

# DIN EN 1991-3: 2010-12(E)

## Eurocode\_1: Actions on structures\_ - Part\_3: Actions induced by cranes and machinery

---

CONTENTS	Page
<b>FOREWORD</b> .....	<b>4</b>
BACKGROUND OF THE EUROCODE PROGRAMME.....	4
STATUS AND FIELD OF APPLICATION OF EUROCODES.....	5
NATIONAL STANDARDS IMPLEMENTING EUROCODES.....	6
LINKS BETWEEN EUROCODES AND HARMONISED TECHNICAL SPECIFICATIONS (ENS AND ETAS) FOR PRODUCTS.....	6
ADDITIONAL INFORMATION SPECIFIC FOR EN 1991-3.....	6
NATIONAL ANNEX FOR EN 1991-3.....	7
<b>SECTION 1 GENERAL</b> .....	<b>8</b>
1.1 SCOPE.....	8
1.2 NORMATIVE REFERENCES.....	8
1.3 DISTINCTION BETWEEN PRINCIPLES AND APPLICATION RULES.....	8
1.4 TERMS AND DEFINITIONS.....	9
1.4.1 Terms and definitions specifically for hoists and cranes on runway beams.....	9
1.4.2 Terms and definitions specifically for actions induced by machines.....	11
1.5 SYMBOLS.....	12
<b>SECTION 2 ACTIONS INDUCED BY HOISTS AND CRANES ON RUNWAY BEAMS</b> .....	<b>14</b>
2.1 FIELD OF APPLICATION.....	14
2.2 CLASSIFICATIONS OF ACTIONS.....	14
2.2.1 General.....	14
2.2.2 Variable actions.....	14
2.2.3 Accidental actions.....	15
2.3 DESIGN SITUATIONS.....	16
2.4 REPRESENTATION OF CRANE ACTIONS.....	17
2.5 LOAD ARRANGEMENTS.....	17
2.5.1 Monorail hoist blocks underslung from runway beams.....	17
2.5.1.1 Vertical loads.....	17
2.5.1.2 Horizontal forces.....	17
2.5.2 Overhead travelling cranes.....	17
2.5.2.1 Vertical loads.....	17
2.5.2.2 Horizontal forces.....	18
2.5.3 Multiple crane action.....	20
2.6 VERTICAL CRANE LOADS - CHARACTERISTIC VALUES.....	21
2.7 HORIZONTAL CRANE LOADS - CHARACTERISTIC VALUES.....	23
2.7.1 General.....	23
2.7.2 Longitudinal forces $H_{L,i}$ and transverse forces $H_{T,i}$ caused by acceleration and deceleration of the crane.....	23
2.7.3 Drive force $K$ .....	25
2.7.4 Horizontal forces $H_{S,i,j,k}$ and the guide force $S$ caused by skewing of the crane.....	26
2.8 TEMPERATURE EFFECTS.....	30
2.9 LOADS ON ACCESS WALKWAYS, STAIRS, PLATFORMS AND GUARD RAILS.....	30
2.9.1 Vertical loads.....	30
2.9.2 Horizontal loads.....	30
2.10 TEST LOADS.....	30
2.11 ACCIDENTAL ACTIONS.....	31
2.11.1 Buffer forces $H_{B,1}$ related to crane movement.....	31
2.11.2 Buffer forces $H_{B,2}$ related to movements of the crab.....	32
2.11.3 Tilting forces.....	32

2.12	FATIGUE LOADS .....	32
2.12.1	<i>Single crane action</i> .....	32
2.12.2	<i>Stress range effects of multiple wheel or crane actions</i> .....	35
<b>SECTION 3 ACTIONS INDUCED BY MACHINERY .....</b>		<b>36</b>
3.1	FIELD OF APPLICATION.....	36
3.2	CLASSIFICATION OF ACTIONS.....	36
3.2.1	<i>General</i> .....	36
3.2.2	<i>Permanent actions</i> .....	36
3.2.3	<i>Variable actions</i> .....	37
3.2.4	<i>Accidental actions</i> .....	37
3.3	DESIGN SITUATIONS .....	37
3.4	REPRESENTATION OF ACTIONS.....	37
3.4.1	<i>Nature of the loads</i> .....	37
3.4.2	<i>Modelling of dynamic actions</i> .....	38
3.4.3	<i>Modelling of the machinery-structure interaction</i> .....	38
3.5	CHARACTERISTIC VALUES .....	39
3.6	SERVICEABILITY CRITERIA .....	41
<b>ANNEX A (NORMATIVE).....</b>		<b>43</b>
<b>BASIS OF DESIGN – SUPPLEMENTARY CLAUSES TO EN 1990 FOR RUNWAY BEAMS LOADED BY CRANES .....</b>		<b>43</b>
A.1	GENERAL .....	43
A.2	ULTIMATE LIMIT STATES.....	43
A.2.1	<i>Combinations of actions</i> .....	43
A.2.2	<i>Partial factors</i> .....	44
A.2.3	<i><math>\psi</math>-factors for crane loads</i> .....	44
A.3	SERVICEABILITY LIMIT STATES .....	45
A.3.1	<i>Combinations of actions</i> .....	45
A.3.2	<i>Partial factors</i> .....	45
A.3.3	<i><math>\psi</math>-factors for crane actions</i> .....	45
A.4	FATIGUE .....	45
<b>ANNEX B (INFORMATIVE) .....</b>		<b>46</b>
<b>GUIDANCE FOR CRANE CLASSIFICATION FOR FATIGUE .....</b>		<b>46</b>