NA to
CYS EN
1993-6:2007
*(Including
AC:2009)*

NATIONAL ANNEX TO CYS EN 1993-6:2007 (Including AC:2009)

Eurocode 3: Design of steel structures

Part 6: Crane supporting structures

CYPRUS ORGANISATION FOR STANDARDISATION

NATIONAL ANNEX

TO

CYS EN 1993-6:2007+AC:2009

Eurocode 3: Design of steel structures

Part 6: Crane supporting structures

This National Annex has been approved by the Board of Directors of the Cyprus Organisation for Standardisation (CYS) on 14.06.2019.

INTRODUCTION

This National Annex has been prepared by the CYS TC 18 National Standardisation Technical Committee of the Cyprus Organisation for Standardisation. (CYS).

NA 1 SCOPE

This National Annex is to be used together with CYS EN 1993-6:2007+ AC: 2009.Any reference in the rest of this text to CYS EN 1993-6:2007 means the above document.

This National Annex gives:

(a) Nationally determined parameters for the following clauses of CYS EN 1993-6:2007 where National choice is allowed (see Section NA 2)

- 2.1.3.2(1)P
- 2.8(2)P
- 3.2.3(1)
- 3.2.3(2)P
- 3.2.4(1) table 3.2
- 3.6.2(1)
- 3.6.3(1)
- 6.1(1)
- 6.3.2.3(1)
- 7.3(1)
- 7.5(1)
- 8.2(4)
- 9.1(2)
- 9.2(1)P
- 9.2(2)P
- 9.3.3(1)
- 9.4.2(5)

(b) Decisions on the use of the Informative Annex A (see Section NA 3).

(c) References to non-contradictory complementary information to assist the user to apply CYS EN 1993-6:2007 (see Section NA 4)

NA 2 NATIONALLY DETERMINED PARAMETERS

NA 2.1 Clause 2.1.3.2(1)P Design working life.

The recommended design working life of 25 years shall be used for runway beams, but for runways that are not intensively used, a design working life 50 years shall be used.

NA 2.2 Clause 2.8(2)P Partial factor $\gamma_{F,test}$ for crane test loads.

The value for the partial factor for crane loads $\gamma_{F,test}$ is specified as $\gamma_{F,test} = 1,1$

NA 2.3 Clause 3.2.3(1) Lowest service temperature for indoor crane supporting structures

Refer to CYS EN1991-1-5 and its National Annex.

NA 2.4 Clause 3.2.3(2)P Selection of toughness properties for members in compression.

Table 2.1 (CYS) of the National Annex of CYS EN 1993-1-10 for σ_{Ed} = 0,25 f_y(t) shall be used for the toughness properties, which is repeated below

