# Eurocodes evolution - what will it mean to you?

# Evolution of the Structural Eurocodes - Aims, timing, process

28.09.2016

#### **Steve Denton**

Head of Bridges and Ground Engineering Visiting Professor at the University of Bath Chairman of CEN/TC 250 - Eurocodes









#### → Aims

→ Process

#### → Timing

#### Aims

# ✓ EnhancedEase of Use

✓ PositiveVotes fromCEN Members

# CEN/TC 250's vision for the second generation of the Structural Eurocodes:

Whilst respecting the achievements of the past, our vision for the second generation of Structural Eurocodes is to create a more user-orientated suite of design standards that are recognised as the most trusted and preferred in the world.



Five pillars to enhance ease of use of the Eurocodes

#### Recommendation 1: Statements of intent to meet users' needs

**PRIMARY TARGET AUDIENCE** 

Practitioners – Competent engineers

#### DEFINITION

Competent civil, structural and geotechnical engineers, typically qualified professionals able to work independently in relevant fields

#### Recommendation 1: Statements of intent to meet users' needs

CATEGORIES OF EUROCODES' USERS	CEN/TC 250 STATEMENTS OF INTENT
Practitioners – Competent engineers [Primary target audience]	We will aim to produce Standards that are suitable and clear for all common design cases without demanding disproportionate levels of effort to apply them
Practioners – Graduates	We will aim to produce Eurocodes that can be used by Graduates where necessary supplemented by suitable guidance documents and textbooks and under the supervision of an experienced practitioner when appropriate
Expert specialists	We will aim not to restrict innovation by providing freedom to experts to apply their specialist knowledge and expertise
Product Manufacturers	Working with other CEN/TCs we will aim to eliminate incompatibilities or ambiguities between the Eurocodes and Product Standards
Software developers	We will aim to provide unambiguous and complete design procedures. Accompanying formulae will be provided for charts and tables where possible
Educators	We will aim to use consistent underlying technical principles irrespective of the intended use of a structure (e.g. bridge, building, etc.) and that facilitate the linkage between physical behaviour and design rules
National regulator	We will endeavour to produce standards that can be referenced or quoted by National Regulations
Private sectors businesses	We will continue to promote technical harmonization across European markets in order to reduce barriers to trade
Clients	We will produce Eurocodes that enable the design of safe, serviceable, robust and durable structures, aiming to promoting cost effectiveness throughout their whole life cycle, including design, construction and maintenance
Other CEN/TCs	We will engage proactively to promote effective collaboration with those other CEN/TCs that have shared interests

#### EoU - Statements of intent to meet users' needs

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#### **Recommendation 2: Principles and related priorities**

#### **General principles (primary)**

- 1 Improving clarity and understandability of technical provisions of the Eurocodes
- 2 Improving accessibility to technical provisions and ease of navigation between them
- 3 Improving consistency within and between the Eurocodes
- 4 Including state-of the-art material the use of which is based on commonly accepted results of research and has been validated through sufficient practical experience
- 5 Considering the second generation of the Eurocodes as an "evolution" avoiding fundamental changes to the approach to design and to the structure of the Eurocodes unless adequately justified

#### Specific principles (secondary)

- 6 Providing clear guidance for all common design cases encountered by typical competent practitioners in the relevant field
- 7 Omitting or providing only general and basic technical provisions for special cases that will be very rarely encountered by typical competent practitioners in the relevant field
- 8 Not inhibiting the freedom of experts to work from first principles and providing adequate freedom for innovation
- 9 Limiting the inclusion of alternative application rules
- 10 Including simplified methods only where they are of general application, address commonly encountered situations, are technically justified and give more conservative results than the rigorous methods they are intended to simplify
- 11 Improving consistency with product standards and standards for execution
- 12 Providing technical provisions that are not excessive sensitive to execution tolerances beyond what can be practically achieved on site

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#### → Aims

 $\rightarrow$  Process

→ Timing

### European Commission Specific Mandate M/515



### **CEN/TC 250 Technical response**



- 138 pages
- Over 1000 experts from across Europe involved
- Structure of tasks and sub-tasks
- Phased programme

