

The Second Generation Eurocodes

Key changes and benefits through design examples

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EN 1990 'Eurocode: Basis of structural and geotechnical design'

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Overview

- EN 1990 towards the Eurocodes 2G
- EN1990-1 Design of new structures
- Concluding remarks



This presentation

- EN1990-2 Assessment of existing structures
- Concluding remarks



Following presentation
by Thomas Lang

EN 1990 towards the Eurocodes 2G



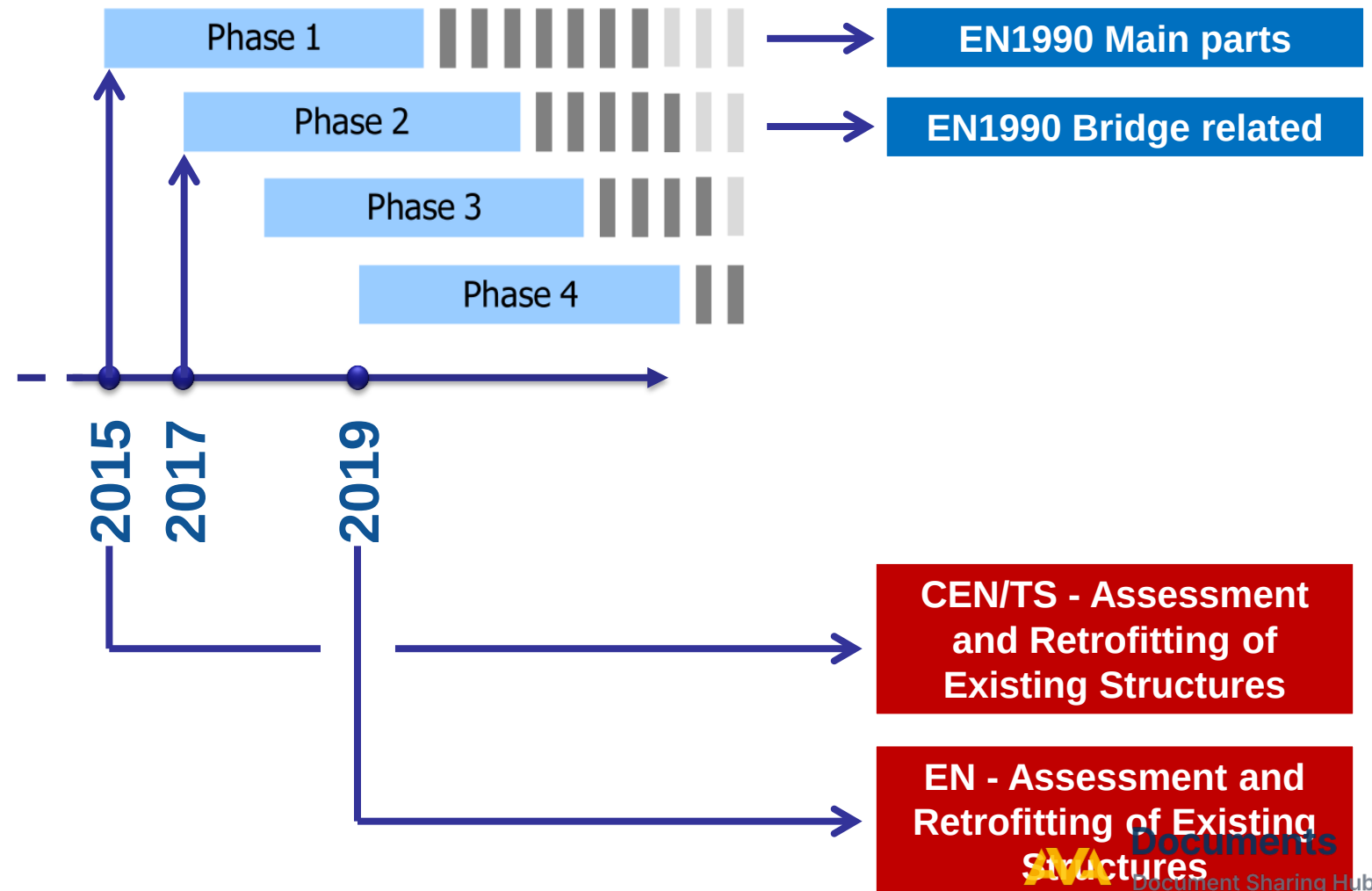
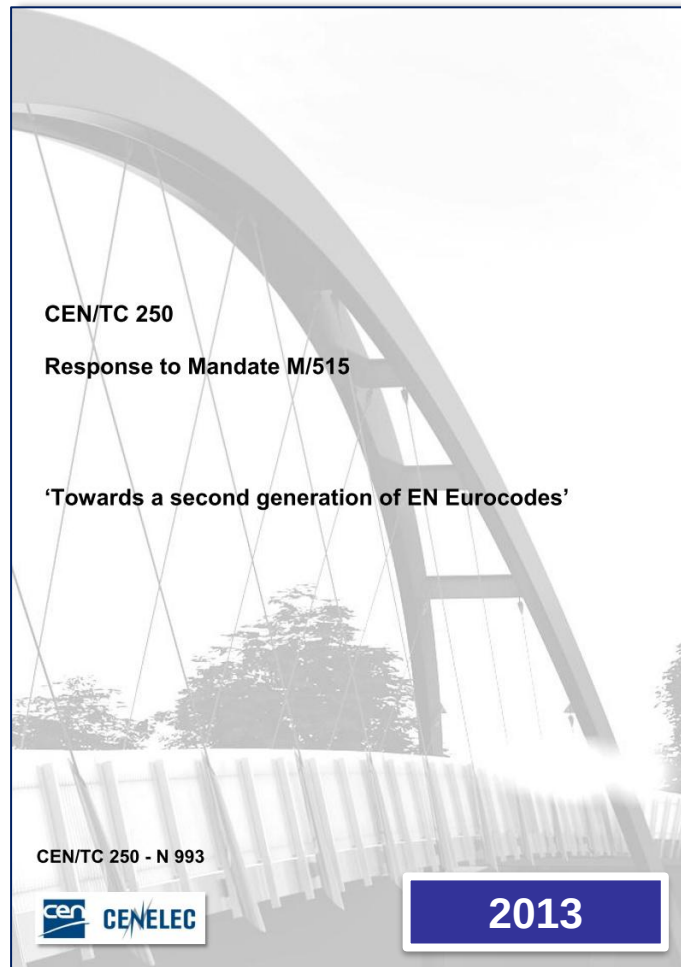
2002	Publication of EN1990 main text + Annexes (except A2)
2005	A1, including Annex A2 (BoD for Bridges)
2007	end of 5 years enquiry , establishment of an Expert Group, active under TC250, CEN/TC agrees to the formation of an Expert Group to prepare the first revision of EN 1990 .
	→ Short term corrigenda revision by April 2010
	→ Report providing suggestions for medium/long term technical revision