Table 2.1 (CYS): Maximum permissible values of element thickness t in mm

Steel grade	Sub-grade	Charpy energy CVN		Reference temperature T_{Ed} [°C]																				
		at T [°C]	J_{min}	10	0	-10	-20	-30	-40	-50	10	0	-10	-20	-30	-40	-50	10	0	-10	-20	-30	-40	-50
				σ_{Ed} = 0,75 f_y(t)							σ_{Ed} = 0,50 f_y(t)							σ_{Ed} = 0,25 f_y(t)						
S235	JR	20	27	60	50	40	35	30	25	20	90	75	65	55	45	40	35	135	115	100	85	75	65	60
	J0	0	27	90	75	60	50	40	35	30	125	105	90	75	65	55	45	175	155	135	115	100	85	75
	J2	-20	27	125	105	90	75	60	50	40	170	145	125	105	90	75	65	200	200	175	155	135	115	100
S275	JR	20	27	55	45	35	30	25	20	15	80	70	55	50	40	35	30	125	110	95	80	70	60	55
	J0	0	27	75	65	55	45	35	30	25	115	95	80	70	55	50	40	165	145	125	110	95	80	70
	J2	-20	27	110	95	75	65	55	45	35	155	130	115	95	80	70	55	200	190	165	145	125	110	95
	M,N	-20	40	135	110	95	75	65	55	45	180	155	130	115	95	80	70	200	200	190	165	145	125	110
	ML,NL	-50	27	185	160	135	110	95	75	65	200	200	180	155	130	115	95	230	200	200	200	190	165	145
S355	JR	20	27	40	35	25	20	15	15	10	65	55	45	40	30	25	25	110	95	80	70	60	55	45
	J0	0	27	60	50	40	35	25	20	15	95	80	65	55	45	40	30	150	130	110	95	80	70	60
	J2	-20	27	90	75	60	50	40	35	25	135	110	95	80	65	55	45	200	175	150	130	110	95	80
	K2,M,N	-20	40	110	90	75	60	50	40	35	155	135	110	95	80	65	55	200	200	175	150	130	110	95
	ML,NL	-50	27	155	130	110	90	75	60	50	200	180	155	135	110	95	80	210	200	200	200	175	150	130
S420	M,N	-20	40	95	80	65	55	45	35	30	140	120	100	85	70	60	50	200	185	160	140	120	100	85
	ML,NL	-50	27	135	115	95	80	65	55	45	190	165	140	120	100	85	70	200	200	200	185	160	140	120
S460	Q	-20	30	70	60	50	40	30	25	20	110	95	75	65	55	45	35	175	155	130	115	95	80	70
	M,N	-20	40	90	70	60	50	40	30	25	130	110	95	75	65	55	45	200	175	155	130	115	95	80
	QL	-40	30	105	90	70	60	50	40	30	155	130	110	95	75	65	55	200	200	175	155	130	115	95
	ML,NL	-50	27	125	105	90	70	60	50	40	180	155	130	110	95	75	65	200	200	200	175	155	130	115
	QL1	-60	30	150	125	105	90	70	60	50	200	180	155	130	110	95	75	215	200	200	200	175	155	130
S690	Q	0	40	40	30	25	20	15	10	10	65	55	45	35	30	20	20	120	100	85	75	60	50	45
	Q	-20	30	50	40	30	25	20	15	10	80	65	55	45	35	30	20	140	120	100	85	75	60	50
	QL	-20	40	60	50	40	30	25	20	15	95	80	65	55	45	35	30	165	140	120	100	85	75	60
	QL	-40	30	75	60	50	40	30	25	20	115	95	80	65	55	45	35	190	165	140	120	100	85	75
	QL1	-40	40	90	75	60	50	40	30	25	135	115	95	80	65	55	45	200	190	165	140	120	100	85
	QL1	-60	30	110	90	75	60	50	40	30	160	135	115	95	80	65	55	200	200	190	165	140	120	100

NA 2.5 Clause 3.2.4(1) Requirement Z_{Ed} for through-thickness properties.

The allocation in Table 3.2 (CYS) is specified for crane supporting structures.

Table 3.2 (CYS) Choice of quality class according to EN 10164

Target value of Z_{Ed} according to EN 1993-1-10	Required value of Z_{Rd} according to EN 10164
≤ 10	—
11 to 20	Z 15
21 to 30	Z 25
> 30	Z 35

NA 2.6 Clause 3.6.2(1) Information on suitable rails and rail steels.

No further information on suitable rails and rail steels is provided in this National Annex.

NA 2.7 Clause 3.6.3(1) Information on special connecting devices for rails.

No further information on special connecting devices for rails is provided in this National Annex.

NA 2.8 Clause 6.1(1) Partial factors γ_{Mi} for resistance for ultimate limit states.

The values for the following partial factors are specidied as:

$\gamma_{M0} = 1{,}00$

$\gamma_{M1} = 1{,}00$

$\gamma_{M2} = 1{,}25$

$\gamma_{M3} = 1{,}25$

$\gamma_{M3,ser} = 1{,}10$

$\gamma_{M4} = 1{,}00$

$\gamma_{M5} = 1{,}00$

$\gamma_{M6,ser} = 1{,}00$

$\gamma_{M7} = 1{,}10$

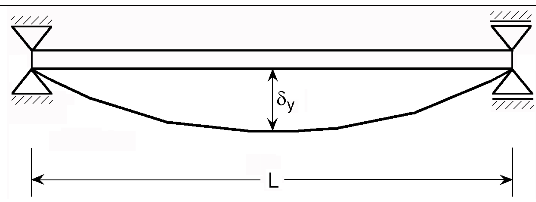
NA 2.9 Clause 6.3.2.3(1) Alternative assessment method for lateral-torsional buckling

No further information for alternative assessment method is specified in this National Annex. The method given in Annex A may be used.

NA 2.10 Clause 7.3(1) Limits for deflections and deformations.

The limits given in Table 7.1 (CYS) are specified for horizontal deflections under the characteristic combination of actions. The limits given in Table 7.2 (CYS) are specified for vertical deflections under the characteristic combination of actions without any dynamic amplification factors.

