other initial one-time preparations are considered and assessed in the forms.

The mode of use for the child restraint and the seating position in the vehicle should be determined in advance and documented in the evaluation form.

The evaluation process first addresses the labels and instructions, followed by the ease of positioning and securing the child or the child dummy in the CRS, in a vehicle environment.

4.2 Scoring system

The scoring system consists of a Good/Average/Poor rating (scored with 3/1/0 points) of each item assessed, and an importance rating A/B/C (scored with 3/2/1 points) for each item. For each assessment, the scoring of the above are multiplied. A maximum score for a "Good" solution on an item with "A" importance is 9 points.

In this document, “average” means “mid-level” and should not be perceived as a statistical average between good and poor.

The maximum possible score will depend on the features and usage of the restraint and vehicle. Different products may have different maximum possible scores, and therefore, comparisons of the raw number of total points would not be meaningful. The final rating consists of a total number of points that should be expressed as a percentage of the maximum possible score for the particular conditions. See also further recommendations given in Annex A.

5 Usability evaluation forms

See the following pages.

To enhance the value and applicability of this document, the forms are also provided in a revisable [MS Excel[1)]] format. These forms are provided at the following URL: http://standards.iso.org/iso/29061/-4/ed-1/en.

1) MS Excel is an example of a suitable product available commercially. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO of this product.

Date of evaluation		**Evaluated by**	**Test no.**

Form 1: Separate evaluation of CRS: Rearward facing (RF), forward facing (FF) or lateral facing (LF) with internal harness or shield

Child restraint system evaluated	☐ Infant only restraint, RF ☐ Infant only restraint, LF	☐ RF only toddler CRS	☐ FF only CRS
Manufacturer		☐ Multiple modes CRS (2-in-1)	☐ Multiple modes CRS (3-in-1)
Child seat make and model		**Base make and model (if applicable)**	
Country/Region of use		**Country/Region of use**	
Approval no. (where applicable)		**Approval no. (where applicable)**	
Production no.		**Production no.**	
Date of manufacturing, yyyy-mm-dd		**Date of manufacturing, yyyy-mm-dd**	
Type (E.g. UN-ECE Group 0+/I/II)			
CRS has separate base	☐ Yes ☐ No		

Appropriate child size range for this mode according to manual	Mass range (kg):	Height range (cm):	Age range (months or years):

Form 1.1: CRS instructions and labels

		Good	Average	Poor	Importance	N/A	Notes
1.1.1	Is there a clear indication of a child's size range for this mode? Is there additional information on the CRS about how the child should fit in it?	Separate, clear, complete height/weight/age information directly next to the illustration. Additional size information included as a picture.	Separate, clear, complete height/weight/age information. Additional size information included as short, simple text.	Incomplete text as indicated, text independent of illustration, or no illustration, and/or no mention of additional sizing information.			
	Labels on CRS	☐	☐	☐	A	☐	
	Manual	☐	☐	☐	C	☐	
1.1.2	Does the CRS indicate the correct harness height position for this mode? Is there additional information on the CRS about how the shoulder straps should fit for this mode?	Yes, there is a graphic or contrasting text indicating the correct harness height position to use for this mode. Additional harness adjustment information is conveyed using a picture.	Yes, there is text indicating the correct harness height position to use for this mode but they may be the same colour as the shell. Additional harness adjustment information is included but may be text only.	There is no indication of a correct height position to use for this mode (for applicable multi-mode CRS) and/or no mention of additional sizing information.			
	Labels on CRS	☐	☐	☐	A	☐	
	Manual	☐	☐	☐	C	☐	
1.1.3	Are the labels durable?	☐ Sticky label(s) or other method of technology label is not peeling.	☐	☐ Sticky label(s) are already peeling when the restraint is removed from the box.	A	☐	

Form 1.2: CRS hardware: Adapting CRS harnessing and other handling

		Good	Average	Poor	Importance	N/A	Notes
1.2.1	Ease of adapting the harness for child's growth.	☐ No need to rethread the system. No mandatory pieces exist that may become loose when adjusting the system.	☐ No need to rethread the system, but may be otherwise difficult to adapt, or very simple procedure to rethread.	☐ Harness must be rethreaded to adapt. Loose mandatory pieces may be present. Could misroute or incorrectly secure harness.	B	☐	
1.2.2	Ease of conversion to the assessed mode from other possible modes of use.	☐ Simple operation with only a single or dual action. Illustrations and instructions on seat showing mode change. ☐	☐ Simple operation but multiple actions are required. Illustrations may be missing from the label requiring the user to read the manual.	☐ Operation is difficult, requiring several complicated steps that must be followed in the manual.	B	☐	
1.2.3	Ease of re-attachment of pad/cover (e.g. if removed for cleaning).	☐ Safely remove and reattach the pad/cover, without detaching the harness.	☐ Upper part of harness system may need to be detached to remove pad/cover, but no loose parts.	☐ Loose parts may exist, including the harness system. The harness system may need to be significantly detached.	B	☐	

