

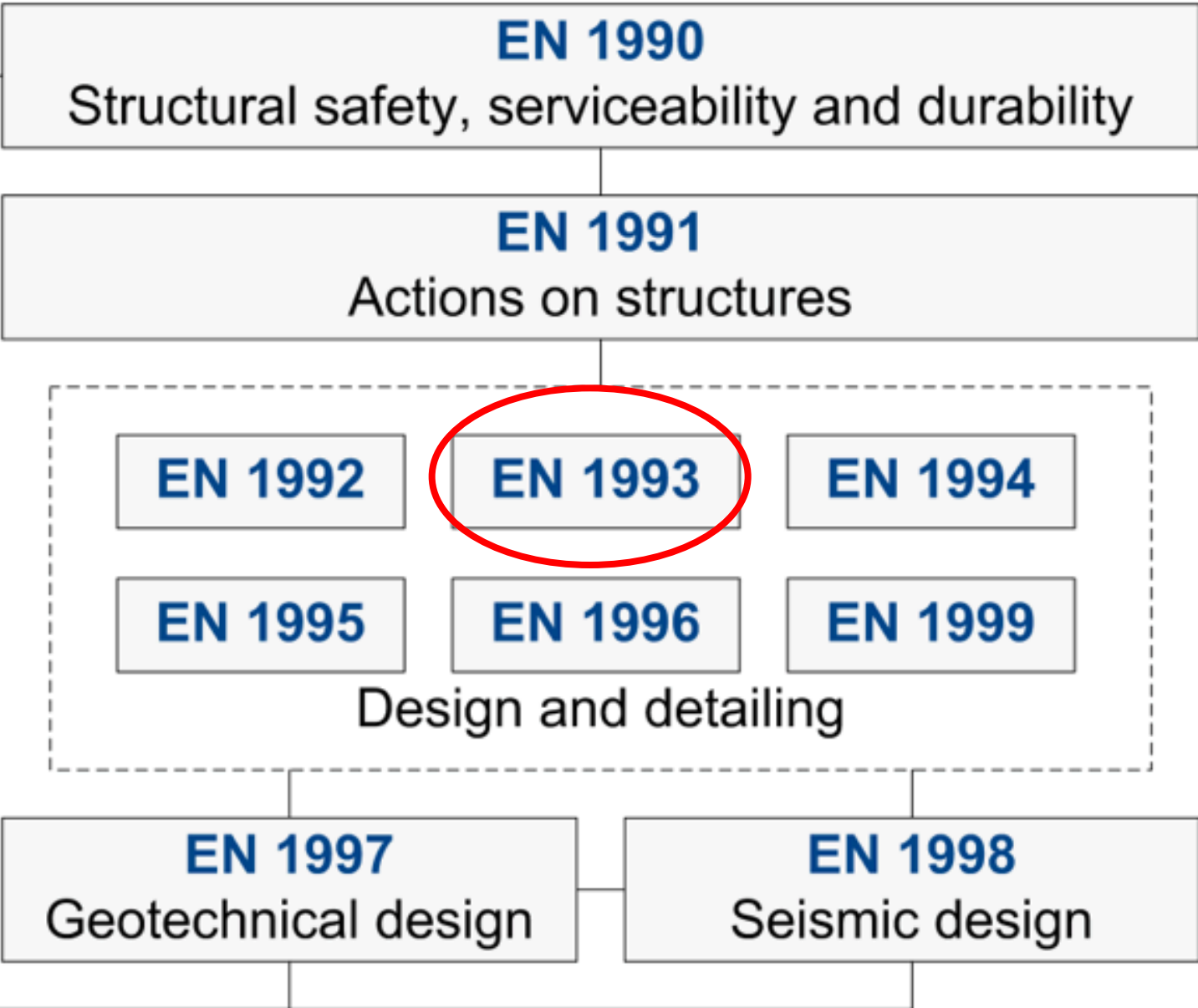
STAINLESS STEEL IN STRUCTURES

DESIGN RULES FOR STRUCTURAL STAINLESS
STEEL IN EUROCODE 3

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Links between the Eurocodes

EN 1993 Design of Steel Structures

Part 1-1
General rules
and rules for
buildings

Part 1-2
Structural fire
design

Part 2
Bridges

Part 3-...
Specific matters

Organisation of material Eurocodes

<http://eurocodes.jrc.ec.europa.eu>

EN 1993-1 General rules and rules for buildings.