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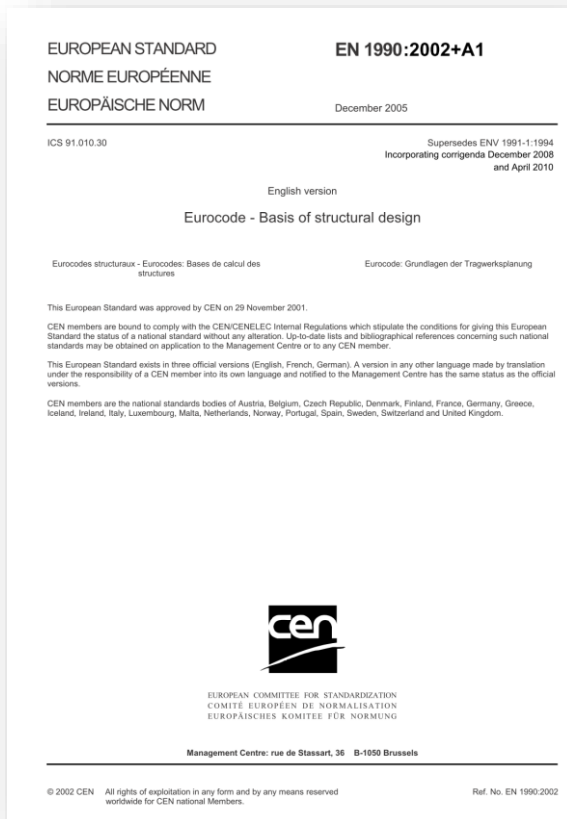


