DIN EN 15227:2008-07 (E)

Railway applications - Crashworthiness requirements for railway vehicle bodies

Contents

Page

Foreword 4

Introduction 5

1 Scope 5

2 Normative references 6

3 Terms and definitions 6

4 Crashworthiness design categories of railway vehicles 8

5 Design collision scenarios 9

6 Structural passive safety 11
6.1 General principles 11
6.2 Overriding 12
6.2.1 Requirements 12
6.2.2 Explanatory notes (informative) 12
6.3 Survival space, intrusion and egress 13
6.3.1 Requirements 13
6.3.2 Explanatory notes (informative) 14
6.4 Deceleration limit/collision pulse 14
6.4.1 Requirement 14
6.4.2 Explanatory notes (informative) 15
6.5 Obstacle deflector 15
6.5.1 Requirement 15
6.5.2 Explanatory notes (informative) 16

7 Validation of crashworthiness 17

Annex A (informative) Parameters of design collision scenarios 19

A.1 Introduction 19
A.2 Determining the design collision scenarios for collision risks which differ from the normal European operations 20
A.2.1 Design collision scenarios 20
A.2.2 Risk analysis 20
A.2.3 Factors to be considered in the risk assessment 21
A.2.4 Collisions following derailment 21
A.2.5 Bibliography of relevant accident information 22

Annex B (normative) Requirements of a validation programme 23

B.1 Test specifications 23
B.1.1 Test programme 23
B.1.2 Acceptance criteria for calibration/validation tests 23
B.2 Numerical simulations 24
B.2.1 Numerical model validation 24
B.2.2 Simulation modelling 24

Annex C (normative) Reference obstacle definitions 26

C.1 80 t wagon 26
C.2 C-III Reference obstacle 27
C.3 Large deformable obstacle 29
C.4 C-IV Corner collision obstacle 31

Annex D (normative) Reference train definitions - Defined formations 32

D.1 Reference trains for locomotive, power head, driving trailer and coach design 32
D.2 Locomotive design 32
D.3 Power head and driving trailer design 32
D.4 Individual coach design 33

Annex E (informative) Migration rule for this European Standard 35

Annex ZA (informative) Relationship between this European Standard and the Essential Requirements of EU Directive 96/48 as amended by Directive 2004/50/EC 36

Bibliography 37

Figures Figure 1 -- Example for clearance requirement of crumple zones in areas of temporary occupation (e.g. vestibule) 13

Figure 2 -- Driver's seat clearance zone 14

Figure 3 -- Obstacle deflector load application 16

Figure C.1 -- Buffered wagon interface 26

Figure C.2 -- Wagon buffer characteristic 27

Figure C.3 -- Peri-urban tram obstacle 28

Figure C.4 -- Coupler characteristic 28

Figure C.5 -- Deformable obstacle geometry 30

Figure C.6 -- Deformable obstacle stiffness 30

Figure C.7 -- Tram corner collision obstacle 31

Figure D.1 -- Locomotive reference train 32

Figure D.2 -- Power head/driving trailer reference train 33

Figure D.3 -- Coach simplified assessment 34

Tables Table 1 -- Crashworthiness design categories of railway vehicles 8

Table 2 -- Collision scenarios and collision obstacles 10

Table 3 -- Obstacle deflector performance requirements 11

Table ZA.1 -- Correspondence between this European Standard and Directive 96/48/EC as amended by Directive2004/50/EC 36