

# DIN EN 12663-1:2010-07 (E)

## Railway applications - Structural requirements of railway vehicle bodies - Part 1: Locomotives and passenger rolling stock (and alternative method for freight wagons)

<b>Contents</b>		<b>Page</b>
Foreword .....		4
Introduction .....		6
1	Scope .....	7
2	Normative references .....	7
3	Terms and definitions .....	7
4	Coordinate system .....	8
5	Structural requirements .....	8
5.1	General .....	8
5.2	Categories of railway vehicles .....	9
5.2.1	Structural categories .....	9
5.2.2	Locomotives .....	9
5.2.3	Passenger vehicles .....	9
5.2.4	Freight wagons .....	10
5.2.5	Other types of vehicles .....	10
5.3	Uncertainties in railway design parameters .....	10
5.3.1	Allowance for uncertainties .....	10
5.3.2	Loads .....	10
5.3.3	Material .....	10
5.3.4	Dimensional tolerances .....	11
5.3.5	Manufacturing process .....	11
5.3.6	Analytical accuracy .....	11
5.4	Demonstration of static strength and structural stability .....	11
5.4.1	Requirement .....	11
5.4.2	Yield or proof strength .....	12
5.4.3	Ultimate failure .....	12
5.4.4	Instability .....	13
5.5	Demonstration of stiffness .....	13
5.6	Demonstration of fatigue strength .....	13
5.6.1	General .....	13
5.6.2	Methods of assessment .....	14
6	Design load cases .....	15
6.1	General .....	15
6.2	Longitudinal static loads for the vehicle body .....	16
6.2.1	General .....	16
6.2.2	Longitudinal forces in buffers and/or coupling area .....	16
6.2.3	Compressive forces in end wall area .....	17
6.3	Vertical static loads for the vehicle body .....	18
6.3.1	Maximum operating load .....	18
6.3.2	Lifting and jacking .....	18
6.3.3	Lifting and jacking with displaced support .....	19
6.4	Superposition of static load cases for the vehicle body .....	19
6.5	Static proof loads at interfaces .....	19
6.5.1	Proof load cases for body to bogie connection .....	19
6.5.2	Proof load cases for equipment attachments .....	20

6.5.3	Proof load cases for joints of articulated units .....	21
6.5.4	Proof load cases for specific components on freight wagons .....	21
6.6	General fatigue load cases for the vehicle body .....	21
6.6.1	Sources of load input .....	21
6.6.2	Payload spectrum .....	21
6.6.3	Load/unload cycles .....	21
6.6.4	Track induced loading .....	21
6.6.5	Aerodynamic loading .....	23
6.6.6	Traction and braking .....	23
6.7	Fatigue loads at interfaces .....	23
6.7.1	General requirements .....	23
6.7.2	Body/bogie connection .....	23
6.7.3	Equipment attachments .....	24
6.7.4	Couplers .....	24
6.7.5	Fatigue load cases for joints of articulated units .....	24
6.8	Combination of fatigue load cases .....	24
6.9	Modes of vibration .....	24
6.9.1	Vehicle body .....	24
6.9.2	Equipment .....	24
7	Permissible stresses for materials .....	25
7.1	Interpretation of stresses .....	25
7.2	Static strength .....	25
7.3	Fatigue strength .....	25
8	Requirements of strength demonstration tests .....	25
8.1	Objectives .....	25
8.2	Proof load tests .....	26
8.2.1	Applied loads .....	26
8.2.2	Test procedure .....	26
8.3	Service or fatigue load tests .....	27
8.4	Impact tests .....	27
9	Validation programme .....	28
9.1	Objective .....	28
9.2	Validation programme for new design of vehicle body structures .....	28
9.2.1	General .....	28
9.2.2	Structural analyses .....	29
9.2.3	Testing .....	29
9.3	Validation programme for evolved design of vehicle body structures .....	29
9.3.1	General .....	29
9.3.2	Structural analyses .....	29
9.3.3	Testing .....	30
	Annex A (informative) Treatment of local stress concentrations in analyses .....	31
	Annex B (informative) Examples of proof load cases at articulation joints .....	33
	Annex ZA (informative) Relationship between this European Standard and the Essential Requirements of EU Directive 2008/57/EC .....	36
	Bibliography .....	39