European Commission

EN 1993
Elaboration of NA

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Introduction

Work organization in CSI (HZN)

- *TC548 was founded in Croatia as mirror Committee of CEN/TC250.*
- *SC3 was founded for EC 3.*
- *One institution/firm may have had more members in Committee/Subcommittee, but only one vote.*
- *Problem! Academic institutions were allocated only one vote the same as a firm with only one employee (democracy at work?).*

Introduction

Work organization in CSI (HZN)

- *The least number of members in SC3 came from industry and construction companies.*
- *They also contributed the least to the process of enactment of National Annexes.*
- *Most active members were prominent structural engineers and professors of academic institutions.*

Introduction

Work organization in CSI (HZN)

- *Proposal for a National Annex was made within SC3.*
- *TC548 adopted or rejected (never) a proposal for particular National Annex.*
- *Public inquiry was held.*
- *Study of comments/objections was done in SC3.*
- *Final adoption of NA took place in TC548.*

Introduction

Time frame for drafting National Annexes

- *Most important and time-consuming was the work in SC3.*
- *Lengthy period after final adoption of a National Annex (language-editing, text processing, announcement in Croatian Standards Institute (HZN) official gazette, finally availability of a National Annex).*
- *National Annexes were released on 30/4/2013.*

Introduction

NA form and contents

- *Some EU member states have very concise National Annexes, whilst others have very extensive ones including NCCI.*
- *At first we collected and carefully studied all available National Annexes from various EU states (Austria, Italy, Germany, UK, etc.) and other sources.*

Introduction

NA form and contents

- *Then we assigned work on Croatian NA to a particular EN 1993 standard to a group of most qualified SC3 members.*
- *Their proposal on a NA was discussed at length in SC3 until the concensus was reached, which sometimes required a lot of time and persuasion.*
- *Particular Croatian NA to EC 3 standards vary extensively in regard to volume and contents.*
- *They are mostly quite elaborate.*

List of EN 1993 standards

Standard	*Action*
EN 1993-1-1	*General rules and rules for buildings*
EN 1993-1-2	*General rules – Structural fire design*
EN 1993-1-3	*General rules – Supplementary rules for cold−formed members and sheeting*
EN 1993-1-4	*General rules – Supplementary rules for stainless steels*
EN 1993-1-5	*Plated structural elements*
EN 1993-1-6	*Strength and stability of shell structures*
EN 1993-1-7	*Plated structures subject to out of plane loading*
EN 1993-1-8	*Design of joints*
EN 1993-1-9	*Fatigue*
EN 1993-1-10	*Material toughness and through-thickness properties*

List of EN 1993 standards

Standard	Action
EN 1993-1-11	*Design of structures with tension components*
EN 1993-1-12	*Additional rules for the extension of EN 1993 up to steel grades S700*
EN 1993-2	*Steel bridges*
EN 1993-3-1	*Towers, masts and chimneys – Towers and masts*
EN 1993-3-2	*Towers, masts and chimneys – chimneys*
EN 1993-4-1	*Silos*
EN 1993-4-2	*Tanks*
EN 1993-4-3	*Pipelines*
EN 1993-5	*Piling*
EN 1993-6	*Crane supporting structures*

Croatian NA to EN 1993
Number of total, accepted and modified NDP (+ NCCI)

Standard	*NDP*				*NCCI*
	Total	Accepted	Modified	Accepted in %	
EN 1993-1-1	25	20	5	80,0	3
EN 1993-1-2	5	5	0	100,0	0
EN 1993-1-3	20	16	4	80,0	0
EN 1993-1-4	8	8	0	100,0	0
EN 1993-1-5	15	11	4	73,3	7
EN 1993-1-6	18	17	1	94,4	1
EN 1993-1-7	1	1	0	100,0	0
EN 1993-1-8	6	3	3	50,0	8
EN 1993-1-9	12	10	2	83,3	0
EN 1993-1-10	4	3	1	75,0	2

