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Glass in building — Heat soaked tempered soda lime silicate safety glass

Verre dans la construction — Verre de sécurité de silicate sodocalcique trempé et traité

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 160, *Glass in building*, Subcommittee SC 1, *Product considerations*.

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Introduction

Heat soaked tempered soda lime silicate safety glass has a safer breakage behaviour when compared with annealed glass. This behaviour is a direct result of the high surface pre-stress.

It also has a known level of residual risk of spontaneous breakage arising from the possible presence of critical nickel sulfide (NiS) inclusions in the thermally toughened soda lime silicate glass.

Heat soaked tempered soda lime silicate safety glass has a known behaviour under accident human impact together with known mechanical and thermal stress resistance.

Other requirements, not specified in this document, can apply to heat soaked tempered soda lime silicate safety glass which is incorporated into assemblies, e.g. laminated glass or insulating glass units, or undergo an additional treatment, e.g. coating. The additional requirements are specified in the appropriate glass product standard. Heat soaked tempered soda lime silicate safety glass, in this case, does not lose its mechanical or thermal characteristics.

NOTE 1 ISO/TC 160/SC 2 is producing standards for the determination of the design strength of glass and is preparing a design method.

NOTE 2 In Europe, instead of “heat soaked tempered”, the term “heat soaked thermally toughened” is used.

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Glass in building — Heat soaked tempered soda lime silicate safety glass

1 Scope

This document specifies product definitions, product characteristics, i.e. tolerances, flatness, edgework, etc., fracture characteristics, including fragmentation, and the physical and mechanical characteristics of flat heat soaked tempered soda lime silicate safety glass for use in buildings.

This document does not cover curved (bent) glass according ISO 11485.

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.

ISO 1288-3, *Glass in building — Determination of the bending strength of glass — Part 3: Test with specimen supported at two points (four point bending)*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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

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

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

3.1
heat soaked tempered soda lime silicate safety glass
heat soaked tempered safety glass
glass within which a permanent surface compressive stress, additionally to the basic mechanical strength, has been induced by a controlled heating and cooling process in order to give it greatly increased resistance to mechanical and thermal stress and prescribed fragmentation characteristics and which has a known *level of residual risk* (3.2) of spontaneous breakage due to the presence of critical nickel sulphide (NiS) inclusions

3.2
level of residual risk
risk of spontaneous breakage of heat soaked thermally toughened soda lime silicate safety glass, on a statistical basis, due to the presence of critical nickel sulphide inclusions

Note 1 to entry: It is considered that the level of residual risk is no more than one breakage per 400 tonnes of heat soaked thermally toughened soda lime silicate safety glass[6][7][8].

3.3
flat heat soaked tempered safety glass
heat soaked tempered (thermally toughened) glass which has not been deliberately given a specific profile during manufacture

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3.4
enamelled heat soaked tempered safety glass
heat soaked tempered (thermally toughened) glass which has a ceramic frit fired into the surface during the tempering (toughening) process

Note 1 to entry: After tempering, the ceramic frit becomes an integral part of the glass.

Note 2 to entry: The application of the ceramic frit may be by a continuous application or discontinuous, e.g. screen printing.

3.5
horizontal tempering process
process in which the glass is supported on horizontal rollers

3.6
air cushion process
process in which the glass is supported by an air cushion with or without additional rollers

Note 1 to entry: In this process, the glass will be between horizontal and 45° of horizontal.

3.7
vertical tempering process
process in which the glass is suspended by tongs

3.8
edge deformation
deformation of the edge caused by the tong marks

3.9
edge lift
edge dip
distortion produced in *heat soaked tempered safety glass* (3.1) which was horizontally tempered, at the leading and trailing edge of the plate, as a result of the glass during the tempering (toughening) process not being supported by a roller

Note 1 to entry: This is a distortion produced by a deviation from surface flatness.

3.10
perimeter deformation
distortion around the edge of *heat soaked tempered safety glass* (3.1) manufactured by *air cushion process* (3.6)

3.11
local distortion
local deformation underneath the tong marks of *heat soaked tempered safety glass* (3.1) which was vertically tempered

3.12
overall bow
deformation of the whole pane of *heat soaked tempered safety glass* (3.1) caused by the heating and cooling process

3.13
roller wave distortion
periodic distortion produced in *heat soaked tempered safety glass* (3.1) which was horizontally tempered as a result of the glass during tempering process being in contact with the rollers

Note 1 to entry: This is a surface distortion produced by a reduction in surface flatness.

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3.14
wave distortion
distortion produced in *heat soaked tempered safety glass* (3.1) manufactured by *air cushion process* (3.6) as a result of the tempering process

3.15
heat soak process
heat treatment after the tempering process during which majority of NiS inclusions is removed resulting in a known level of critical NiS inclusions in the heat soaked tempered soda lime silicate safety glass

3.16
in-line heat soak process
heat soak process (3.15) which follows immediately after the quenching process whereby the glass temperature is directly reduced from quenching to the heat soak temperature in an in-line heat soak oven

3.17
off-line heat soak process
heat soak process (3.15) carried out after the quenching process whereby the glass is cooled down to room temperature and heated up again to the heat soak temperature in an off-line heat soak oven

4 Glass products

Heat soaked tempered safety glass is made from a monolithic glass generally corresponding to one of the following standards:

— basic soda lime silicate glass products according to ISO 16293-1;

— float glass according to ISO 16293-2;

— patterned glass according to ISO 16293-5;

— coated glass according to ISO 11479-1.

NOTE For drawn sheet glass, an ISO standard is not available. Therefore, see EN 572–4 or national standards.

Other nominal thicknesses of glass than those covered in the above standards are possible.

5 Manufacturing processes

5.1 General

Heat soaked tempered safety glass is manufactured as follows.

Basic soda lime silicate glass products (see Clause 4) are cut to size, shaped and edgeworked (see Clause 8).

The prepared glass panes are then tempered (see 5.2).

The tempered panes are then subjected to an off-line or in-line heat soak process cycle (see 5.3.1 and 5.3.2)

After manufacture the heat soaked tempered safety glass shall comply with the fragmentation test (see Clause 9) and mechanical strength requirement (see 10.4).

5.2 Tempering process

The cut, shaped and edgeworked glasses are tempered. The heat soaked tempered glass shall comply with the flatness criteria for horizontal or vertical tempering or the air cushion process (see 7.3).

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