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Glass in building — Laminated glass and laminated safety glass —

Part 6: Appearance

*Verre dans la construction — Verre feuilleté et verre feuilleté de
sécurité —*

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Partie 6: Aspect
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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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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Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of 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 www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 160, *Glass in building* Subcommittee SC 1, *Product considerations*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 129, *Glass in building*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This third edition cancels and replaces the second edition (ISO 12543-6:2011), which has been technically revised.

The main changes compared to the previous edition are as follows:

- some definitions have been revised;
- a paragraph on laminated glass incorporating thermally treated glasses has been added;
- a method of observation of glasses by pack for jumbos or stock sizes has been added.

A list of all parts in the ISO 12543 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Glass in building — Laminated glass and laminated safety glass —

Part 6: Appearance

1 Scope

This document specifies defects of finished sizes and test methods with regard to the appearance of laminated glass and laminated safety glass when looking through the glass.

All references to laminated glass in this document refer to both laminated glass and laminated safety glass.

NOTE Special attention is paid to acceptability criteria in the vision area.

This document is applicable to finished sizes at the time of supply.

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 12543-1, *Glass in building — Laminated glass and laminated safety glass — Part 1: Definitions and description of component parts*

ISO 12543-5, *Glass in building — Laminated glass and laminated safety glass — Part 5: Dimensions and edge finishing*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 12543-1, 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 <https://www.electropedia.org/>

3.1

spot defect

type of defect that includes *opaque spots* (3.3), bubbles and *foreign bodies* (3.4)

3.2

linear defect

type of defect that includes *foreign bodies* (3.4) and *scratches* (3.5) or *grazes* (3.6)

3.3

opaque spot

visible defects in the laminated glass

EXAMPLE Tin marks and inclusions in the glass or interlayer.

3.4

foreign body

unwanted item introduced into the laminated glass during manufacture

3.5

scratch

linear damage to the outside surface of the laminated glass

3.6

graze

damage to the outside surface of the laminated glass

3.7

vent

sharp tipped fissure or crack running into the glass from an edge

3.8

crease

distortion introduced into the interlayer by folds visible after manufacture

3.9

streak

distortion in the interlayer, caused by manufacturing defects in the interlayer or due to interlayer inhomogeneity, that are visible after manufacture

3.10

edge area

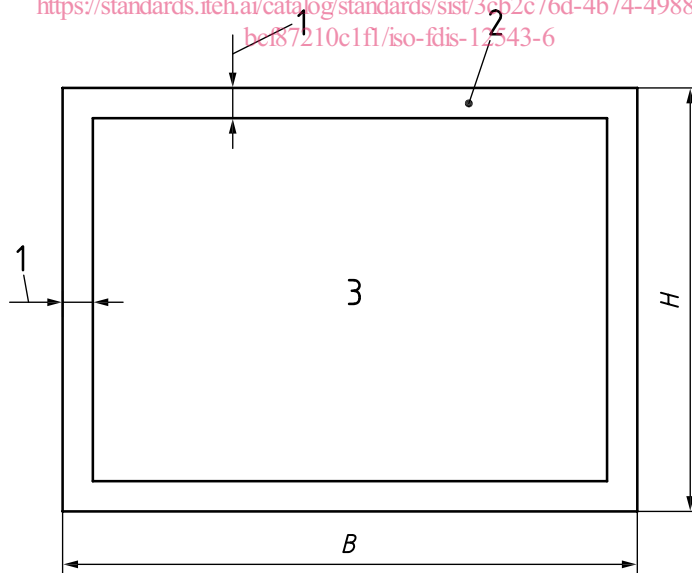
perimeter of the pane which is generally contained within the glazing system

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Note 1 to entry: For pane sizes that are less than 5 m², the width of the edge area as given in Figure 1 is 15 mm. The width of the edge area is increased to 20 mm for pane sizes that are greater than 5 m².

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Key

- B width
- H length
- 1 width of edge area
- 2 edge area
- 3 main area

Figure 1 — Areas to be examined on finished sizes ready for glazing

3.11**vision area**

main area of the glass that excludes the edge area

4 Method of observation

The laminated glass is put in a vertical position, in front of and parallel to a matt grey screen, and is lit by diffuse daylight or equivalent.

