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**Road vehicles — Sled test method to
enable the evaluation of side impact
protection of child restraint systems —
Essential parameters**

*Véhicules routiers — Méthode d'essai sur chariot pour permettre
l'évaluation de la protection en choc latéral des dispositifs de retenue
pour enfants — Paramètres essentiels*



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ISO/PAS 13396 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 12, *Passive safety crash protection systems*.

Introduction

The UNECE/GRSP Working Group on Child Restraint Systems in April 2008 sent a request to ISO/TC 22/SC 12 to support their work on defining a side impact test procedure for CRS (child restraint systems) homologation based on state-of-the-art research and experience.

UNECE/GRSP specifically requested ISO/TC 22/SC 12 to define the essential parameters of a simplified test method, to ensure that a child restraint system has a sufficient capacity to contain the child and to absorb energy in case of side impact exposure.

The aim of this Publicly Available Specification is to answer the UNECE request.

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Road vehicles — Sled test method to enable the evaluation of side impact protection of child restraint systems — Essential parameters

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1 Scope

This Publicly Available Specification mainly summarises the content of ISO/TR 14646^[1] to assist the Informal Group on CRS of UNECE/GRSP in their development of a simplified side impact method based on commonly agreed input data. In addition to the content of ISO/TR 14646, new data and further recommendations have been included. Where not otherwise stated, ISO/TR 14646 is reference source.

The essential input parameters given in Clause 3 are applicable to accessory child restraint systems aiming to offer side impact protection.

2 Accident statistics

The accident data presented in ISO/TR 14646 shows that side impact is especially severe for those children (age up to 12 years) sitting on the struck side. Head, neck and chest are the body regions most frequently showing severe injuries, and the head in particular needs to be protected. Comparison of accident data from different years (1985 to 1990; 1991 to 1996 and 1997 to 2001), without any filter on product age shows, however, decreasing risk for head injuries and increasing risk for neck injuries in the recent data compared to the older data.

Based on results of the EC funded CHILD project and the EEVC WG18 Report^[5], non-head containment combined with intrusion loading are found to be one of the major reasons for head injuries in side impacts involving rearward facing and forward facing harness type CRS, as well as high back booster and backless booster (Johannsen et al.^[4]; EEVC^[5]).

Analysis of accident data involving children in side impacts from different sources and different regions of the world (Germany, Sweden and USA) indicates that the purely lateral impact (due to the accident data coding with $\pm 15^\circ$ deviation) is possibly more severe than angled ones, while the share of perpendicular and angled impacts with forward component is nearly equal (Johannsen and Menon^[3]). Although all three sources show the same tendency, final conclusions are not possible, as the number of children involved is too small to allow statistically significant results. These data regard all types of impact objects and restraint use.

Henary et al.^[7], when comparing the risk of injury between children (aged 0-23 months) in side impacts, using US crash data (NASS-CDS), found a significantly higher benefit for children in rearward facing compared to forward facing harness type CRS. The authors conclude that this is likely because a forward component in the vehicle travel direction in many of the cases will move the head forward during the crash and will therefore improve the containment situation. The forward movement of the head is directed towards the backrest of the CRS used.

The struck car is in many cases subjected to an angled acceleration due to its initial speed. The main expected influence of a possible forward component would be an increase in head forward motion. Head forward trajectory can also be influenced by pre-braking conditions. Maltese et al.^[6] mapped probable head