

**NATIONAL ANNEX
TO
CYS EN 1993-1-1:2005
Eurocode 3: Design of steel structures
Part1-1: General rules and rules for buildings**

Public Enquiry Draft

Period of Enquiry

November 19th 2007 to January 14th 2008

Readers are advised that this is a draft document and subject to change

**Prepared by: Eurocodes Committee
Ministry of Interior / Technical Chamber of Cyprus**

PUBLIC ENQUIRY DRAFT

National Annex to CYS EN 1993-1-1:2005 Eurocode 3: Design of Steel Structures
Part 1-1: General rules and rules for buildings

INTRODUCTION

This National Annex has been prepared by the Eurocodes Committee of the Technical Chamber of Cyprus which was commissioned by the Ministry of Interior of the Republic of Cyprus.

NA 1 SCOPE

This National Annex is to be used in conjunction with CYS EN 1993-1-1:2005.

This National Annex gives:

- (a) Nationally Determined Parameters described in the following clauses of CYS EN 1993-1-1:2005 (see Section NA 2):
- 2.3.1 (1)
 - 3.1 (2)
 - 3.2.1 (1)
 - 3.2.2 (1)
 - 3.2.3 (1)
 - 3.2.3 (3)B
 - 3.2.4 (1)B
 - 5.2.1 (3)
 - 5.2.2 (8)
 - 5.3.2 (3)
 - 5.3.2 (11)
 - 5.3.4 (3)
 - 6.1(1)
 - 6.1 (1)B
 - 6.3.2.2 (2)
 - 6.3.2.3 (1)
 - 6.3.2.3 (2)
 - 6.3.2.4 (1)B
 - 6.3.2.4 (2)B
 - 6.3.3 (5)
 - 6.3.4 (1)
 - 7.2.1 (1)B
 - 7.2.2 (1)B
 - 7.2.3 (1)B
 - BB.1.3 (3)B
- (b) Decisions on the use of CYS EN 1993-1-1:2005 informative annexes (see Section NA 3)
- (c) References to non-contradictory complementary information to assist the user to apply CYS EN 1993-1-1:2005 (see Section NA 4)

NA 2 NATIONALLY DETERMINED PARAMETERS

NA 2.1 Clause 2.3.1 (1) Actions and environmental influences

Refer to the parts of CYS EN 1991 and their National Annexes.

PUBLIC ENQUIRY DRAFT

National Annex to CYS EN 1993-1-1:2005 Eurocode 3: Design of Steel Structures
Part 1-1: General rules and rules for buildings

NA 2.2 Clause 3.1 (2) General

No information for other steel material and products is provided in this National Annex.

NA 2.3 Clause 3.2.1 (1) Material properties

The nominal values of the yield strength f_y and the ultimate strength f_u for structural steel should be obtained by adopting the values $f_y = R_{ch}$ and $f_u = R_m$ direct from the product standard.

NA 2.4 Clause 3.2.2 (1) Ductility requirements

The following recommended requirements should be used:

- $f_u / f_y \geq 1,10$;
- elongation at failure not less than 15%;
- $\epsilon_u \geq 15\epsilon_y$, where ϵ_y is the yield strain ($\epsilon_y = f_y / E$).

NA 2.5 Clause 3.2.3 (1) Fracture toughness

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

NA 2.6 Clause 3.2.3 (3)B Fracture toughness

The toughness properties for members in compression should be taken from Table NA1 (Table 2.1 of CYS EN 1993-1-10) for $\sigma_{Ed} = 0,25 f_y(t)$.

**Table NA1: Maximum permissible values of element thickness t in mm
(Table 2.1 of CYS EN 1993-1-10)**

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
				$\sigma_{Ed} = 0,75 f_y(t)$						$\sigma_{Ed} = 0,50 f_y(t)$						$\sigma_{Ed} = 0,25 f_y(t)$								
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	10	65	55	45	40	30	25	20	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

PUBLIC ENQUIRY DRAFT

National Annex to CYS EN 1993-1-1:2005 Eurocode 3: Design of Steel Structures
Part 1-1: General rules and rules for buildings

NOTE 1 Linear interpolation can be used in applying Table NA1. Most applications require σ_{Ed} values between $\sigma_{Ed} = 0,75 f_y(t)$ and $\sigma_{Ed} = 0,50 f_y(t)$. $\sigma_{Ed} = 0,25 f_y(t)$ is given for interpolation purposes. Extrapolations beyond the extreme values are not valid.

NOTE 2 For ordering products made of S 690 steels the T_J – values should be specified.

NA 2.7 Clause 3.2.4 (1)B Through-thickness properties

The allocation of target values Z_{Ed} according to 3.2(2) of CYS EN 1993-1-10 to the quality class in EN 10164 should be as given in Table NA2 (Table 3.2 of CYS EN 1993-1-1).