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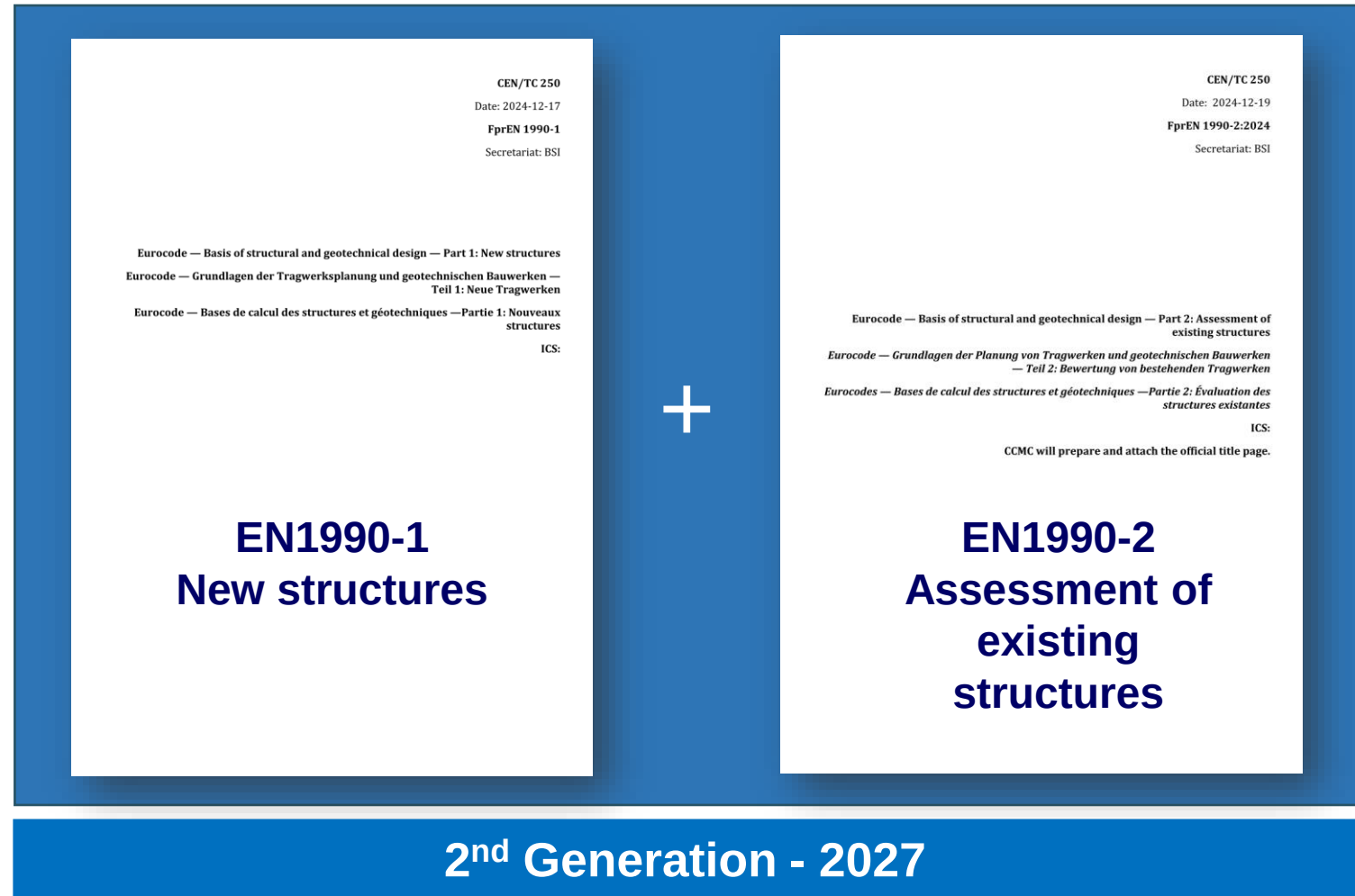
EN 1990 towards the Eurocodes 2G