Croatian NA to EN 1993
Number of total, accepted and modified NDP (+ NCCI)

Standard	NDP				NCCI
	Total	Accepted	Modified	Accepted in %	
EN 1993-1-11	16	10	6	62,5	7
EN 1993-1-12	6	3	3	50,0	2
EN 1993-2	57	26	31	45,6	15
EN 1993-3-1	47	40	7	85,1	3
EN 1993-3-2	20	17	3	85,0	5
EN 1993-4-1	55	54	1	98,2	0
EN 1993-4-2	11	10	1	90,9	0
EN 1993-4-3	22	18	4	81,8	0
EN 1993-5	15	11	4	73,3	4
EN 1993-6	17	12	5	70,6	9

Croatian NA to EN 1993
General

- *Extensive numerical case studies were done to modify NDP, so that the same level of reliability is achieved as by using previous Croatian standards*
- *German National Annexes were heavily relied upon, because Croatian (Yugoslav) standards on steel structures had traditionally been based on DIN standards.*
- *Almost all modified NDP are more stringent in respect to the EC recommended ones.*

Croatian NA to EN 1993
General

- *Some of NA contain NCCI to enhance some EC 3 clauses and to clarify most important issues and detailing, thus helping the designers to avoid unnecessary computations and to understand more clearly, what was actually meant.*

- *Only important modified NDP are shown, with recommended corresponding EC 3 values given in brackets in red color.*

HRN EN 1993-1-1/NA: General rules and rules for buildings
modified NDP

- ***6.1(1)***

- *Partial factor:* γ_{M1}=1,10(1,00)

- *In stability checks utilizing 2nd order theory cross-section resistances should be calculated by using* γ_{M1}.

HRN EN 1993-1-1/NA: General rules and rules for buildings

NCCI

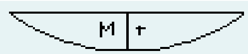
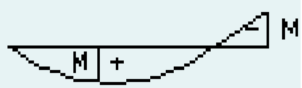
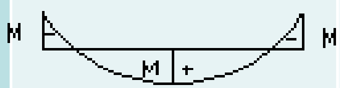
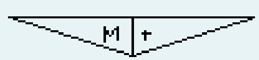
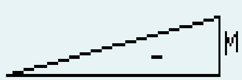
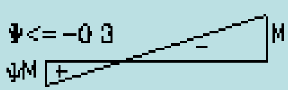
- ***BB.2.2(1)B – NCCI***

- *Table BB.1 of factor K_ς considering moment type distribution and type of restraint for continuous torsional restraint is replaced by Table BB.1(HR).*

HRN EN 1993-1-1/NA: General rules and rules for buildings

NCCI

- *Table BB.1(HR): factor K_c*

Case	Moment distribution	Without translational restraint				With translational restraint			
		b	c	d	EC 3	b	c	d	EC 3
1		6,8	10,0	14,2	4,0	0	0	0	**0**
2		4,8	7,3	10,9	3,5	0,030	0,041	0,067	**0,12**
3		4,2	6,4	9,7	3,5	0,032	0,044	0,072	**0,23**
4		2,8	4,4	7,1	2,8	0	0	0	**0**
5		0,89	1,4	2,6	1,6	0,38	0,60	1,1	**1,0**
6		**0,47**	**0,75**	**1,4**	**1,0**	**0,23**	**0,36**	**0,65**	**0,7**

EN 1993-1-2/NA: General rules – Structural fire design

- *All recommended NDP are accepted.*

HRN EN 1993-1-3/NA: General rules – Supplementary rules for cold-formed members and sheeting
modified NDP

- ***2(3)P***
- *Partial factors:* γ_{M0}=1,10(1,00); γ_{M1}=1,10(1,00)

- ***3.2.4(1)***
- *Range of core thickness* t_{cor} *:*
  Sheeting/members: 0,45 mm ≤ t_{cor} ≤ 3 (15) mm

