

DIN EN 1993-6:2007-07 (E)

Eurocode 3: Design of steel structures - Part 6: Crane supporting structures

Contents

	Page
Foreword	4
1 General	7
1.1 Scope	7
1.2 Normative references	7
1.3 Assumptions	8
1.4 Distinction between principles and application rules	8
1.5 Terms and definitions	8
1.6 Symbols	8
2 Basis of design	9
2.1 Requirements	9
2.1.1 Basic requirements	9
2.1.2 Reliability management	9
2.1.3 Design working life, durability and robustness	9
2.2 Principles of limit state design	9
2.3 Basic variables	9
2.3.1 Actions and environmental influences	9
2.3.2 Material and product properties	9
2.4 Verification by the partial factor method	9
2.5 Design assisted by testing	10
2.6 Clearances to overhead travelling cranes	10
2.7 Underslung cranes and hoist blocks	10
2.8 Crane tests	10
3 Materials	11
3.1 General	11
3.2 Structural steels	11
3.2.1 Material properties	11
3.2.2 Ductility requirements	11
3.2.3 Fracture toughness	11
3.2.4 Through thickness properties	11
3.2.5 Tolerances	11
3.2.6 Design values of material coefficients	11
3.3 Stainless steels	11
3.4 Fasteners and welds	11
3.5 Bearings	11
3.6 Other products for crane supporting structures	12
3.6.1 General	12
3.6.2 Rail steels	12
3.6.3 Special connecting devices for rails	12
4 Durability	12
5 Structural analysis	13
5.1 Structural modelling for analysis	13
5.1.1 Structural modelling and basic assumptions	13
5.1.2 Joint modelling	13
5.1.3 Ground structure interaction	13
5.2 Global analysis	13
5.2.1 Effects of deformed geometry of the structure	13
5.2.2 Structural stability of frames	13

5.3	Imperfections	13
5.3.1	Basis	13
5.3.2	Imperfections for global analysis of frames	13
5.3.3	Imperfections for analysis of bracing systems	13
5.3.4	Member imperfections	13
5.4	Methods of analysis	13
5.4.1	General	13
5.4.2	Elastic global analysis	13
5.4.3	Plastic global analysis	13
5.5	Classification of cross-sections	14
5.6	Runway beams	14
5.6.1	Effects of crane loads	14
5.6.2	Structural system	14
5.7	Local stresses in the web due to wheel loads on the top flange	15
5.7.1	Local vertical compressive stresses	15
5.7.2	Local shear stresses	17
5.7.3	Local bending stresses in the web due to eccentricity of wheel loads	17
5.8	Local bending stresses in the bottom flange due to wheel loads	18
5.9	Secondary moments in triangulated components	20
6	Ultimate limit states	22
6.1	General	22
6.2	Resistance of cross-section	22
6.3	Buckling resistance of members	22
6.3.1	General	22
6.3.2	Lateral-torsional buckling	23
6.4	Built up compression members	23
6.5	Resistance of the web to wheel loads	23
6.5.1	General	23
6.5.2	Length of stiff bearing	24
6.6	Buckling of plates	24
6.7	Resistance of bottom flanges to wheel loads	24
7	Serviceability limit states	27
7.1	General	27
7.2	Calculation models	27
7.3	Limits for deformations and displacements	27
7.4	Limitation of web breathing	29
7.5	Reversible behaviour	30
7.6	Vibration of the bottom flange	30
8	Fasteners, welds, surge connectors and rails	31
8.1	Connections using bolts, rivets or pins	31
8.2	Welded connections	31
8.3	Surge connectors	31
8.4	Crane rails	32
8.4.1	Rail material	32
8.4.2	Design working life	32
8.4.3	Rail selection	32
8.5	Rail fixings	33
8.5.1	General	33
8.5.2	Rigid fixings	33
8.5.3	Independent fixings	33
8.6	Rail joints	33
9	Fatigue assessment	34
9.1	Requirement for fatigue assessment	34
9.2	Partial factors for fatigue	34
9.3	Fatigue stress spectra	34
9.3.1	General	34
9.3.2	Simplified approach	34
9.3.3	Local stresses due to wheel loads on the top flange	35

9.3.4	Local stresses due to underslung trolleys	35
9.4	Fatigue assessment	35
9.4.1	General	35
9.4.2	Multiple crane actions	35
9.5	Fatigue strength	36

Annex A [informative] - Alternative assessment method for lateral-torsional buckling 37