EN 1993-2 Steel bridges.

EN 1993-3 Towers, masts and chimneys.

EN 1993-4 Silos, tanks and pipelines.

EN 1993-5 Piling.

EN 1993-6 Crane supporting structures.

Eurocode 3: Part 1 EN 1993-1

EN 1993-1-1 General rules and rules for buildings.

EN 1993-1-2 Structural fire design.

EN 1993-1-3 Cold formed members and sheeting .

EN 1993-1-4 Stainless steels.

EN 1993-1-5 Plated structural elements.

EN 1993-1-6 Strength and stability of shell structures.

EN 1993-1-7 Strength & stability of planar plated structures
transversely loaded.

EN 1993-1-8 Design of joints.

EN 1993-1-9 Fatigue strength of steel structures.

EN 1993-1-10 Selection of steel for fracture toughness and through-
thickness properties.

EN 1993-1-11 Design of structures with tension components

EN 1993-1-12 Supplementary rules for high strength steels

Eurocode 3: Design of Steel Structures, Part 1.4 Supplementary rules for stainless steels

Types of members

- Hot rolled and welded
- Cold-formed
- Bar

Scope

- Members and connections
- Fire (*by reference to EN 1993-1-2*)
- Fatigue (*by reference to EN 1993-1-9*)

Grades

Annealed

- 3 Ferritic
- 16 Austenitic !!!
- 2 Duplex

Cold-worked Austenitic

- CP350 (C700)

