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Road restraint systems - Guidelines for computational mechanics of crash testing against vehicle restraint system - Part 4: Validation Procedures

Dispositifs de retenue routiers - Recommandations pour la simulation numérique d'essai de choc sur des dispositifs de retenue des véhicules - Partie 4: Procédures de validation

Rückhaltesysteme an Straßen - Richtlinien für Computersimulationen von Anprallprüfungen an Fahrzeug-Rückhaltesysteme - Teil 4: Validierungsverfahren

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Foreword

This document (CEN/TR 16303-4:2012) 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]

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[1] In preparation

Introduction

In order to improve safety the design of roads may require the installation of vehicle restraint systems, which are intended to contain errant vehicles safely for the benefit of the occupants and other road users, on sections of road and at particular locations defined by the National or Local Authorities. The EN 1317 standard identifies test methods and impact test acceptance criteria that need to be met to demonstrate compliance with the essential requirements for CE marking. This document allows in some cases the use of computational mechanics in order to obtain CE certification. That is why it becomes necessary to develop a methodology to verify and validate the result obtained with computational mechanics work and guarantee the reliability of the simulation itself.

CEN/TR 16303-2 and CEN/TR 16303-3 give informative guideline to develop a complete and efficient numerical model of a vehicle and a test item in order to properly simulate a crash event. These parts address the user in the creation of a reliable and efficient model both for finite element (FE) methodology and multi-body (MB) approach.

The purpose of this document, "Validation Procedures", is to define the validation and verification process for the use as defined and regulated within EN 1317 and provides support in the application of simulation for studies of real life installations.

This part includes procedures and acceptance criteria for the use of computational mechanics in approval process of products for roads safety design and a scheme that can be applied to any simulation in order to certify its reliability.

1 Scope

The aim of this part is to provide a methodology for the validation of the simulation performed to demonstrate compliance with the essential requirements for CE marking. The use of computational mechanics in the approval process for CE market of a test item is defined and regulated within EN 1317.

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*

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, *Road restraint systems — Guidelines for computational mechanics of crash testing against vehicle restraint system — Part 2: Vehicle Modelling and Verification*

CEN/TR 16303-3, *Road restraint systems — Guidelines for computational mechanics of crash testing against vehicle restraint system — Part 3: Test Item Modelling and Verification*

3 General

Obtaining accurate and reliable models requires careful attention to detail and careful verification of material properties, energy management, numerical stability and a number of other important computational characteristic. Without careful verification and validation the result of the simulations cannot be depended upon.

This part of the guidelines puts its attention to the process necessary to guaranty the reliability of the performed simulation; this is a process that consists of modelling, validation of the model and verification of the result.

Modelling consists of creating a suitable model of the test item and vehicle, described in CEN/TR 16303-2 and CEN/TR 16303-3.

Verification consists of determining that a computational model accurately represents the underlying mathematical model and its solution and that result are numerically stable, described in CEN/TR 16303-2 and CEN/TR 16303-3.

Validation consists of determining the degree to which a model is an accurate representation of the real word from the perspective of the intended uses of the model.