EN1990's revision under M/515



1st Generation - 2002



2nd Generation - 2027

EN1990's revision under M/515

18 mandated sub-tasks

EN1990 Main parts

Key objectives:

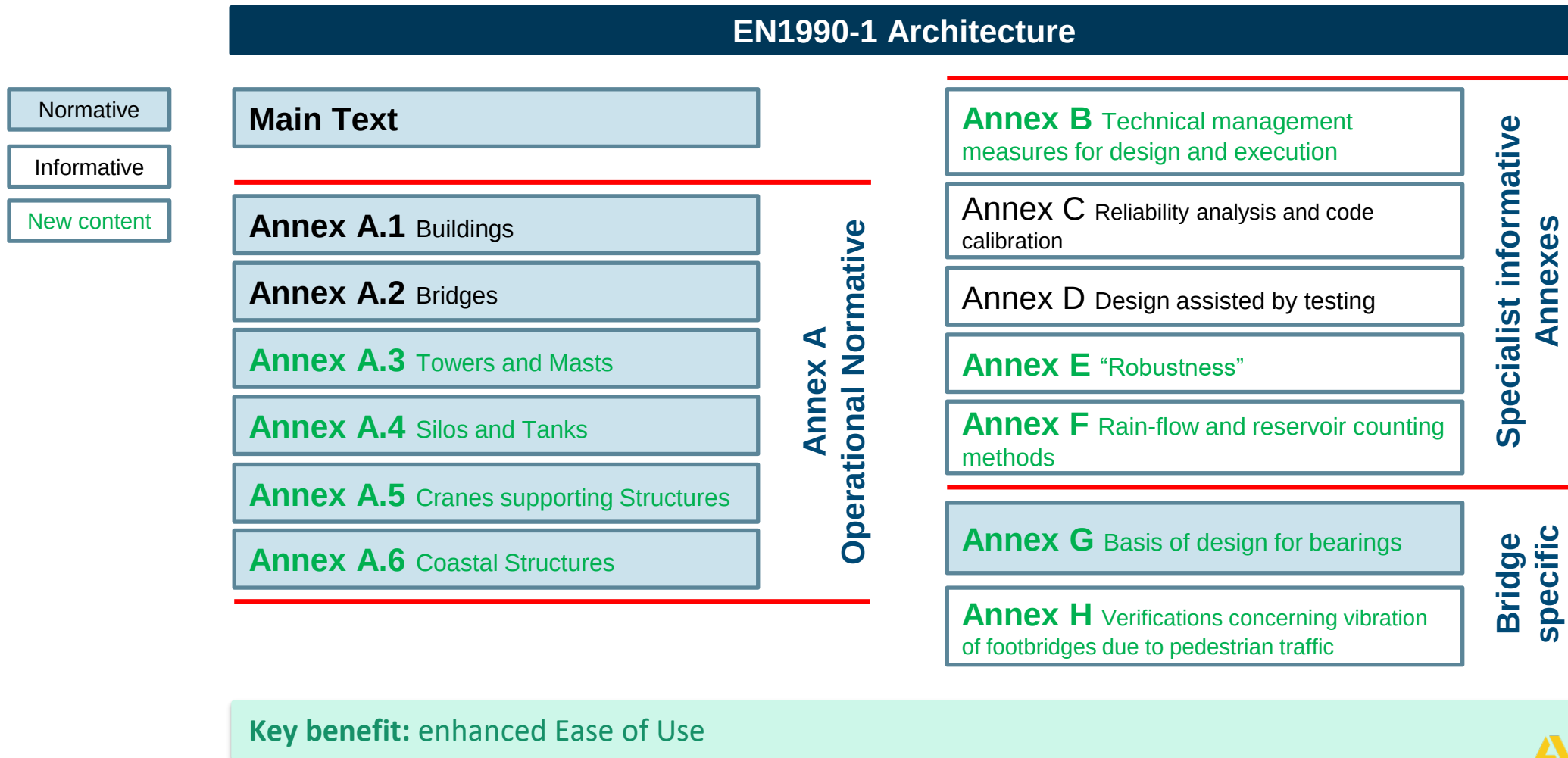
- Enhanced Ease of Use
- Evolution of management of structural reliability of construction
- Treatment of Robustness
- Sustainability
- ULS (Better guidance and increased clarity on EQU-STR-GEO ULS verification)
- Serviceability of buildings
- Fatigue verification
- Alignment with EN 1997