HRN EN 1993-1-3/NA: General rules – Supplementary rules for cold-formed members and sheeting

modified NDP

- ***5.3(4)***

- *Magnitude of imperfections related to lateral torsional buckling should be taken according to Table 5.1 for lateral torsional buckling curve „c" 6.3.2.2 simultaneously using factor k = 0,5 5.3.4(3), all of EN 1993-1-1*

- ***10.1.4.2(1)***

- *Values χ_{LT} and $\bar{\lambda}_{\mathrm{fz}}$ for buckling resistance of free flange in compression should be defined using buckling curve „c" („b"), 6.3.2.2 of EN 1993-1-1*

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HRN EN 1993-1-4/NA: General rules – Supplementary rules for stainless steels

- *All recommended NDP are accepted.*

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HRN EN 1993-1-5/NA: Plated structural elements

modified NDP

- ***10(2)***
- *Reduced stress method should be used for serviceability checks (SLS).*
- *It may be used for ULS checks.*
- *Hinged boundary conditions should be used.*
- ***D.2.2(2)***
- *For plate girders with corrugated webs expressions to calculate stiffnesses of trapezoidal and sinusoidal corrugated webs are specified.*

HRN EN 1993-1-6/NA: Strength and Stability of Shell Structures
NCCI

- ***NCCI***

- *Procedure for calculation of buckling of spherical shells and domes under constant radial loading is added in Annex E(HR).*

HRN EN 1993-1-7/NA: Strength and stability of planar plated structures subject to out of plane loading

- *All recommended NDP are accepted.*

HRN EN 1993-1-8/NA: Design of joints
modified NDP

- **2.2(2)**
  - *Partial factors γ_{Mi} are modified as follows: injection bolts γ_{M4}=1,10(1,00); resistance of joints in hollow section lattice girder γ_{M5}=1,35(1,00).*
- **3.1.1(3)**
  - *Bolt classes 4.8, 5.8 and 6.8 are forbidden for use in steel structures; bolt class 4.6 is allowed for use in non-bearing structural parts only.*

HRN EN 1993-1-8/NA: Design of joints
NCCI

- ***3.1.2(1) – NCCI***

- *For preloaded bolts various procedures for preloading are specified.*

HRN EN 1993-1-9/NA: Fatigue
modified NDP

- ***3(7)***
- *Fatigue assessment should be undertaken using damage tolerant method.*
- *Partial factors γ_{Mf} for fatigue resistance given in Table 3.1(HR) should be used, with values depending on consequence classes CC1-CC3.*

HRN EN 1993-1-9/NA: Fatigue
modified NDP

- *Table 3.1(HR): Values for partial factors for fatigue strength γ_{Mf}*

Assessment method	**Consequence of failure**		
	Low consequence	**Medium consequence**	**High consequence**
	CC1[a)]	**CC2[a)]**	**CC3[a)]**
Damage tolerant	1,00	1,10	1,15
Safe life	1,15	1,35	1,50 (1,35)
a) CC1, CC2, CC3: Consequence classes in accordance with Table B.1, Annex B of EN 1990			

HRN EN 1993-1-10/NA: Material toughness and through-thickness properties

NCCI

- ***2.2(5) – NCCI***
- *Lowest air temperature with a specified return period T_{md} used in expression for reference temperature T_{ed} at potential fracture location is specified for various steel structures (bridges, buildings, etc) in Table 1(HR).*

HRN EN 1993-1-10/NA: Material toughness and through-thickness properties

NCCI

Designation	Structures and parts of structures	Temperature T_{mdr} °C
1	Steel and composite bridges	- 30
2	Steel structures in buildings	
2a	Parts of structures outside	- 30
2b	Parts of structures inside	0
3	Crane supporting structures (outside parts)	- 30
4	Hydraulic engineering	
4a	Shutters ocassionally completely or mostly out of water	- 30
4b	Shutters under water on one side	-15
4c	Shutters partially under water on both sides	-15
4d	Shutters always completely under water	-5

