STAINLESS STEEL IN STRUCTURES

DESIGN RULES FOR STRUCTURAL STAINLESS STEEL IN EUROCODE 3
EN 1993 Design of Steel Structures

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 1993-1-2 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 1993-1-10 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)
\[ \varepsilon = \begin{cases} \frac{\sigma}{E} + 0.002 \left( \frac{\sigma}{f_y} \right)^n & \text{for } \sigma \leq f_y \\ 0.002 + \frac{f_y}{E} + \frac{\sigma - f_y}{E_y} + \varepsilon_u \left( \frac{\sigma - f_y}{f_u - f_y} \right)^m & \text{for } f_y < \sigma \leq f_u \end{cases} \]

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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
  - 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