#### CEN/TC 250 Work Programme Structure



#### **CEN/TC 250 Structural Eurocodes**



#### CEN/TC 250 Detailed Task Plans

ask R	ef:	TCEN1990.T1	Task Name:	Evolution of EN1990 – General					
ropos hase:	ed Task	P1	Deliverable:	A new version of EN 1990 with an increased scope reflecting need Annex A2 for bridges and new Annex Es relating to bearings and	ds identified by National Standard Bodie expansion joints.	s and the other Eurocodes, together with backgroun	d information for all changes and new material, exclu	iding new version of	codes
Dutline	Task Sco	pe:	Revision of EN 19 Eurocodes and ex	Determine the end of the end o	quirements from other Eurocodes for pri - EN, Brussels, 13th July 2012). Scope	nciple guidance on fatigue, non-linear analysis etc w does not include specific work relating to Bridges wh	ith the Specific Mandate Section 5 from Mandate fo hich is included in Task TCEN1990.T2.	amending existing	$\checkmark$
Starting	g documer	nts:	EN 1990: Basis of	Structural Design					
Justific Phase	ation for i 1:	nclusion in	EN 1990 is the heat the cornerstone for proposal have bee and construction s buildings and othe Phase 1.	Ind Eurocode, setting the rules for achieving safety, serviceability, rot all other Structural Eurocodes and serves as a template for the dev developed colaboratively with a representative cross section of st ector. The work takes into account market and research development construction works. Therefore EN 1990 as the head code needs to	sustness and durability as well as Reliab elopment of new parts as well as revisis akeholders and need to be given priority this im naterials, products, construction to be updated at the earliest convenience	ility and Quality Management for the other 57 parts on of existing standards. The items identified by the to . The selected tasks will further support and streng tochniques and design methods in the sector. It also so as to form a basis for the work of the other sub-o	of the Structural Eurocode suite and CEN structural ZENTC250/Expert Group for the revision of EN 199 hen harmonisation, the development of an EU Interr effects new sociatia needs and demands as linked ommittees. As full a draft as possible must be made	product standards. It is 0 described in this all Market in the design o structural design of available at end of	V
Sub-	Su	h-task name	Brief desc	rintion background and reasons for the work	Interdependencies	Key benefits	Outout	Priority item for	
task Ref.				(including any additional comments / notes)	Identify known Task (sub-tasks) that must be substantially completed before this sub-task can commence. (Independencies within individual Tasks do not need to be identified)		(e.g. new Eurocode part; new or modified clauses in existing Eurocode part)	EC contract	✓ ✓
1	Reduction i Choices (N	in number of National DPs)	Review the content where they provide the values or choic possible, the JRC no variation exists consensus, but no to adopt it. In case and try to eliminate international studie	is of all Countries' National Annexes and supporting documents, information needed to implement the Eurocode Part. Compare smade by all Countries in their relevant National Annox, using if database of collected National values and choices. Where little or between Countries, eliminate the NDP, where there is good unanimity, seek to parsuade those not using that value or choice of wide variation between Countries, seek the reasons for them them so that consensus can be achieved, for example by use of s and research.				~	V