**Table NA2: Choice of quality class according to EN 10164
(Table 3.2 of CYS EN 1993-1-1)**

Target value of Z_{Ed} according to CYS EN 1993-1-10	Required value of Z_{Rd} according to EN 10164
$Z_{Ed} \leq 10$	—
$10 < Z_{Ed} \leq 20$	Z 15
$20 < Z_{Ed} \leq 30$	Z 25
$Z_{Ed} > 30$	Z 35

NA 2.8 Clause 5.2.1 (3) Effects of deformed geometry of the structure

The lower limit for α_{cr} should be the general limit set in the clause.

NA 2.9 Clause 5.2.2 (8) Structural stability of frames

No further information is provided in this National Annex.

NA 2.10 Clause 5.3.2 (3) Imperfections for global analysis of frames

The values of initial local bow imperfection, e_0 / L , should be taken from Table NA3 (Table 5.1 of CYS EN 1993-1-1).

**Table NA3: Design values of initial bow imperfection e_0 / L
(Table 5.1 of CYS EN 1993-1-1)**

Buckling curve acc. to Table 6.1	elastic analysis	plastic analysis
	e_0 / L	e_0 / L
a_0	1 / 350	1 / 300
a	1 / 300	1 / 250
b	1 / 250	1 / 200
c	1 / 200	1 / 150
d	1 / 150	1 / 100

NA 2.11 Clause 5.3.2 (11) Imperfections for global analysis of frames

No further information is provided in this National Annex.

NA 2.12 Clause 5.3.4 (3) Member imperfections

The recommended value of $k=0,5$ should be used.

PUBLIC ENQUIRY DRAFT

National Annex to CYS EN 1993-1-1:2005 Eurocode 3: Design of Steel Structures
Part 1-1: General rules and rules for buildings

NA 2.13 Clause 6.1 (1) General

For structures not covered by CYS EN 1993 Part 2 to Part 6, the values for the partial factors γ_{Mi} should be taken from CYS EN 1993-2.

NA 2.14 Clause 6.1 (1)B General

The following recommended values for the partial factors γ_{Mi} for buildings should be used:

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

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

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

NA 2.15 Clause 6.3.2.2 (2) Lateral torsional buckling curves – General case

The values of imperfection factor α_{LT} should be taken from Table NA4 (Table 6.3 of CYS EN 1993-1-1). The recommendations for buckling curves are given in Table NA5 (Table 6.4 of CYS EN 1993-1-1).

**Table NA4: Imperfection factors for lateral torsional buckling curves
(Table 6.3 of CYS EN 1993-1-1)**

Buckling curve	a	b	c	d
Imperfection factor α_{LT}	0,21	0,34	0,49	0,76

Table NA5: Lateral torsional buckling curves for cross-sections using equation (6.56) (Table 6.4 of CYS EN 1993-1-1)

Cross-section	Limits	Buckling curve
Rolled I-sections	$h/b \leq 2$	a
	$h/b > 2$	b
Welded I-sections	$h/b \leq 2$	c
	$h/b > 2$	d
Other cross-sections	-	d

NA 2.16 Clause 6.3.2.3 (1) Lateral torsional buckling curves for rolled sections or equivalent welded sections

The following recommended limitations should be used:

$$\bar{\lambda}_{LT,0} = 0,4 \quad (\text{maximum value})$$

$$\beta = 0,75 \quad (\text{minimum value})$$

The recommendations for buckling curves are given in Table NA6 (Table 6.5 of CYS EN 1993-1-1).

Table NA6: Selection of lateral torsional buckling curve for cross sections using equation (6.57) (Table 6.5 of CYS EN 1993-1-1)

Cross-section	Limits	Buckling curve
Rolled I-sections	$h/b \leq 2$	b
	$h/b > 2$	c
Welded I-sections	$h/b \leq 2$	c
	$h/b > 2$	d

PUBLIC ENQUIRY DRAFT

National Annex to CYS EN 1993-1-1:2005 Eurocode 3: Design of Steel Structures
Part 1-1: General rules and rules for buildings


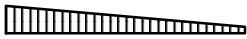


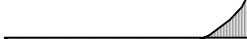




NA 2.17 Clause 6.3.2.3 (2) Lateral torsional buckling curves for rolled sections or equivalent welded sections

The following recommended minimum values should be used:

$$f = 1 - 0,5(1 - k_c)[1 - 2,0(\bar{\lambda}_{LT} - 0,8)^2] \quad \text{but } f \leq 1,0$$

k_c is a correction factor according to Table NA7 (Table 6.6 of CYS EN 1993-1-1).

Table NA7: Correction factors k_c (Table 6.6 of CYS EN 1993-1-1)

Moment distribution	k_c
 $\psi = 1$	1,0
 $-1 \leq \psi \leq 1$	$\frac{1}{1,33 - 0,33\psi}$
   	0,94 0,90 0,91
  	0,86 0,77 0,82

NA 2.18 Clause 6.3.2.4 (1)B Simplified assessment methods for beams with restraints in buildings

The recommended limit value $\bar{\lambda}_{c0} = \bar{\lambda}_{LT,0} + 0,1$ should be used, see 6.3.2.3 of CYS EN 1993-1-1.

