

SRI LANKA STANDARD
NA to SLS EN 1993-1-10: 2017
UDC 624.014.2



SRI LANKA NATIONAL ANNEX TO
EUROCODE 3: DESIGN OF STEEL
STRUCTURES - PART 1-10: MATERIAL
TOUGHNESS AND THROUGH-THICKNESS
PROPERTIES

SRI LANKA STANDARDS INSTITUTION

**SRI LANKA NATIONAL ANNEX TO
EUROCODE 3: DESIGN OF STEEL STRUCTURES - PART 1-10: MATERIAL
TOUGHNESS AND THROUGH-THICKNESS PROPERTIES**

NA to SLS EN 1993-1-10:2017

Gr. 2

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The preparation of this National Annex was entrusted by the Working Group on Formulation of National Annexes to Eurocode 3, Design of Steel Structures., appointed by the Sectoral Committee on Building & Construction Materials, upon which the following members were represented:

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National Annex (informative) to SLS EN 1993-1-10:2016, Eurocode 3: Design of Steel Structures – Part 1-10: Material toughness and through-thickness properties

Introduction

This National Annex has been prepared based on **EN 1993-1-10:2005** incorporating corrigenda December 2005 and March 2009 by the Working Group on Formulation of National Annexes to Eurocode 3, Design of Steel Structures. It is to be used in conjunction with **SLS EN 1993-1-10:2016** along with any further revision, amendment or corrigendum thereto.

This National Annex was approved by the Sectoral Committee on Building and Construction Materials and was authorized for publication as a Sri Lanka National Annex by the Council of the Sri Lanka Standards Institution on 2017-12-04.

In the preparation of this standard the assistance derived from the publications of the European Committee for Standardization (CEN) and British Standards Institution (BSI) are gratefully acknowledged.

NA.1 Scope

This National Annex gives:

- a) The decisions for the National Determined Parameters described in the following clauses and sub clauses of **SLS EN 1993-1-10:2016**
 - 2.2(5)
 - 3.1(1)
- b) References to non-contradictory complementary information.

NA.2 Nationally Determined Parameters

NA.2.1 Procedure [SLS EN 1993-1-10:2016, 2.2(5)]

NA.2.1.1 Safety element

NA.2.1.1.1 Factors affecting safety elements

The value of ΔT_R should be obtained from the following equation:

$$\Delta T_R = \Delta T_{RD} + \Delta T_{Rg} + \Delta T_{RT} + \Delta T_{R\sigma} + \Delta T_{Rs}$$

where

- ΔT_{RD} is an adjustment for the detail type (see **NA.2.1.1.2**);
- ΔT_{Rg} is an adjustment for the gross stress concentrations (see **NA.2.1.1.3**);
- ΔT_{RT} is an adjustment for Charpy test temperature (see **NA.2.1.1.4**);
- $\Delta T_{R\sigma}$ is an adjustment for the applied stress level (see **NA.2.1.1.5**);
- ΔT_{Rs} is an adjustment for the strength grade (see **NA.2.1.1.6**);

The procedures in **NA.2.1.1.2** to **NA.2.1.1.6** for ΔT_R are consistent with $\Delta T_G = 0^\circ\text{C}$.

Reference to guidance giving recommended maximum permissible values of element thickness t for reference temperatures below -50°C is given in NA.3.

NA.2.1.1.2 Adjustment for detail type, ΔT_{RD}

The value of $\Delta T_{RD} = 0$ should be used except as follows:

a) unwelded details:

- for unwelded as-rolled, ground or machined surfaces, a value of $\Delta T_{RD} = +30^{\circ}\text{C}$ should be used;
- for unwelded mechanically fastened joints or flame cut edges, a value of $\Delta T_{RD} = +20^{\circ}\text{C}$ should be used;

b) welded details:

- for welded details, the value of $\Delta T_{RD} = +0^{\circ}\text{C}$ should be used; except for those locations given in Table NA.1.

TABLE NA.1 – Values of ΔT_{RD} for specific welded locations

Component or detail	Initiation site	Attachment dimensions ^A		ΔT_{RD}
		Length (mm) ^B	Width (mm) ^C	
Welded attachment	Transverse weld toe	> 150	≤ 50 > 50	-20 -30
Member fabricated from plates	Transverse butt weld ^D	-	-	-20
Rolled sections	Transverse butt weld ^D	-	-	-30
^{A)} Measured overall between weld toes on member concerned ^{B)} Measured in direction of tensile stress ^{C)} Measured transverse to direction of tensile stress ^{D)} Applies only to welds joining the full cross section, not those joining individual plates prior to sub-assembly)				

NA.2.1.1.3 Adjustment for detail type, ΔT_{Rg}

The value of ΔT_{Rg} should be applied for initiation sites in regions of gross stress concentration in accordance with Table NA 2.