EN1990's revision under M/515

- Assessment of Existing Structures
- New Annex A parts
 - Annex A.3 - Application for towers, masts and chimneys
 - Annex A.4 - Application for silos and tanks
 - Annex A.5 - Application for structures supporting cranes and other machines
 - Annex A.6 - Application for coastal structures

Additional Revision Tasks

EN1990-1 Design of new structures



EN1990-1 Design of new structures

1. Scope

1.1 Scope of prEN 1990-1

(1) This document establishes principles and requirements for the safety, serviceability, **robustness** and durability of structures, **including geotechnical structures**, appropriate to the consequences of failure.

(2) This document is also applicable for existing structures as specified in prEN 1990-2.

(3) This document is intended to be used in conjunction with the other Eurocodes for buildings and civil engineering works, including temporary structures.

(4) This document describes the basis for structural and geotechnical verification according to the limit state principle.

(5) The verification methods in this document are based primarily on the partial factor method.

NOTE 1 Alternative methods are given in the other Eurocodes for specific applications.

NOTE 2 The Annexes to this document also provide general guidance concerning the use of alternative methods.

Key revisions:

- Robustness explicitly mentioned
- Inclusion of “geotechnical structures”
- Link to new part EN1990-2 on assessment
- Partial factor method is the “default method”

Definitions

EN990:2002+A1:2005 (1st Generation)

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EN1990-1 (2nd Generation)

3.1.1.9

elements other than structural

completion and finishing elements connected with the structure that are not classified as structural members and that **have the lowest consequence of failure**

Note 1 to entry: See 4.3 for the classification of consequences of failure.

EXAMPLE Roofing; surfacing and coverings; partitions and linings; kerbs; wall cladding; suspended ceilings; thermal insulation; bridge furniture, road surfacing; services fixed permanently to, or within, the structure such as equipment for lifts and moving stairways; heating, ventilating and air conditioning equipment; electrical equipment; pipes; cable trunking and conduits.

Key benefit:

- Clarification of the classification of elements as “structural” or “other than structural” **depending on their consequences of failure**



4. General Rules

4 General rules

4.2 Structural reliability

(1) The reliability required for structures within the scope of this document shall be achieved by design in accordance with the Eurocodes.

(2) Appropriate measures should be taken to avoid gross human errors and omissions and to limit their effects on the structural reliability.

NOTE 1 This document does not make allowance for gross human errors.

NOTE 2 Guidance on appropriate measures to limit the probability of occurring of gross human errors and omissions is given in Annex B.

(3) The choice of an appropriate level of reliability for the structure should take account of the following:

- possible consequences of failure in terms of risk to life, injury, and potential economic losses, see 4.3;
- the possible cause and mode of attaining a limit state;

NOTE 1 Examples of modes of attaining a limit state are failure modes with or without warnings, e.g. ductile or brittle failure.

- public aversion to failure;
- the expense and procedures necessary to reduce the risk of failure.

NOTE 2 Reliability levels can be set by the National Annex. Further guidance is given in Annex C.