NA 2.19 Clause 6.3.2.4 (2)B Simplified assessment methods for beams with restraints in buildings

The recommended value of $k_{f\lambda} = 1,10$ should be used.

NA 2.20 Clause 6.3.3 (5) Uniform members in bending and axial compression

Method 2 is preferred but Method 1 may be used at the discretion of the designer.

NA 2.21 Clause 6.3.4 (1) General method for lateral and lateral torsional buckling of structural components

The method may be used at the discretion of the designer.

NA 2.22 Clause 7.2.1 (1)B Vertical deflections

With reference to Figure NA1 (Figure A1.1 of CYS EN 1990), the recommended limits for vertical deflections are given in Table NA8.

PUBLIC ENQUIRY DRAFT

National Annex to CYS EN 1993-1-1:2005 Eurocode 3: Design of Steel Structures
Part 1-1: General rules and rules for buildings

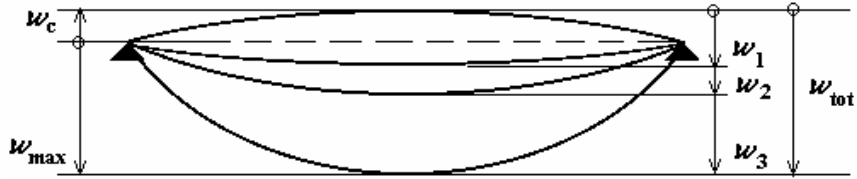


Figure NA1 - Definitions of vertical deflections (Figure A1.1 of CYS EN 1990)

Key :

- w_c Precamber in the unloaded structural member
- w_1 Initial part of the deflection under permanent loads of the relevant combination of actions according to expressions (6.14a) to (6.16b)
- w_2 Long-term part of the deflection under permanent loads
- w_3 Additional part of the deflection due to the variable actions of the relevant combination of actions according to expressions (6.14a) to (6.16b)
- w_{tot} Total deflection as sum of w_1 , w_2 , w_3
- w_{max} Remaining total deflection taking into account the precamber

Table NA8: Recommended limits for vertical deflections

Design situation	Total deflection limits
Cantilevers	Length/180
Beams carrying plaster or other brittle finish	Span/360
Other beams (except purlins and sheeting rails)	Span/250
Purlins and sheeting rails	To suit cladding

NA 2.23 Clause 7.2.2 (1)B Horizontal deflections

With reference to Figure NA2 (Figure A1.2 of CYS EN 1990), the recommended limits for horizontal deflections are given in Table NA9.

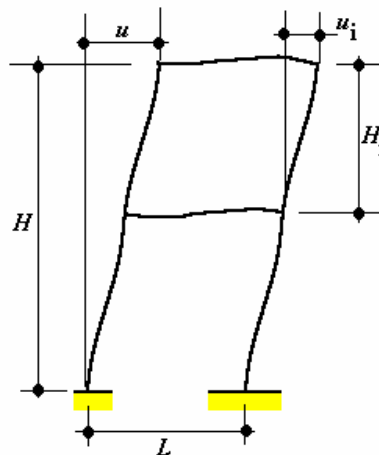


Figure NA2 - Definition of horizontal displacements (Figure A1.2 of CYS EN 1990)

Key :

- u Overall horizontal displacement over the building height H
- u_i Horizontal displacement over a storey height H_i

PUBLIC ENQUIRY DRAFT

National Annex to CYS EN 1993-1-1:2005 Eurocode 3: Design of Steel Structures
Part 1-1: General rules and rules for buildings

Table NA9: Recommended limits for horizontal deflections

Design situation	Deflection limits
Tops of columns in single storey buildings, except portal frames	Height/300
Columns in portal frame buildings, not supporting crane runways	To suit cladding
In each storey of a building with more than one storey	Storey height/300
On the multistorey building as a whole	Building height/500

NA 2.24 Clause 7.2.3 (1)B Dynamic effects

The recommended limits for vibration of floors are given in Table NA10.

Table NA10: Recommended limits for vibration of floors

Design situation	Lowest natural frequency
Floors over which people walk regularly	5 Hz
Floor which is jumped or danced on in a rhythmical manner	9 Hz

NA 2.25 Clause BB.1.3 (3)B Hollow sections as members

No further information is provided in this National Annex.

NA 3 DECISION ON THE USE OF INFORMATIVE ANNEXES

NA 3.1 Annex A

Annex A may be used.

NA 3.2 Annex B

Annex B shall be used.

NA 3.3 Annex AB

Annex AB may be used.

NA 3.4 Annex BB

Annex BB may be used.

NA 4 REFERENCES TO NON-CONTRADICTORY COMPLEMENTARY INFORMATION

None