SLOVENSKI STANDARD
kSIST-TS FprCEN/TS 19100-3:2021

01-junij-2021

Projektiranje steklenih konstrukcij - 3. del: Projektiranje steklenih komponent pod vplivom obtežb, ki delujejo v ravnini komponent in njihvih mehanskih spojev

Design of glass structures - Part 3: Design of in-plane loaded glass components and their mechanical joints

Bemessung und Konstruktion von Tragwerken aus Glas - Teil 3: In Scheibenebene belastete Bauteile und mechanische Verbindungen

Conception et calcul des structures en verre - Partie 3 : Conception et calcul des composants en verre chargés dans leur plan et de leurs assemblages

Ta slovenski standard je istoveten z: **FprCEN/TS 19100-3**

ICS:

91.080.99	Druge konstrukcije	Other structures

kSIST-TS FprCEN/TS 19100-3:2021 **en,fr,de**

TECHNICAL SPECIFICATION

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Design of glass structures - Part 3: Design of in-plane loaded glass components and their mechanical joints

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This draft Technical Specification is submitted to CEN members for Vote. It has been drawn up by the Technical Committee CEN/TC 250.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

Warning : This document is not a Technical Specification. It is distributed for review and comments. It is subject to change without notice and shall not be referred to as a Technical Specification.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (FprCEN/TS 19100-3:2021) has been prepared by Technical Committee CEN/TC 250 “Structural Euro-codes”, the secretariat of which is held by BSI. CEN/TC 250 is responsible for all Structural Eurocodes and has been assigned responsibility for structural and geotechnical design matters by CEN.

This document is currently submitted to the Vote on TS.

This document has been prepared under Mandate M/515 given to CEN by the European Commission and the European Free Trade Association.

This document has been drafted to be used in conjunction with relevant execution, material, product and test standards, and to identify requirements for execution, materials, products and testing that are relied upon by this document.

0 Introduction

0.1 Introduction to the Eurocodes

The Structural Eurocodes comprise the following standards generally consisting of a number of Parts:

— EN 1990 Eurocode: Basis of structural and geotechnical design

— EN 1991 Eurocode 1: Actions on structures

— EN 1992 Eurocode 2: Design of concrete structures

— EN 1993 Eurocode 3: Design of steel structures

— EN 1994 Eurocode 4: Design of composite steel and concrete structures

— EN 1995 Eurocode 5: Design of timber structures

— EN 1996 Eurocode 6: Design of masonry structures

— EN 1997 Eurocode 7: Geotechnical design

— EN 1998 Eurocode 8: Design of structures for earthquake resistance

— EN 1999 Eurocode 9: Design of aluminium structures

The Eurocodes are intended for use by designers, clients, manufacturers, constructors, relevant authorities (in exercising their duties in accordance with national or international regulations), educators, software developers, and committees drafting standards for related product, testing and execution standards.

NOTE Some aspects of design are most appropriately specified by relevant authorities or, where not specified, can be agreed on a project-specific basis between relevant parties such as designers and clients. The Eurocodes identify such aspects making explicit reference to relevant authorities and relevant parties.

0.2 Introduction to FprCEN/TS 19100-1 (all parts)

FprCEN/TS 19100 applies to the structural design of mechanically supported glass components and assemblies of glass components. It complies with the principles and requirements for the safety and serviceability of structures, the basis of their design and verification that are given in EN 1990, *Basis of structural and geotechnical design.*

FprCEN/TS 19100 is subdivided into three parts:

— *Part 1: Basis of design and materials*

— *Part 2: Design of out-of-plane loaded glass components*

— *Part 3: Design of in-plane loaded glass components and their mechanical joints*

0.3 Introduction to FprCEN/TS 19100-3

This document applies to the structural design of in-plane loaded glass components in conjunction with FprCEN/TS 19100-1 and FprCEN/TS 19100-2.

0.4 Verbal forms used in the Eurocodes

The verb “shall" expresses a requirement strictly to be followed and from which no deviation is permitted in order to comply with the Eurocodes.

The verb “should” expresses a highly recommended choice or course of action. Subject to national regulation and/or any relevant contractual provisions, alternative approaches could be used/adopted where technically justified.

The verb “may" expresses a course of action permissible within the limits of the Eurocodes.

The verb “can" expresses possibility and capability; it is used for statements of fact and clarification of concepts.

0.5 National annex for FprCEN/TS 19100-3

This document gives values within notes indicating where national choices can be made. Therefore, a national document implementing FprCEN/TS 19100-3 can have a National Annex containing all Nationally Determined Parameters to be used for the assessment of buildings and civil engineering works in the relevant country.

When not given in the National Annex, the national choice will be the default choice specified in the relevant Technical Specification.

The national choice can be specified by a relevant authority.

When no choice is given in the Technical Specification, in the National Annex, or by a relevant authority, the national choice can be agreed for a specific project by appropriate parties.

National choice is allowed in FprCEN/TS 19100-3 through the following clauses:

4.1 (1) NOTE

4.2.1 (2) NOTE

4.2.1 (5) NOTE 1

4.2.1 (5) NOTE 2

4.2.3 (5) NOTE

4.3.1 (2) NOTE

4.3.1 (3) NOTE

4.3.1 (7) NOTE

7.3.2 (1) NOTE 2

8.2 (3) NOTE 1

10.3.1 (4) NOTE 1

10.3.1 (4) NOTE 2

10.3.3 (1) NOTE

10.3.4.3 (2) NOTE 1

10.4.1 (5) NOTE

National choice is allowed in FprCEN/TS 19100-3 on the application of the following informative annexes:

Annex A, Calculation of the critical buckling load N_{cr} or critical bending moment $M_{cr,LT}$

Annex B, Calculation of $I_{z,eff}$ and $I_{T,eff}$ of laminated glass

Annex C, Calculation of K_m - values for simplified calculation

The National Annex can contain, directly or by reference, non-contradictory complementary information for ease of implementation, provided it does not alter any provisions of the Eurocodes.