Score (points) | |

Score (% of achievable) | |

Form 2: Evaluation in a vehicle environment	**Evaluation includes assessment of the following interfaces and modes:**
Vehicle – Make, model and model year	☐ Rearward facing mode ☐ CRS upright/normal ☐ CRS reclined
Child seat – Make and model	☐ Lateral facing mode
Seating position(s) evaluated (see Figure 1)	☐ Forward facing (integral) mode
Vehicle seat position (fore/mid/aft)	
Additional information	

Form 2.1: Securing the child or child dummy in harness or shield (with CRS installed in vehicle or simulated vehicle setup

		Good	Average	Poor	Importance	N/A	Notes
2.1.1	Are all functional parts (i.e. required for correct use as per instructions), including seat pad or cover, attached and ready to use?	☐ Yes, all parts are assembled when unpacking the CRS. System is ready for use with the smallest child size.	☐	☐ No, not ready to use regardless of how difficult the assembly may be. May direct user to manual or is otherwise difficult. Tools may be required. Please describe under notes.	B	☐	
2.1.2	Is it easy to install a child in the CRS?	☐ Yes, means are provided to assist the placement of a child in the CRS, and/or sufficient space available in combination with the car model.	☐	☐ No, placement of the child requires a complex manoeuvring before the child is in place or insufficient space for the child access to the CRS.	B	☐	
2.1.3	Is it easy to access the harness system with the child (or child dummy) placed in the seat?	☐ Harness is easily kept away when placing the child in the CRS. Means are provided to avoid twisting the belts of the harness. Harness does not get stuck behind the body.	☐	☐ Belts easily get stuck under the body, and/or get easily twisted or otherwise difficult to access	B		
2.1.4	Is it easy to insert the harness buckle tongues into the buckle? Is there clear feedback of latching?	☐ Easy to insert the tongues and clear feedback of latching. E.g. separate harness portion insertion, or puzzle buckle with simple means of holding the different portions together.	☐	☐ Puzzle buckle with no intermediate method of holding the different portions together. No clear feedback of latching.	B	☐	

		Good	Average	Poor	Importance	N/A	Notes
2.1.5	Is it easy to remove slack from the harness?	☐ Requires less than 100 N for tightening or is achieved automatically.	☐	☐ Slack is not removed with a force less than 100 N.	A	☐	
2.1.6	Is there an indication of child harness tension?	☐ Visual plus tactile and/or audible indication that the harness is correctly tensioned.	☐ Tactile and/or audible indication that the harness is correctly tensioned.	☐ No indication	B	☐	NOTE Not applicable if there is an automatic retractor.
2.1.7	Is there an automatic tensioning in the harness?	☐ Yes		☐ No	A	☐	
2.1.8	Will a harness clip secure properly, without requiring threading? Is it labelled to indicate its proper positioning on the child?	☐ Yes, and the harness clip is labelled.	☐ Yes, but the harness clip is not labelled, alternatively requires simple threading and is labelled	☐ No, the harness clip requires threading in a more or less difficult way	C	☐	NOTE Not applicable to UN-ECE R44 systems, where harness clips are not allowed.
2.1.9	Is it easy to unbuckle the harness system?	☐ One hand/action to unbuckle the harness, and easy to remove the child out from the CRS.	☐ Two hands action to unbuckle the harness, some problems to release the child.	☐ Considerable efforts needed, problems to release the child.	B	☐	
2.1.10	Impact shield system: Is it easy to adjust the impact shield to properly fit the child or dummy?	☐ Easy to achieve a good restraint of the upper and lower body.	☐	☐ Properly tight fit cannot be achieved.	B	☐	

		Good	Average	Poor	Importance	N/A	Notes
2.1.11	Impact shield system: Is it easy to close (buckle, lock) the impact shield with the child or dummy in place?	□ Can close (buckle) the shield with a one-hand operation.	□	□ Two hands or considerable efforts needed.	B	□	
2.1.12	Impact shield system: Is it easy to open/remove the impact shield with the child or dummy in place?	□ Can open/remove the shield with a one-hand operation.	□	□ Two hands or considerable efforts needed.	B	□	

Score (points)

Score (% of achievable)

Figure 1 — Seating position codes
If right-hand drive - mirror image