2	Enhanced	ease of use	Enhance ease of u avoiding or removi and/or empirical ru extent that it can b technical requirem	se by improving clarity, simplifying routes through the Eurocode, ng rules of little practical use in design and avoiding additional les for particular structure or structural-element types, all to the technically justified whilst safeguarding the core of essential ents. Take into account feedback from users of the Eurocode.				~	√ De
3	Transfer of from EN 19 1991-4, EN 2 and EN 1	Basis of Design rules 991-1-6, EN 1991-3, EN 1993-3-1, EN 1993-3- 991-7.	There are a number as EN 1991-1-6, E Towers and Masts to EN 1990, to gua this is a maintenant	r of Basis of Design clauses at present included in EN 1991, such N 1991-3 and EN 1991-4, and EN 1993-3-1 and EN 1993-3-2 on and EN 1991-1-7. These parks, including y factors will be moved rantee consistency with general rules and harmonisation, (N.B. as ca activity no resources have been allowed for tit).	All work to provide information completed	All Basis of Design information will be in EN 1990 thus avoiding mixed responsibilities that can lead to inconsistency.	New Annexes A3, A4 and A5 in EN 1990.		nce issues, w any funding subsequent
4	Evolution o structural n works (Ann	of management of eliability of construction ex B)	Adapt EN 1990 by execution in agree recognizing differe more comprehensi consequences of f design. Improving appropriate materi	establishing and implementing control procedures for design and ment with the principles of the standard, on a national level nose between the various countries. Making Annes & DE (EN 1990) ve by increasing its scope to construction works with higher aligner than Consequence Class 3 and treoghizing complexity of alignment with Execution Standards (EN 1090 and EN 13670) and Eurocodes.	EN 1990 as the head code needs to be updated first so as to form a basis for the work on reliability differentiation of the other SCs and WGs and CEN Committees developing Execution Standards	The evolution of Annex B, which is expected to be kept informative, will assist NSBs in heiping ensure that the assumptions in the Eurocodes relating to quality management during design and execution are fulfilled and thus leading to increased levels of safety. EN 1990 as the Head code will ensure alignment with consistent approach.	Revised Annex B and revisions to Section 2.	~	×
5	Robustnes	S	Review and update EN 1990 in the ligh report. It is expect 1991-1-7 to EN 19 WG6: Robustness	as necessary the requirements for Robustness in Section 2 of t of necent published cost action (COST Action TU0601, 2011) de that work will also include moving some information from EN 30 and further developing these rules. This will be in liaison with	In liaison with WG6: Robustness	Ensure that the requirements for robustness reflect the latest state of the art.	Updated Section 2 of EN 1990. Based on the recommendations of WG6 the Inclusion of new clauses into EN 1990, based on content currently included in other Eurocodes.	~	×
6	Sustainabil	lity	Update EN 1990 to Eurocodes, respor e.g. TC 350. At the present time	<ul> <li>include aspects of sustainability relevant to the scope of the ding to the relevant requirements for Sustainability developed by any amendment will be Section 2 Requirements.</li> </ul>	EN 1990 as the head code needs to be updated first so as to form a basis for the work of the other SCs and WGs.	EN 1990 will address the new Requirement the "Sustainable use of natural resources" in particular as it addresses durability in the CPR.	New and modified clauses in EN 1990.	~	✓ ✓
ile na	me: EN19	90 Template 3 dra	aft 4.0	Draft/Final version of: 26/04/2013			TC EN 1990	) – page: 1 of 3	
		File name: EN	1990 Template	3 draft 4.0 Draft/Final version of	f: 26/04/2013			TC EN 1990 – p	age: 2 of 3