HRN EN 1993-1-11/NA: Design of structures with tension components
modified NDP

- ***3.1(1)***
- *Characteristic value of nominal tensile strength f_u for bundle of parallel round wires is specified as* $f_u \leq 1860$ N/mm² *in buildings and* $f_u \leq 1770$ N/mm² *in bridges.*
- *Characteristic value of nominal tensile strength f_u for fully locked coil ropes in bridges is specified as* $f_u \leq 1570$ N/mm².

HRN EN 1993-1-11/NA: Design of structures with tension components NCCI

- ***2.1 – NCCI***
- *Pedestrian and cycle bridges are treated as buildings.*
- ***9.2 – NCCI***
- *Cable systems for bridges are classified as exposure class 5.*
- *Fully locked coil ropes are classified in structural detail category* $\Delta\sigma_c = 112$ N/mm^2 *and bundle of parallel round wires in structural detail category* $\Delta\sigma_c = 167$ N/mm^2.

HRN EN 1993-1-12/NA: Additional rules for the extension of EN 1993 up to steel grades S 700

- *All recommended NDP are accepted.*

HRN EN 1993-2/NA: Steel Bridges
modified NDP

- ***2.1.3.4(2)***
  - *Fatigue assessment should be undertaken using damage tolerant method.*
- ***6.1(1)P***
  - *Partial factor γ_{M5} for resistance of joints in hollow section lattice girders is specified as γ_{M5}=1,35 (1,1).*

HRN EN 1993-2/NA: Steel Bridges
modified NDP

- ***6.2.2.5(1)***
- *Procedure with effective cross section properties of class 4 sections is limited to buckling verification of webs without longitudinal stiffeners.*
- ***8.1.6.3(1)***
- *Provisions for hybrid connections are specified.*
- *Hybrid connections are not allowed in railway bridges, except in reconstruction of existing ones.*

HRN EN 1993-2/NA: Steel Bridges
modified NDP

- ***9.1.2(1)***

- *Conditions based on appropriate detailing are specified to avoid fatigue assessment of road bridges.*

HRN EN 1993-2/NA: Steel Bridges
modified NDP

- ***9.3(2)P***

- *Partial factors for fatigue resistance are specified:*

Road bridges:

- *main load-bearing elements:* $\gamma_{Mf}=1{,}15$
- *secondary elements:* $\gamma_{Mf}=1{,}0$

Railway bridges:

- *main load-bearing elements (main girders, arch, hangers, etc.):* $\gamma_{Mf}=1{,}25$
- *secondary elements (deck plate, longitudinal stiffeners, cross beams):* $\gamma_{Mf}=1{,}15$ (1,00) – *non-ballasted track (ballasted track)*

HRN EN 1993-2/NA: Steel Bridges
modified NDP

- ***9.4.1(6)***
- *Fatigue stress spectra should not be used.*

- ***C.1.2.2(1)***
- *Thickness of deck plates and minimum stiffness of stiffeners in structural detailing of steel bridge decks of highway bridges are specified.*

HRN EN 1993-2/NA: Steel Bridges
NCCI

- ***C.1.3.5.1(4) – NCCI***
- *Fitting of stiffeners between webs is allowed only as an exception in road bridges with light traffic.*
- ***C.2.5(HR) – NCCI***
- *Procedures for design of orthotropic steel decks are provided.*
- ***NCCI***
- *Thorough analysis of hangers of through arch bridges is provided in Annex F(HR).*

HRN EN 1993-3-1/NA: Towers, masts and chimneys – Towers and masts
modified NDP

- ***2.3.6(2)***
  - *Imposed loads on platforms include also concentrated load 3 kN.*
- ***2.6(1)***
  - *For important towers and masts design service life is 50 years and for other towers and masts 30 years.*
- ***6.1(1)***
  - *Partial factor* γ_{M1} *is specified as* γ_{M1}=1,10(1,00).