TABLE NA.2 - Values of ΔT_{Rg} according to gross stress concentration factor
Units in degrees Celsius ($^{\circ}\text{C}$)

Stress concentration factor	ΔT_{Rg}
1	0
1.5	-10
2	-20
3	-30

NA.2.1.1.3 Adjustment for Charpy test temperature, ΔT_{RT}

The value of ΔT_{RT} according to the difference between the Charpy test temperature T and the minimum steel temperature ($T_{md} + \Delta T_1$) should be as given in Table NA.3.

TABLE NA.3 - Values of ΔT_{RT} according to difference between Charpy test and minimum service temperatures

Units in degrees Celsius ($^{\circ}\text{C}$)

Application	$T - ((T_{md} + \Delta T_1)^A)$	ΔT_{RT}^A
General (except bridges conforming to SLS EN 1993-2)	≤ 20	0
	25	-10
	30	-20
	35	-30
	$>35 \leq 40$	-40 restricted use ^{B)C)}
Bridges conforming to SLS EN 1993-2	≤ 20	0
	20	Not permitted ^{B)}
^{A)} Intermediate values should be obtained by linear interpolation ^{B)} See NA.2.1.2. ^{C)} Welded joint types where either $\Delta T_{RD} + \Delta T_{R\sigma} < 0^{\circ}\text{C}$ or $\Delta T_{Rg} < 0^{\circ}\text{C}$ should not be used in tension if $T - ((T_{md} + \Delta T_1) > 35^{\circ}\text{C}$ (see Tables NA.1 and NA.2) respectively). No type of welded joint should be used in tension in this temperature condition where $\Delta T_1 < 0^{\circ}\text{C}$ (see SLS EN 1993-1-10:2016, 2.2 and 2.3)		

NA.2.1.1.5 Adjustment for applied stress, $\Delta T_{R\sigma}$

For $\sigma_{Ed} = 0.75f_y(t)$, $\Delta T_{R\sigma}$ may be taken as zero. For $\sigma_{Ed} < 0.75f_y(t)$, the values for $0.75f_y(t)$ should be used, but adjusted by use of a $\Delta T_{R\sigma}$ value for lower values of σ_{Ed} as given in Table NA.4. Linear interpolation may be used for intermediate values of σ_{Ed} in Table NA.4.

TABLE NA.4 - Values of $\Delta T_{R\sigma}$ for maximum tensile stresses less than $0.75f_y(t)$

Units in degrees Celsius ($^{\circ}\text{C}$)

σ_{Ed}	$\Delta T_{R\sigma}$
$0.5f_y(t)$	0
$0.3f_y(t)$	+10
$0.15f_y(t)$	+20
≤ 0	+30

NA.2.1.1.6 Adjustment for steel grade, ΔT_{Rs}

The value of ΔT_{Rs} should be as given in Table NA.5.

TABLE NA.5 - Values of ΔT_{Rs} according to steel grade
Units in degrees Celsius ($^{\circ}\text{C}$)

Steel grade	ΔT_{Rs}
< S355	+10
S355	0
> S355	-10

NA.2.1.2 Charpy test and reference temperatures and applied stress

NA.2.1.2.1 Charpy test and reference temperatures

The maximum range between T_{Ed} and the Charpy test temperature T should be limited such that the recommended values given in Table NA.3 are achieved.

NA.2.1.2.2 Range of σ_{Ed}

The use of Table 2.1 may be restricted to the values of t given for $\sigma_{Ed} = 0.75f_y(t)$. For other values of σ_{Ed} see NA.2.1.1.5.

NA.2.1.2.3 Limitation of steel grade

Table 2.1 may be used for steel grades up to and including S690 (subject to the recommendations given in NA.2.1.1.6)

NA.2.2 Quality class for through thickness properties

[SLS EN 1993-1-10:2016, 3.1(1)]

Class 2 should be used. Reference to design guidance is given in NA.3.

NA.3 References to non-contradictory complementary information

Complementary guidance on toughness and through thickness properties is given in PD 6695-1-10.

Bibliography

For dated references only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

[1] PD 6695-1-10, Recommendations for the design of structures to BS EN 1993-10.

[2] BS EN 1993-2 Eurocode 3 – Design of steel structures – Part 2: Steel bridges.

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