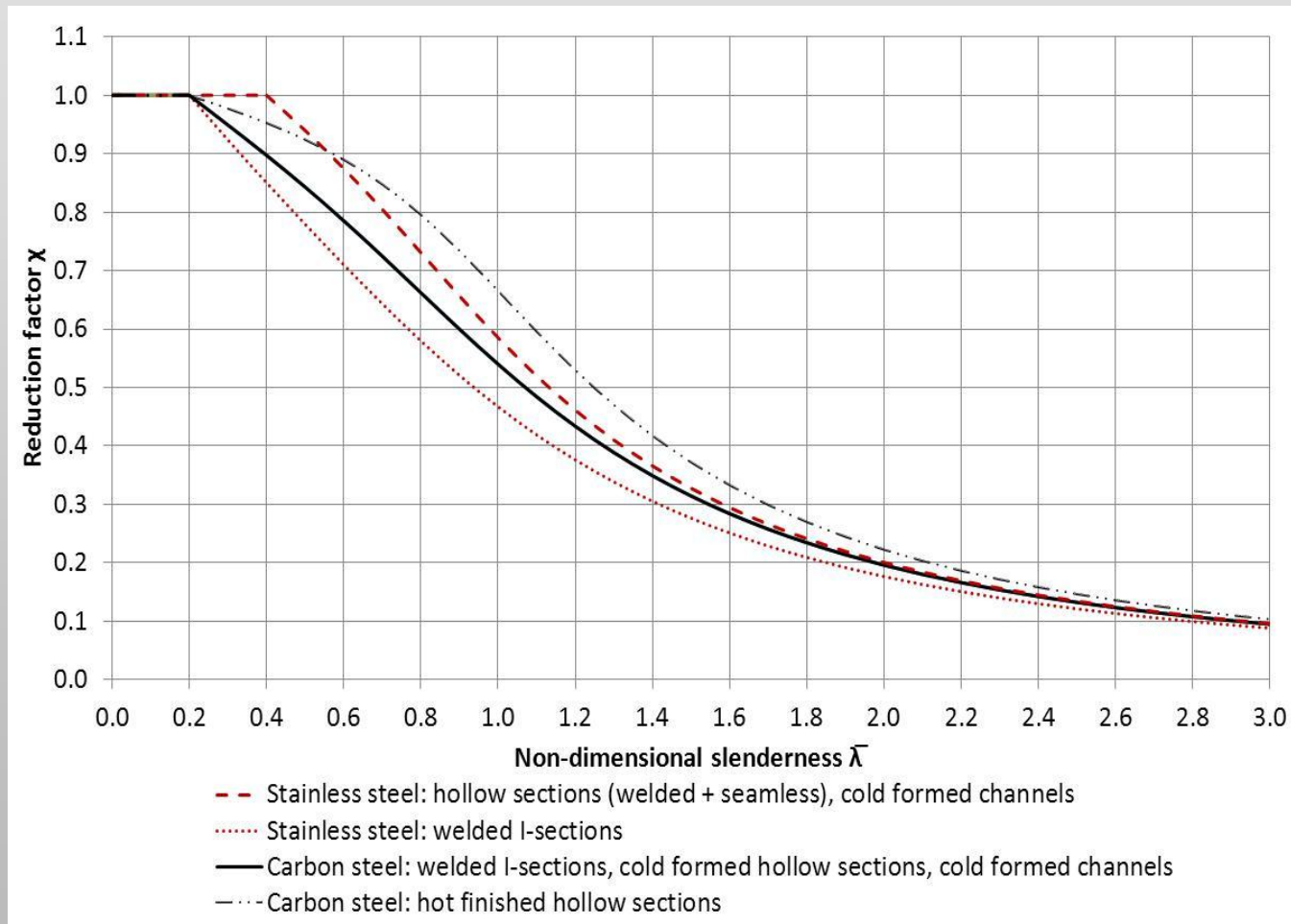
$$\varepsilon = \begin{cases} \frac{\sigma}{E} + 0,002 \left(\frac{\sigma}{f_y} \right)^n & \text{for } \sigma \leq f_y \\ 0,002 + \frac{f_y}{E} + \frac{\sigma - f_y}{E_y} + \varepsilon_u \left(\frac{\sigma - f_y}{f_u - f_y} \right)^m & \text{for } f_y < \sigma \leq f_u \end{cases}$$