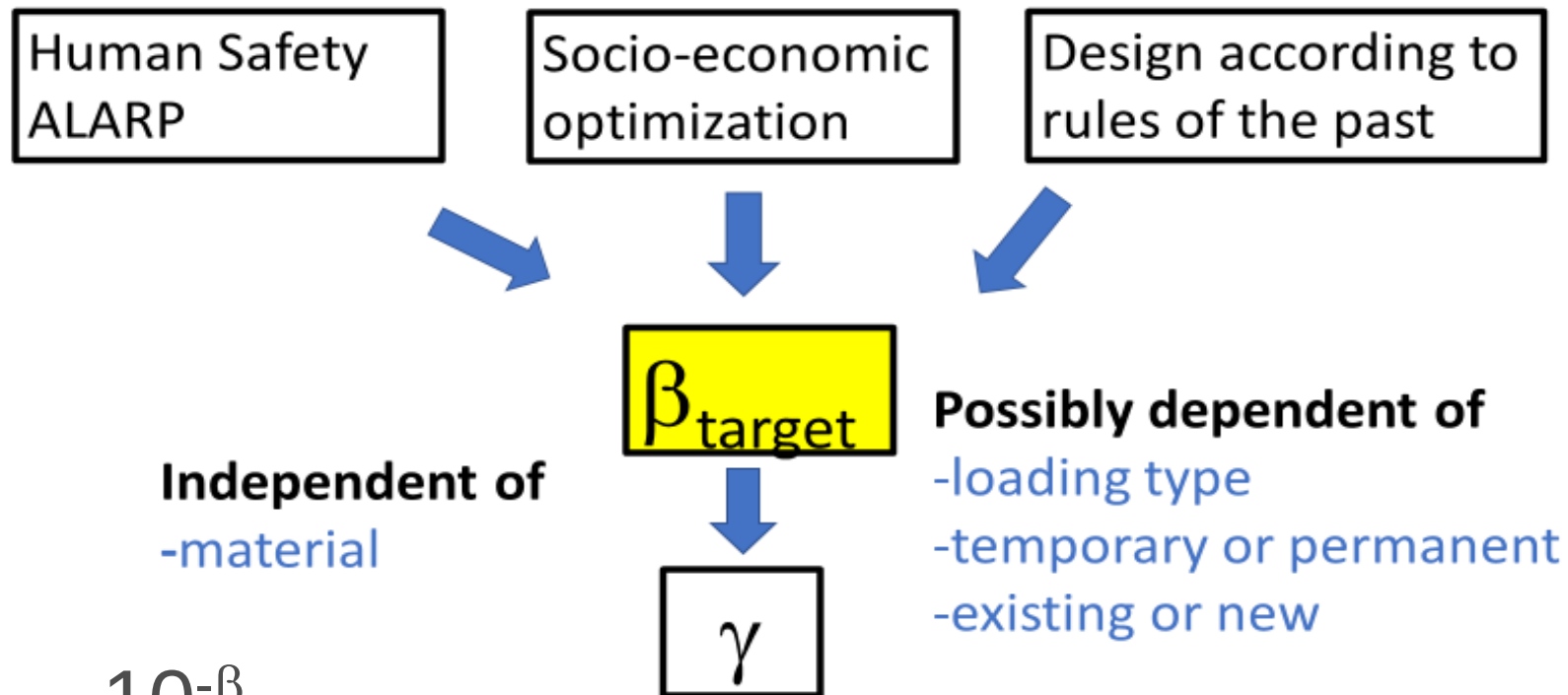
NOTE 3 Different levels of reliability are commonly adopted for limit states relating to structural failure, serviceability, and durability.

Key revisions:

- New Annex B
- Improved guidance in Annex C to assist NSBs setting reliability targets

Structural reliability

Code calibration gamma values (two steps)



$$P_f = \Phi(-\beta) \sim 10^{-\beta}$$

Reliability background of the Eurocodes, Vrouwenvelder, T. et al., 2024 – JRC publication (<https://eurocodes.jrc.ec.europa.eu/publications/reliability-background-eurocodes>)



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Structural reliability

Table C.3 (NDP) — Target values for reliability index β for different consequence classes (for persistent and transient (fundamental) and fatigue design situations in ULS) relevant to structures in the scope of Clauses A.1 and A.2

Consequence class ^a	1-year reference period β	50-year reference period	
		β	$P_{f,50}$
CC3	5,2	4,3	$\sim 10^{-5}$
CC2	4,7	3,8	$\sim 10^{-4}$
CC1	4,2	3,3	$\sim 10^{-3}$
^a Regarding CC0 and CC4, see also 4.3(2) and 4.3(3).			

Responsibility to decide on the target reliability resides on the National Authorities (NDP)

$$P_f = \Phi(-\beta) \sim 10^{-\beta}$$

$\beta = 3,8$ “central” reference value in the Eurocodes