### CEN/TC 250 Phased Programme

	Maximum extension of activity												
	Call for experts and establishment of Project Teams		0 6	12	18	24	30	36 42	48	54	60	66 72	78 months
		0 - General			Part of the second			-	_	1		1	
	Preliminary Project Team activity						T						
	r remining r roject ream activity	uffer loads (			***		-						
	awaiting other tasks	EN 1992-1-1, EN 1992-2, EN 1992-3					1		-	h			
		ers according to EN 1993-1-1				1111				im			
		sing to EN 1993-1-8 m industry, including needs for harmonization with EN1992 and EN1993			11.				_				
	Main Project Team work	arge web openings			1.000								
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		imposite columns (concrete tied tubes) in the ode 5, part 1-1					-			1			
		ber Concrete Composites							-				
	Finalization by relevant SC/WG	51-1	Q 11				1111			illin.			
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	Interdependent activities												
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	FINAL 4	Landa Caracter		-					_				
	29 WG7.12 Basis of Design - Evolution	of EN 1990 - Bridges specific issues											
	30 BC1.T2 Actions - EN 1991-1-3 (Sno 31 BC1.T3 Actions - EN 1991-1-4 Mins	n (cads)	-	_									
	32 BC1.13 Actions - EN 1991-1-5 (The	rmal actions)		-									
	23 BC1.17 Actions - EN 1991-1-8 ( Wa	ves and Currents)		-									
	24 SC1.78 Actions - EN 1991-1-9 (Atr 25 RC1.710 Actions - EN 1991-4 (Size	Inspheric king)							_				
	36 SC2.T2 Concrete - New Items in EN	1992-1-2	1										
	37 SC2.T3 Concrete - Further new item	s in EN 1992-1-1, EN 1992-2, EN 1992-3											
	39 BC3.T3 Steel - Cold-formed member 19 S/C3.T4 Steel - Stability of Plated St	rs and sheeting. Keysed EN 1993-1-3 tortural Elements. Revised EN 1993-1-5	1			+							
	40 BC3.75 Steel - Harmonisation and E	xtension of Rules for Shells and Similar Structures. Revised EN 1993-1-6 and EN 1993-1-7				*				(H+)			
	41 BC3.76 Steel - Fire design of Steel :	Bructures. Revised EN 1993-1-2				1.00							
	43 BC5.T3 Timber - Revised Eurocode	r rules covering shallow foor construction, and other flooring types using precast concrete elements. 5. part 1-1											
	44 SC6.T4 Masonry - Revised version	VEN 1996-3											
	45 BC7.T3 Geotechnica - Eurocode 7 P	art 2: Ground investigation							_				
	47 SC7.15 Geotechnics - Eurocode 7 P	art 3: Poundatoris art 4: Retaining structures	1									1	
	48 SC8.T2 Earthquake - Material deper	dent sections of EN 1998-1		-									
	49 SC8.T4 Earthquake - Evolution of El 50 B/C9.T3 Abuttinism - Reofen	¥ 1996-5	1										
	51 BC9.T4 Aluminium - Bridging												
	PHASE 3					-	111						
	57 BC1.15 Actions - Interdependence of 53 BC3.17 Steal - Stainless Steals Re-	r csmatic actions (wind, show, thermal and atmospheric long) and glass structure rised EN 1993-1-4											
	54 SC3.T8 Steel - Steel Fatigue, Revis	id EN 1993-1-9	1										
	55 SC3.T9 Steel - Material and Fracture	n. Revised EN 1993-1-10							+	HII		-	
	56 SC4.76 Composite - Evolution of ex 57 SC4.77 Composite - Development of	song parts of the two not included in the other tasks I rules for composite frames and prestressed elements			1	-							
	58 BC5.T4 Timber - Revised Eurocode	5, part 1-2 (Fire)				-	*			11111			
	19 BC5.T5 Timber - Revised Eurocode	5, part 1-1	1		-			1					
	60 SC6.T2 Masonry - Revised version ( 61 BC7.T5 Geotechnics - Rock mechan	If EN 1995-1-2 ics and dynamic design					•		7.0				
	#2 BC8.75 Earthquake - Evolution of El	¥ 1998-4 and EN 1998-6			Î.	-			*				
	63 SC8.76 Earthquake - Evolution of en	isting parts of EN 1996 not included in the other tasks		Maximum enters	d activity			•					
	65 W02.12 Assessment and Retrofiting	of Existing Structures - Concrete Structures. This task is solely coordination with SC2		maximum extension (			10	+		1			
	66 WG4.12 Fibre Reinforced Polymers	Preparation of CEN TS	-	Call for experts and e	Inemhaldates								
	67 WG5.T2 Membrane Structures - Pres	anation of CEN TS	-	of Project Teams									
	69 HG-8.T2 Bridges - Ease of use and to	chrical consistency review		Preliminary Project T	eam activity								
	PHASE 4			awaiting other tasks					-	11111			
	70 BC1.T11 Actions - Evolution of existin	g parts of EN 1991 not included in the other tasks	No. of Concession, name	Main Project Team w	ork	-			_				
	72 BC3.T10 Steel - Steel bridges and ter 72 BC3.T11 Steel - Consolidation and ra	aion componenia. Nevado EN 1993-2 and EN 1993-1-11 fonalisation of EN 1993-3					1		Sciences of				
	73 SC3.T12 Steel - Harmonisation and E	xtension of Rules for Storage Structures. Revised EN 1993-4-1 and EN 1993-4-2		Finalization by releva	nt SC/WG				-				
	74 BC3.T13 Evolution of existing parts of	EN 1993 not included in the other tasks	+	Interdependent activit	ties	-			_				
	76 BC5.76 Timber - Evolution of existin	g parts of EN 1995 not included in the other tasks	1 +		100				a constant				
	77 BC6.T3 Masonry - Revised version	x/EN 1996-2	0	Interrelated activities					-				
	78 WG2.T3 Assessment and Retrofiting	of Existing Structures - General Rules / Actions, Preparation of EN				-	1	1					
	1.** maa.ta jaruuturai Glass - Preparas	AT DR ALTS	1										

### CEN/TC 250 Work Programme Structure



#### **CEN/TC 250 Evolution Overview**



### Systematic Review Comments



### **Eurocode Evolution Process**

- → Follow CEN Internal Regulations
- Specific information available in CEN/TC
   250 document N1250 [CEN, Eurocodes]
- → Further details available in Phase 1 call for experts specification (Vol 3) [NEN, Eurocodes 2020]