HRN EN 1993-3-1/NA: Towers, masts and chimneys – Towers and masts
modified NDP

- ***6.5.1(1)***

- *Design bearing stresses on spherical pinned connection of mast base joint are given in Table 1(HR) Design bearing stresses:*

	Steel quality	**$\sigma_{H,k}$ (N/mm²)**
1	S235, S275	800
2	S355, S420, S460	1000
3	C35+N, C45+N	950

HRN EN 1993-3-1/NA: Towers, masts and chimneys – Towers and masts modified NDP

- ***A.2(1)P***

- *Partial factors for actions are given in Table A.2(HR):*

Type of effect	Reliability class	Permanent Actions	Variable Actions (Q_s)
Unfavorable	All classes	1,3 (1,2–1,0)	1,5 (1,6–1,2)
Favorable	All classes	1,0	0,0
Accidental situations		1,0	1,0

HRN EN 1993-3-1/NA: Towers, masts and chimneys – Towers and masts
modified NDP

- ***C.2(1)***
  - *It may be assumed as simplification that all exposed surfaces are covered with ice 3 cm thick of 7 kN/m^3 density for locations at altitudes less than 700 m.*
- ***F.4.2.1(1)***
  - *Maximum displacement of lattice tower top during erection should not exceed $f=0.01\sqrt{h}$ (1/500 h).*

HRN EN 1993-3-2/NA: Towers, masts and chimneys – Chimneys
modified NDP

- ***2.3.3.1(1)***

- *Imposed loads on platforms include besides specified continuous load also concentrated load 3 kN in most unfavorable position.*

HRN EN 1993-3-2/NA: Towers, masts and chimneys – Chimneys
modified NDP

- ***A.2(1)***
- *Partial factors for actions γ are given in Table A.2(N)(HR):*

Type of effect	Reliability class	Permanent actions	Variable actions
Unfavorable	3	1,5 (1,2)	1,9 (1,6)
	2	1,3 (1,1)	1,5 (1,4)
	1	1,1 (1,0)	1,3 (1,2)
Favorable	All classes	1,0	0,0
Accidental situations		1,0	1,0

HRN EN 1993-3-2/NA: Towers, masts and chimneys – Chimneys
NCCI

- ***Annex C – NCCI***

- *Fatigue assessment is not necessary if one of the specified conditions are fulfilled:*

$\Delta\sigma \leq 26\ \mathrm{N/mm^2}/\gamma_{Mf}$

$N \leq 5 \times 10^6 \times [(26\ \mathrm{N/mm^2}/\gamma_{Mf}) / \Delta\sigma]^3$

$\Delta\sigma$ *maximum stress difference at ULS*

N *number of stress cycles*

γ_{Mf} *material safety factor for fatigue*

HRN EN 1993-3-2/NA: Towers, masts and chimneys – Chimneys
NCCI

- ***C.1(2) – NCCI***
  - *Minimum quality level for welds of shells subjected to fatigue is quality level B (C).*

- ***NCCI***
  - *Requirements for inspections of chimneys are specified in Annex F(HR).*

HRN EN 1993-4-1/NA: Silos modified NDP

- ***2.9.2.2(3)P***

  - *Partial factor γ_{M4} for resistance of shell wall to cyclic plasticity is specified as γ_{M4}=1,10(1,00).*

HRN EN 1993-4-2/NA: Tanks
modified NDP

➤ ***2.9.2.1(1)P***

- *Table 2.1(N)(HR) – Partial factors for actions on tanks for persistent, transient and accidental design situations*