Table 7.1 (CYS) : Limiting values of horizontal deflections

Description of deflection (deformation or displacement)	Diagram
a) Horizontal deformation δ_y of a runway beam, measured at the level of the top of the crane rail: $\delta_y \leq L/600$	

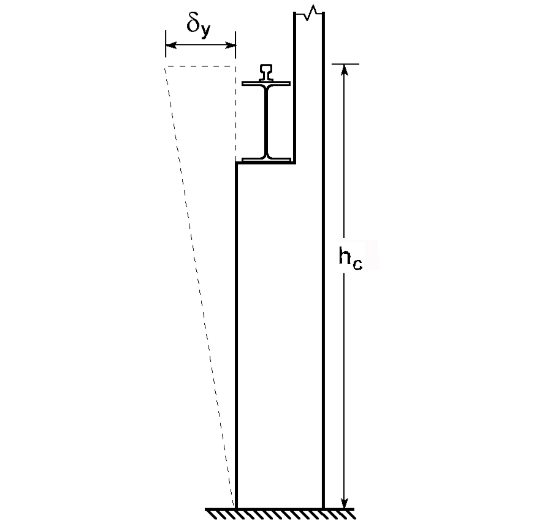
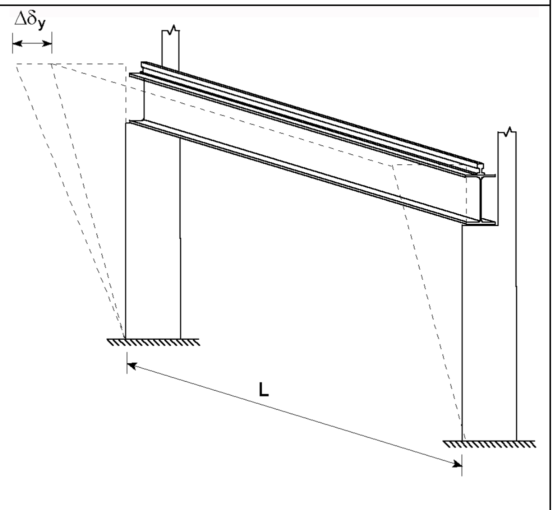
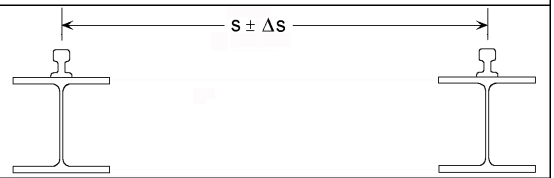
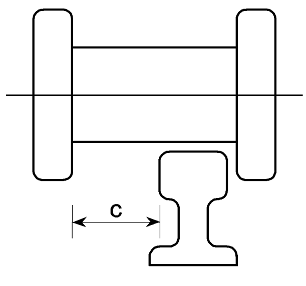
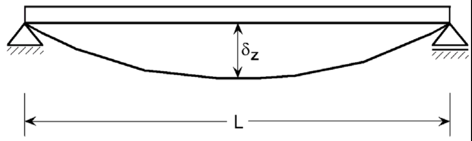
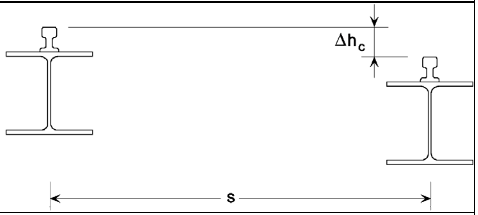
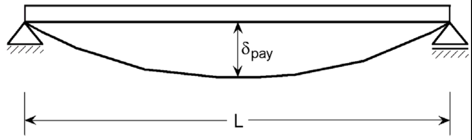
b) Horizontal displacement δ_y of a frame (or of a column) at crane support level, due to crane loads: $\delta_y \le h_c/400$ where: h_c is the height to the level at which the crane is supported (on a rail or on a flange)	
c) Difference $\Delta\delta_y$ between the horizontal displacements of adjacent frames (or columns) supporting the beams of an indoor crane runway: $\Delta\delta_y \le L/600$	
d) Difference $\Delta\delta_y$ between the horizontal displacements of adjacent columns (or frames) supporting the beams of an outdoor crane runway: - due to the combination of lateral crane forces and the in-service wind load: $\Delta\delta_y \le L/600$ - due to the out-of-service wind load $\Delta\delta_y \le L/400$	
e) Change of spacing Δs between the centres of crane rails, including the effects of thermal changes: $\Delta s \le 10$ mm [see Note]	
Note: Horizontal deflections and deviations of crane runways are considered together in crane design. Acceptable deflections and tolerances depend on the details and clearances in the guidance means. Provided that the clearance c between the crane wheel flanges and the crane rail (or between the alternative guidance means and the crane beam) is also sufficient to accommodate the necessary tolerances, larger deflection limits can be specified for each project if agreed with the crane supplier and the client.	