### **Eurocode Evolution Process**

- → Follow CEN Internal Regulations
- → Specific information available in CEN/TC 250 document N1250 [CEN, Eurocodes]
- → Further details available in Phase 1 call for experts specification (Vol 3) [NEN, Eurocodes 2020]

#### Call for tender - Evolution of Structural Eurocodes



#### Call for Tender for experts for the development of the second generation of Structural Eurocodes.

- Updated 20th of May 2015 -

The Eurocodes (EN 1990 – EN 1999) enable the design of building and civil engineering works, and comprises of 10 European Standards in 58 parts. The first generation of EN Eurocodes were the most comprehensive and technically advanced suite of standards for structural and geotechnical design in the world. Their development was a tremendous achievement and represented the culmination of over 30 years collaborative effort. Their impact has been considerable. It has been estimated that they affecting the work of around 500.000 professional

<u>Volume 1:</u> Instructions to Tenderers – This volume provides full instructions on how the Tender Process shall be organized and how and when Tenderers should submit their responses to the questions contained within and to the award criteria;

Volume 2: Contract terms and Conditions - This Volume contains the documentation for Contracts and general terms and conditions;

Volume 3: The Specification – This volume contains the scope/brief, outlining the requirements;

<u>Volume 1 Annex 2</u>: Template for quality submission – This word document provides the template for the quality submission;

<u>Volume 1 Annex 3:</u> Template for financial submission – This excel document provides the template for the financial submission.



#### → Aims

→ Process

→ Timing

#### The Structural Eurocodes

#### **Timeline - Historic**



#### The Structural Eurocodes

#### Timeline – Latest status



#### Phase 1 – Project Team Programme

Year						201	5					2016													2017													2	018				
Month	January	February	March	April	May	June	VIN	August	September	October	December	January	February	March	April	Mary	June	ylut	August	September	October	November	December	February	March	April	May	June	VIIV	August	September	October	December	January	February	March	April	May	June	VIN	August	October	November
Month number	1	2	3	4	5	6	7	8	9	10 1	1 1	2 1	31	1 15	16	17	18	19	20	21	22	23	24 2	5 2	6 2	7 28	29	30	31	32	33	34 3	5 3	6 3	7 38	39	40	41	42	43 4	4 4	5 4(	5 <b>47</b>
Task specific (the schedule represents the deadlines for these tasks)																																									T		$\square$
A																																											$\square$
Start of the Project Team																																											$\square$
Preparation of first Draft by PT																																											$\square$
preparation of background document(s) by PT																																											$\square$
Delivery of first Draft by PT to NEN																																											
Review of first Draft by SC or WG																																											$\square$
Preparation of Second Draft by PT, taking into account comments from SC or	WG																																	Τ							Т	T	$\square$
Delivery of second draft by PT to NEN																																		Τ							Т	Т	$\square$
review by SC or WG																																											$\square$
preparation of Final Draft by PT, taking into account comments from SC or W	G																																										$\square$
Delivery of Final Draft by PT to NEN																																											$\square$
Commenting period for NSBs (Enquiry)																																									Т	T	$\square$
Preparation of Final document by PT, taking into account comments from NS	Bs																																										$\square$
Delivery of Background document(s) by PT to NEN																																											
Delivery of Final document by PT to NEN																																											
End of the Project Team																																											
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#### See Call for Experts, Specification, Annex C

Community participation - Why your involvement is vital, how it can be achieved





### Why Design Standards Matter?



### Impact



### International trade



Verification of adequacy



#### Feedback



#### New societal demands



### Research to application



### **Development Cycles**

Comparing infrastructure and digital technology





### Historical evolution (\*)



#### Who develops design Standards?



## Concerns for the UK

28.09.2016

#### **Steve Denton**

Head of Bridges and Ground Engineering Visiting Professor at the University of Bath Chairman of CEN/TC 250 - Eurocodes



#### The Structural Eurocodes





#### Concerns ...

- $\rightarrow$  Thank you for written submissions
- → Opportunity to raise specific concerns
  - Will be recorded by BSI and discussed by B525

## What happens next

28.09.2016

#### **Steve Denton**

Head of Bridges and Ground Engineering Visiting Professor at the University of Bath Chairman of CEN/TC 250 - Eurocodes





- → December 2016 Call for Experts for Phase 2
- $\rightarrow$  April 2017 2<sup>nd</sup> draft deliverables from Phase 1 PTs
- → Sept 2017 (informal) enquiry on Phase 1 PT deliverables