Design situation	Liquid type	γ_F in case of variable actions from liquids	γ_F in case of permanent actions
Liquid induced loads during operation	Toxic, explosive or dangerous liquids	1,40	1,35
	Flammable liquids	1,35 (1,30)	1,35
	Other liquids	1,35 (1,20)	1,35
Liquid induced loads during test	All liquids	1,00	1,35
Accidental actions	All liquids	1,00	

HRN EN 1993-4-2/NA: Tanks
modified NDP

- ***2.9.2.2(3)P***

- *Partial factors for resistances:*

Resistance to failure mode	γ	HR/NA	EN
Resistance of shell wall to plastic limit state, cross-sectional resistance	γ_{M0}	1,10	1,00
Resistance of shell wall to stability	γ_{M1}	1,10	1,10
Resistance of shell wall to rupture	γ_{M2}	1,25	1,25
Resistance of shell wall to cyclic plasticity	γ_{M4}	1,10	1,00
Resistance of connections or joints	γ_{M5}	1,25	1,25
Resistance of shell wall to fatigue	γ_{M6}	1,10	1,10

HRN EN 1993-4-3/NA: Pipelines
modified NDP

- ***5.1.1(2)***
- *Partial factors γ_F are specified as γ_{F1}=1,40(1,39), γ_{F2}=1,60(1,50), γ_{F3}=1,80(1,82) with detailed description of pipelines belonging to each category 1-3.*
- *Additional partial factor γ_{F4}=2,20 is introduced for gas pipelines under highways and railway lines and in inhabited localities.*

HRN EN 1993-4-3/NA: Pipelines
modified NDP

- ***5.1.1(9)***

- *Minimum radius for bends of pipeline section x D_e is specified in detail.*

HRN EN 1993-5/NA: Piling
modified NDP

- ***6.4(3)***

- *Reduction factors β_D on effective flexural stiffness and β_B on design resistance of sheet piling made of U-piles, accounting for possible reduction due to insufficient shear force transmission in interlocks, are specified in detail in Table 1(HR).*

HRN EN 1993-5/NA: Piling
modified NDP

- *Table 1(HR) – Reduction factors β_B and β_D*

Sheet piling made of U–piles	Number of anchors/stiffeners	Soil type Texture/ Strength	Reduction factor	
			β_B (bending stiffness)	β_D (bending resistance)
Single pile or multiple piles without interlocks			0,6	0,4
Double pile (in middle interlock shear–resistantly[1] connected along the whole length)	0	Loose to medium dense; Very soft to soft[2]	0,7	0,6
		Dense to very dense; Stiff to firm	0,8	0,7
	1	Loose to medium dense; Very soft to soft[2]	0,8	0,7
		Dense to very dense; Stiff to firm	0,9	0,8
	≥ 2	Loose to medium dense; Very soft to soft[2]	0,9	0,8
		Dense to very dense; Stiff to firm	1,0	0,9

[1] Shear-resistantly connected are all types of interlocks, that prevent mutual movement of U-piles in the interlock under loads.

[2] Loose to medium dense soils or very soft to soft soils include:
- cohesionless soils: $q_c \leq 10$ MN/m^2 (CPT)
- cohesion soils: $q_c \leq 0,75$ MN/m^2 (CPT)
- soil embankments
- water.

HRN EN 1993-5/NA: Piling
modified NDP

- ***7.2.3(2)***

- *Reduction factor* k_t *in (7.1) for tensile resistance of thread of anchors* $F_{tt,Rd}$ *is defined as* k_t=0,55 (0,9) *and only if detailing at the connection to wall is such that there are no bending moments* k_t=0,8(0,9).

