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Road restraint systems - Guidelines for computational mechanics of crash testing against vehicle restraint system - Part 3: Test Item Modelling and Verification

Dispositifs de retenue routiers - Recommandations pour la simulation numérique d'essai de choc sur des dispositifs de retenue des véhicules - Partie 3: Composition et vérification des modèles numériques de dispositifs d'essai

Rückhaltesysteme an Straßen - Richtlinien für Computersimulationen von Anprallprüfungen an Fahrzeug-Rückhaltesysteme - Teil 3: Modellierung des Prüfgegenstands und Überprüfung

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Foreword

This document (CEN/TR 16303-3:2012) has been prepared by Technical Committee CEN/TC 226 “Road equipment”, the secretariat of which is held by AFNOR.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document consists of this document divided in five Parts under the general title: Guidelines for Computational Mechanics of Crash Testing against Vehicle Restraint System:

— *Part 1: Common reference information and reporting*

— *Part 2: Vehicle Modelling and Verification*

— *Part 3: Test Item Modelling and Verification*

— *Part 4:Validation Procedures*

— Part 5: *Analyst Qualification*[1]

[1] In preparation

Introduction

This part of this Technical Report is meant to provide the user with all the information necessary for the development of a complete and efficient numerical model of a test item vehicle in order to properly simulate a crash event.

The vehicle restraint system (VRS) models represent the test item in a certification test according EN 1317. The model shall faithfully depict the performance of a VRS so that the performance criteria identified in EN 1317 can be extracted from the simulation of a vehicle impact with the VRS model. The VRS simulation can only be assessed in combination with a validated vehicle model described in CEN/TR 16303-2.

There are different types of VRS and they can incorporate concrete, metal, plastic, and composite materials in their construction. Each system has different modelling requirements and the following manual describes the guidelines applicable for all VRS. It is important to recognize that the requirements for modelling a deformable VRS are significantly different from a rigid systems and the latter are not covered in this version of the guidelines.

This document currently focuses on Finite Element simulation methodologies. Rigid body (or multi-body) dynamic codes are also used in the development of a VRS. The VRS model requirements are not the same as for the Finite Element approach and shall be consistent to the methodology. The CM/E group does not yet have guidelines for the use of rigid body codes and their application for certification requirement cannot be recommended until they are similarly defined.

1 Scope

The aim of this Technical Report is to provide a step-by-step description of the development process of a reliable VRS model for the simulations of full-scale crash tests.

2 Normative references

The following referenced documents are indispensable for the application 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.

EN 1317-1, *Road restraint systems — Part 1: Terminology and general criteria for test methods*

EN 1317-2, *Road restraint systems — Part 2: Performance classes, impact test acceptance criteria and test methods for safety barriers including vehicle parapets*

EN 1317-3, *Road restraint systems — Part 3: Performance classes, impact test acceptance criteria and test methods for crash cushions*

ENV 1317-4, *Road restraint systems — Part 4: Performance classes, impact test acceptance criteria and test methods for terminals and transitions of safety barriers*

EN 1317-5, *Road restraint systems — Part 5: Product requirements and evaluation of conformity for vehicle restraint systems*

prCEN/TR 1317-6, *Road restraint systems — Part 6: Pedestrian restraint system, pedestrian Parapets* (under preparation)

prEN 1317-8, *Road restraint systems — Part 8: Motorcycle road restraint systems which reduce the impact severity of motorcyclist collisions with safety barriers*

CEN/TR 16303-2:2011, *Road restraint systems — Guidelines for computational mechanics of crash testing against vehicle restraint system — Part 2: Vehicle Modelling and Verification*

CEN/TR 16303-4:2011, *Road restraint systems — Guidelines for computational mechanics of crash testing against vehicle restraint system — Part 4: Validation Procedures*

3 General considerations on the modelling technique

3.1 General

Particular attention shall be paid on the geometrical description of the contact areas of the VRS model. Proper geometry and material properties shall be used. The fixation of the VRS to the roadbed shall correspond to the test conditions reflected by the standard and the application of the VRS. Modelling of any soil, asphalt, concrete, etc. element should be documented. Simplifications as well as rigid soil conditions shall be justified through empirical or engineering analyses independent of the computer model.

The model shall include all significant parts, the connections between the parts, and appropriate boundary conditions.