EURO NCAP

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WorldSID 50th Arm to thorax loading

Crash Protection

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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 Euro NCAP. Where a disagreement exists between the laboratory and manufacturer, the Euro NCAP secretariat should be informed immediately to pass final judgment. Where the laboratory staff suspect that a manufacturer has interfered with any of the set up, the manufacturer's representative 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 representative will be told to leave the test site and the Secretary General should be immediately informed. Any such incident may be reported by the Secretary General to the manufacturer and the person concerned may not be allowed to attend further Euro NCAP tests.

DISCLAIMER: Euro 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, Euro NCAP reserves the right to make corrections and determine the assessment and subsequent result of the affected requirement(s).

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1 INTRODUCTION

As experience with the WorldSID dummy has grown, an issue has been identified regarding inconsistent behaviour and poor repeatability, primarily due to its high sensitivity to arm position relative to rib 1 in side impact tests. When the arm aligns with and loads rib 1, chest deflections increase significantly, whereas positioning the arm just above rib 1 results in much lower deflections. Even minor changes in arm position can raise rib 1 deflection from approximately 20 mm to 40 mm, corresponding to an estimated thoracic injury risk increase from 0% to 50%. This variability compromises test repeatability and has influenced side airbag design strategies. In response, manufacturers have adopted measures to elevate the WorldSID's arm above rib 1 to reduce variability associated with direct loading on that specific rib.

Due to the variable behaviour observed with rib 1 loading, Euro NCAP may, under certain conditions, permit an alternative assessment for rib 1 for the official test. The OEM must provide information in advance of testing informing Euro NCAP that there may be an issue with rib 1 loading in the official test. Furthermore, the alternative assessment will not be permitted if either the shoulder load modifier is applied or the side airbag deploys incorrectly. With the preconditions met, two key aspects must be addressed by supporting data from the vehicle manufacturer.

As data and experience with this procedure grows, Euro NCAP will consider and review updates to this procedure and ensure it is being used in the spirit intended.

2 PROCEDURE

This procedure accommodates vehicles with side thorax airbags that have been designed to consider risks to the occupant's arm and deploy in a manner that do not force the arm upward.

Euro NCAP reserves the right to apply the WorldSID assessment as detailed in the Injury criteria and limits Section of the Side Impact Protocol where unsatisfactory data is provided or this procedure is being exploited.

This is applicable to thoracic rib 1 loading only in either the side barrier or oblique pole impacts. Thoracic ribs 2 and 3 will always be evaluated with both lower and higher performance limits (LPL & HPL)

2.1 Prerequisites

Where the vehicle manufacturer wishes to have the alternative assessment for rib 1 applied to the test in which arm to rib 1 interaction occurs, all of the following pre-requisites must be met.

At the time of equipment matrix submission (before testing), the OEM must declare that rib 1 loading is affected by the arm position. This first declaration must be supported by physical test or virtual simulation data. If no declaration is made before testing, the full assessment of rib 1 will be applied regardless of interaction in the official test.

In the official test, loading of rib 1 must be from interaction with the WorldSID arm. Loading wholly or partly caused by any vehicle components such as seat structures/bolsters, arm rests, door structures and intrusion will result in the full assessment of rib 1 being applied regardless of interaction in the official test..

The shoulder force (Fy) in the official test and OEM data must remain below the 3.0kN limit.

All restraint systems and airbags must activate/deploy correctly and not attract restrain or incorrect deployment modifiers.

There must be no door opening or detachment modifiers applied in the post test vehicle inspection.

2.2 Data

The OEM must provide data in the form of virtual test data using correlated WorldSID and vehicle simulation models as well as Human Body Models (HBM) from load case in question.

2.2.1 WorldSID variation study

It must be demonstrated that rib 1 deflection in the official test was as a result of direct loading from the WorldSID arm. Correlated WorldSID and vehicle models must show:

Case 1: WorldSID arm interaction with thorax rib 1 and subsequent rib deflection.

Case 2: WorldSID thorax rib 1 is not loaded by the arm.

2.2.2 Human Mody Models

Human Body Model data must be provided demonstrating that loading from the human arm does not present a risk of increased loading to the thoracic ribs (case 3).

2.2.3 Requirements

A comparison of all dummy measures shall be provided as detailed in the Injury criteria and limits Section of the Side Impact Protocol.

The data must show that all of the following requirements are met:

Deflection of thoracic ribs 2 & 3 are similar and within normal test variation in both case 1 & case 2.

Deflection of rib 1 must be within the same range as ribs 2 & 3 in case 2.

In both cases there must be no major abnormalities in other measurements and comparable performance in all other dummy assessment areas defined in the Injury criteria and limits Section of the Side Impact Protocol.

2.3 Assessment

Where any of the prerequisites detailed in Section 2.1 have not been met, all three thoracic ribs will be assessed with LPL-HPL colour band assessments and capping limits as detailed in the Injury criteria and limits Section of the Side Impact Protocol.

Where all prerequisites detailed in Section 2.1 have been met and the OEM data detailed in Section 2.2 has been accepted by Euro NCAP, the assessment will be as follows:

Criterion		WorldSID 50th	
		HPL - LPL	Capping
Rib 1 $D_{chest\ compression}$	mm	50	50 - AE-MDB 55 - Pole
Rib 2 & 3 $D_{chest\ compression}$	mm	28 - 50	50 - AE-MDB 55 - Pole

All other assessments and modifiers will remain unchanged as detailed in the Injury criteria and limits Section of the Side Impact Protocol.