HRN EN 1993-5/NA: Piling
modified NDP

- ***D.2.2(5)***
  - *Circumferential compression stresses due to water and earth pressure in buckling verifications may be omitted only if tube is filled to the top by cohesionless soil or concrete.*

- ***7.4.3(3)– NCCI***
  - *Double bolted connection of Z-piles is elaborated upon including detailing and calculation.*

HRN EN 1993-6/NA: Crane supporting structures
modified NDP

- ***6.1(1)***

- *Modification of partial factors for resistance γ_{Mi}:*

Resistance of members and cross-section	
− Resistance of cross-sections to excessive yielding including local buckling	γ_{M0} **= 1,00 (1,00)**
− Resistance of members to instability	γ_{M1} **= 1,10 (1,00)**
− Resistance of cross-sections in tension to fracture	γ_{M2} **= 1,25 (1,25)**
Resistance of joints	
− Resistance of bolts, rivets, pins at ULS, welds, plates in bearing	γ_{M2} **= 1,25 (1,25)**
− Slip resistance	
– at ULS (category c)	γ_{M3} **= 1,25 (1,25)**
– at SLS (category b)	$\gamma_{M3,ser}$ **= 1,10 (1,10)**
− Bearing resistance of an injection bolt	γ_{M4} **≥ 1,10 (1,00)**
− Resistance of joints in hollow section lattice girders	γ_{M5} **= 1,35 (1,00)**
− Resistance of pins at SLS	$\gamma_{M6,ser}$ **= 1,00 (1,00)**
− Preload of high strength bolts	γ_{M7} **= 1,10 (1,10)**

HRN EN 1993-6/NA: Crane supporting structures

NCCI

- ***2.3.1 – NCCI***

- *Dynamic factor $\varphi \geq 1,1$ may be reduced for analysis of structural parts, which take over crane loads to foundations by $\Delta\varphi = 0,1$.*
- *Foundations may be analyzed without dynamic factor.*

Amendment or corrigenda to EN 1993 standards

- *It should be noted that all EN standards are subject to permanent reviews, which sometimes result in certain necessary amendments or corrigenda to the original documents.*
- *Since the release of HRN EN 1993 standards in 2013, amendment or corrigenda (AC) have been released for standards:*

  EN 1993-1-1, EN 1993-1-4, EN 1993-1-6

  EN 1993-4-1, EN 1991-4-2

Amendment or corrigenda to EN 1993 standards

- *Amendments or corrigenda to EN 1991-1-3 & EN 1993-1-5 standards are currently under preparation.*

- *It may be concluded, that work on Eurocodes in Technical Committee and Subcommittees is everlasting with the end not in sight.*

Current and future work on evolution of EN 1993

- ***M/515*** *– "Mandate for amending existing Eurocodes and extending the scope of structural Eurocodes"*
- *2014 supposed start of the Mandate (5 year period)*
- *Total work programme is split up into 4 over-lapping phases*
- *Duration of 5 year, in parallel to official CEN review period of Eurocodes*

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Current and future work on evolution of EN 1993

- *CEN/TC250/SC3: Decision 4/2013 – Principles*
- ➢ *keep the overall structure of EN 1993 and its parts;*
- ➢ *improve the clarity;*
- ➢ *harmonize and simplify rules (same format, structure, notations,..) and harmonize different parts of Eurocode 3 and if possible also with other relevant Eurocodes;*
- ➢ *reduce the overall volume (e.g. by avoiding informative annexes);*
- ➢ *reduce number of alternatives.*

Current and future work on evolution of EN 1993

- *Sequence of work on evolution of EN 1993:*

1. *Amendment or corrigenda coming from everyone: designer, national bodies, experts to be discussed in CEN/TC250/SC3*
2. *Technical clarification of problem with solution to be worked out with the support of Evolution Groups, that should provide a concept following these principles (16 Egs chaired by convenors)*
3. *Resolution of amendment through CEN/TC250/SC3,*
4. *Update of EN 1993*

Conclusion

- ***An immense amount of work was done in drafting Croatian National Annexes to Eurocode 1993 by all parties involved.***
- ***Nationally Determined Parameters were tailored to conform to previous design practice and experience in response of executed structures in Croatia.***
- ***Almost all modified NDP-s are conservative in comparison to the EC 3 recommended values.***