Table 7.2 (CYS) : Limiting values of vertical deflections

Description of deflection (deformation or displacement)	Diagram
a) Vertical deformation δ_z of a runway beam: $\delta_z \leq L/600$ and $\delta_z \leq 25$ mm The vertical deformation δ_z should be taken as the total deformation due to vertical loads, less the possible pre-camber, as for δ_{max} in figure A1.1 of EN 1990.	
b) Difference Δh_c between the vertical deformations of two beams forming a crane runway: $\Delta h_c \leq s/600$	
c) Vertical deformation δ_{pay} of a runway beam for a monorail hoist block, relative to its supports, due to the payload only: $\delta_{pay} \leq L/500$	

NA 2.11 Clause 7.5(1) Partial factor $\gamma_{M,ser}$ for resistance for serviceability limit states.

The partial factor $\gamma_{M,ser}$ for resistance for serviceability is specified as $\gamma_{M,ser} = 1{,}00$.

NA 2.12 Clause 8.2(4) Crane classes to be treated as "high fatigue".

Classes S7 to S9 according to Annex B of EN 1991-3 are specified as the crane classes to be treated as "high fatigue".

NA 2.13 Clause 9.1(2) Limit for number of cycles C_0 without a fatigue assessment.

The recommended numerical value $C_o = 10^4$ shall be used.

NA 2.14 Clause 9.2(1)P Partial factor γ_{Ff} for fatigue loads.

The partial factor γ_{Ff} for fatigue loads is specified as $\gamma_{Ff} = 1{,}0$.

NA 2.15 Clause 9.2(2)P Partial factors γ_{Mf} for fatigue resistance.

Table 3.1 (CYS) of the National Annex of CYS EN 1993-1-9 shall be used, which is repeated below

Table 3.1 (CYS) : Values for partial factors for fatigue strength

Assessment method	Consequence of failure	
	Low consequence	High consequence
Damage tolerant	1,00	1,15
Safe life	1,15	1,35

NA 2.16 Clause 9.3.3(1) Crane classes where bending due to eccentricity may be neglected.

The bending stresses $\sigma_{T,Ed}$ can be neglected for crane classes S_0 to S_3

NA 2.17 Clause 9.4.2(5) Damage equivalence factors λ_{dup} for multiple crane operation.

The value of λ_{dup} is equal to the values λ_i from Table 2.12 (CYS) of the National Annex of CYS EN 1991-3, which is repeated below, for a loading class S_i as follows:

- for 2 cranes: 2 classes below the loading class of the crane with the lower loading class;

- for 3 or more cranes:3 classes below the loading class of the crane with the lowest loading class.

Table 2.12(CYS) — λ_i-values according to the classification of cranes

Classes S	S_0	S_1	S_2	S_3	S_4	S_5	S_6	S_7	S_8	S_9
normal stresses	0,198	0,250	0,315	0,397	0,500	0,630	0,794	1,00	1,260	1,587
shear stresses	0,379	0,436	0,500	0,575	0,660	0,758	0,871	1,00	1,149	1,320

NOTE 1: In determining the λ-values standardized spectra with a gaussian distribution of the load effects, the Miner rule and fatigue strength S-N lines with a slope $m = 3$ for normal stresses and $m = 5$ for shear stress have been used.

NOTE 2: In case the crane classification is not included in the specification documents of the crane client indications are given in Annex B.

NA 3 DECISION ON THE USE OF INFORMATIVE ANNEXES

NA 3.1 Annex A

Annex A may be used.

NA 4 REFERENCES TO NON-CONTRADICTORY COMPLEMENTARY INFORMATION

None

NA to CYS EN 1993-6:2007 (Including AC:2009)

CYPRUS ORGANISATION FOR STANDARDISATION
Limassol Avenue and Kosta Anaxagora 30,
2nd & 3rd Floor, 2014 Strovolos, Cyprus
P.O.BOX.16197, 2086 Nicosia, Cyprus
Tel: +357 22 411411 Fax: +357 22 411511
E-Mail: cystandards@cys.org.cy
Website: www.cys.org.cy