The laminated glass is visually inspected perpendicularly at a distance of two metres from the glass, with the matt screen on the other side of the glass.

Any visible defects that are disturbing shall be marked.

An alternative method of observation by pack is given in [Annex A](#).

5 Vents

Vents are not permitted.

6 Creases and streaks

Creases and streaks are not permitted in the vision area.

7 Defects in the vision area**7.1 Spot defects in the vision area**

When inspected according to the method given in [Clause 4](#), the admissibility of spot defects depends on the following:

- size of the defect;
- frequency of the defect;
- number of panes as components of a laminated glass.

The number of permissible defects in a pane shall be in accordance with [Table 1](#).

Defects less than 0,5 mm shall not be considered.

Defects greater than 3 mm shall not be permitted.

Table 1 — Permissible spot defects in the vision area

Size of defect <i>d</i> mm	0,5 < <i>d</i> ≤ 1,0		1,0 < <i>d</i> ≤ 3,0			
	for all sizes		<i>A</i> ≤ 1	1 < <i>A</i> ≤ 2	2 < <i>A</i> ≤ 8	<i>A</i> > 8
Size of pane <i>A</i> m ²						
NOTE An accumulation of defects occurs if four or more defects are at a distance of < 200 mm from each other. This distance is reduced to 180 mm laminated glass consisting of three panes, to 150 mm laminated glass consisting of four panes and to 100 mm laminated glass consisting of five or more panes.						

Table 1 (continued)

Number of permissible defects	2 panes	no limitation, however, no accumulation of defects	1	2	1/m ²	1,2/m ²
	3 panes		2	3	1,5/m ²	1,8/m ²
	4 panes		3	4	2/m ²	2,4/m ²
	≥ 5 panes		4	6	2,5/m ²	3/m ²
NOTE An accumulation of defects occurs if four or more defects are at a distance of < 200 mm from each other. This distance is reduced to 180 mm laminated glass consisting of three panes, to 150 mm laminated glass consisting of four panes and to 100 mm laminated glass consisting of five or more panes.						

The number of permissible defects in [Table 1](#) shall be increased by one for each individual interlayer which is thicker than 2 mm.

7.2 Linear defects in the vision area

When inspected according to the method given in [Clause 4](#) linear defects are permitted as given in [Table 2](#).

Table 2 — Number of permissible defects in the vision area

Area of pane m ²	Number of permissible defects > 30 mm in length ^a
≤ 5	not permitted
5 to 8	1
> 8	2
^a Linear defects less than 30 mm in length are permitted.	

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8 Defects in the edge area

8.1 Framed edges

When inspected according to the test method given in [Clause 4](#), defects which do not exceed 5 mm in diameter are permitted and the total defect area shall not exceed 5 % of the edge area.

8.2 Unframed edges

If laminated glass is unframed, then its edges may be as follows, see ISO 12543-5:

- ground edges;
- polished edges;
- bevelled edges.

When inspected according to the method given in [Clause 4](#), shells, bubbles are permissible if they do not become visually disturbing. Interlayer retractions deeper than 2 mm are not permissible. Interlayer extrusions at the edge should be flush trimmed.

9 Laminated glass incorporating thermally treated glasses

In laminated glass which incorporates one or more thermally treated glass products optical distortions and anisotropy originating from the thermal treatment processes can be visible. The statements made in the applicable standards for thermally treated products regarding optical distortions and anisotropy are equally valid for laminated glass incorporating thermally treated glasses.

Annex A (informative)

Method of observation of glasses by pack (for jumbos or stock sizes)

Laminated glass of the same type and dimension (e.g. jumbos, stock sizes) can be observed by pack when their tint, nature and composition allow for effective detection of defects.

The observation is done on a pack not exceeding 3 tonnes in case of jumbos, or not thicker than 7 cm in the other cases.

NOTE This kind of control can be done on a pack of glass coming out from the autoclave. The observation is done against a bright, diffused luminous background. The observer is placed at 2 m from the glass. If defects are observed, the concerned glass is taken out of the lot and further observation is made. The requirements of [Clauses 5](#) to [7](#) apply.

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