1 Scope

1.1 Scope of FprCEN/TS 19100-3

(1) This document gives design rules for mechanically supported glass components primarily subjected to in-plane loading. It also covers construction rules for mechanical joints for in-plane loaded glass components.

NOTE In-plane loaded glass elements are primarily subjected to in-plane loads, e.g. transferred from adjacent parts of a structure. They can also be subjected to out-of-plane loading.

1.2 Assumptions

(1) The assumptions of EN 1990 apply to this document.

(2) This document is intended to be used in conjunction with EN 1990, EN 1991 (all parts), EN 1993-1-1, EN 1995-1-1, EN 1998-1, EN 1999-1-1 and EN 12488.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE See the Bibliography for a list of other documents cited that are not normative references, including those referenced as recommendations (i.e. through 'should' clauses) and permissions (i.e. through 'may' clauses).

EN 1990, *Eurocode - Basis of structural and geotechnical design*

FprCEN/TS 19100-1:2021, *Design of glass structures - Part 1: Basis of design and materials*

FprCEN/TS 19100-2:2021, *Design of glass structures - Part 2: Design of out-of-plane loaded glass components*

3 Terms, definitions and symbols

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in FprCEN/TS 19100-1:2021 and FprCEN/TS 19100-2:2021 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1.1
shear element made of glass
glass element sustaining on purpose loads or stresses in-plane (F_x, F_z ,p_x, p_z,)

Note 1 to entry: The element may be loaded also by loading transversal to the plane (q_y).

3.1.2
buckling length
length of an equivalent member with pinned ends, which has the same buckling resistance as a given member or segment of member, whereas the system length corresponds to the distance between two consecutive

points in a given plane where a member is braced against lateral displacement in this plane, or between one such point and the end of the member

3.1.3
second order analysis
geometrically non-linear analysis taking account of the out-of-plane deflections whilst calculating equilibrium of stresses or sectional forces of a glass pane

3.1.4
third order analysis
geometrically non-linear analysis taking account of both the out-of-plane and in-plane deflections whilst calculating equilibrium of stresses or sectional forces of a glass pane

3.1.5
membrane effect
influence on stresses and sectional forces due to consideration of in-plane deflections in static equilibrium

3.1.6
axes of a glass pane, component or member and their direction
x-x in the glass pane, component or member, preferably one of the gravity lines

y-y perpendicular to the glass pane, defined by the x- and the z-axes

z-z in the glass pane, component or member, perpendicular to x-x

Note 1 to entry: The directions of x-, y- and z-axes should accord to those of thumb, index finger and middle finger of the right hand in the defined planes, see Figure 3.1.

Note 2 to entry: When bending about the y-axis occurs this axis is also called strong axis, and accordingly, when bending about the x-axis or the z-axis these axes are called weak axes.

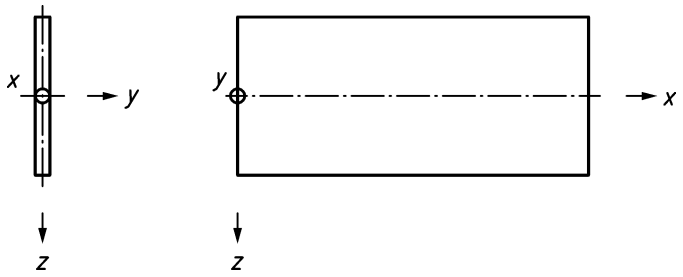

Figure 3.1 — Definition of axes of a glass pane, component or member and their direction

3.1.7
structural redundancy
ability of a structure to redistribute among its members/connections the loads which can no longer be carried by some other damaged portions

3.1.8
sudden fracture
fracture event of unknown origin, induced without external energy

3.1.9
protection measure
measure that is intended to prevent or reduce the risk of accidental damage of a glass member that may affect its structural function

3.1.10
polymeric-modified mortar
mortar, used for filling gaps between glass and other parts for force and stress transmission

Note 1 to entry: For reasons of strength and ductility, to avoid stress peaks, polymeric materials are added to the mortar.

3.2 Symbols and abbreviations

A_g	glass cross section area without cross section area of the interlayer
AR	aspect ratio
C_1, C_2	factors taking into account different bending moments
DLF	Dynamic load amplification factor due to dynamic effects
E	Young's modulus of glass
G	shear modulus of glass
G_L	shear modulus of interlayer
I_z	moment of inertia about the minor axis (z-axis)
$I_{z,eff}$	effective moment of inertia about the minor axis (z-axis)
K	interlayer stiffness
K_m	equilibrium parameter
L_b	buckling length
L_{LT}	buckling length (lateral torsional buckling)
M_{Ed}	the design value of the moment
$M_{b,Rd}$	the design buckling resistance moment
$M_{cr,LT}$	critical buckling moment (lateral torsional buckling)
$M_{c,Rd}$	the design resistance moment
$M_{lateral,Ed}$	flexural moment
$N_{b,Ed}$	design value of the compressive force
$N_{b,Rd}$	design buckling resistance of the compression component
N_{cr}	elastic critical force for the relevant buckling mode
$P_{D,cr}$	critical diagonal load of the four-point supported glass panel
P_d	relevant design load