Material model

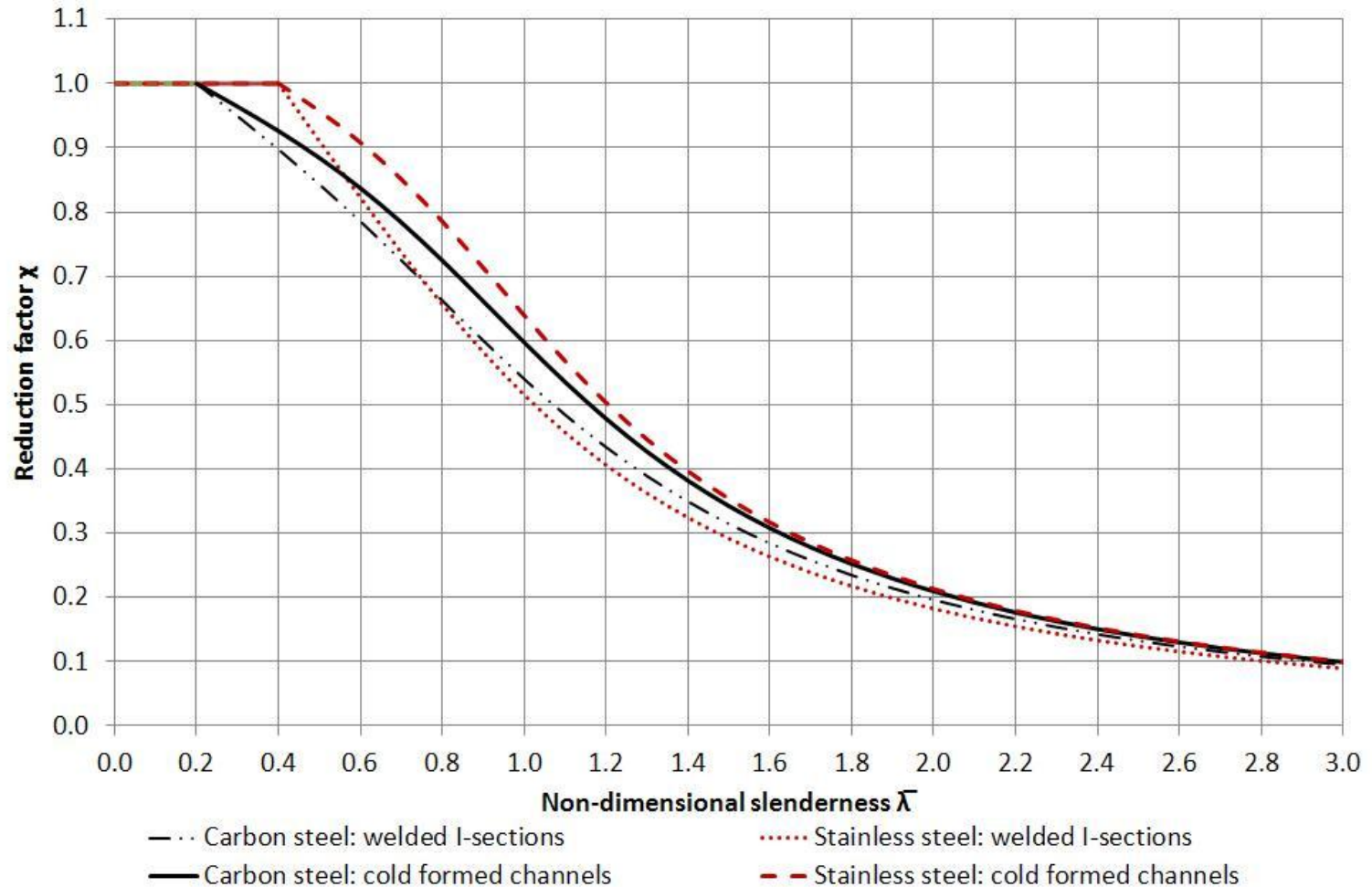
n values

Steel grade	Coefficient <i>n</i>	
	Longitudinal direction	Transverse direction
1.4003	7	11
1.4016	6	14
1.4512	9	16
1.4301	6	8
1.4306		
1.4307		
1.4318		
1.4541		
1.4401	7	9
1.4404		
1.4432		
1.4435		
1.4539		
1.4571	5	5
1.4462		
1.4362		

EC3 Flexural buckling curves



EC3 Lateral torsional buckling curves



Future developments to Eurocode 3: Part 1.4

- New grades ✓ EG, ✓ EC3 SC3
Lean duplexes
- Section classification ✓ EG, ✓ EC3 SC3
Less conservative limits
- Continuous Strength Method ✓ EG, pending approval SC3
Less conservative rules for stocky sections
- Shear buckling of webs of plate girders
Less conservative curve
- Strength enhancements corners of CF sections
Rules for design

Future developments to Eurocode 3: Part 1.4

- Flexural buckling of CHS
Lower curve, possibly
- Bolted connections
Different rules for thin and thick walled material
- Guidance on grade selection
Group grades into corrosion resistant & strength class, e.g. A4-S270, new procedure for grade selection
- Cold worked stainless steel
Clearer rules, undermatched welding permitted
- Safety factors
Gamma M factors re-evaluated