INTERNATIONAL STANDARD

ISO 24084

First edition
2022-11

Curtain walling — Inter-storey displacement resistance — Test method

Reference number
ISO 24084:2022(E)

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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 162, *Doors, windows and curtain walling*.

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.

Curtain walling — Inter-storey displacement resistance — Test method

1 Scope

This document specifies the test method to evaluate the inter-storey displacement resistance of curtain walling to three-directional seismic or wind actions when curtain walling is subjected to repeated movement.

The test method allows to determine, depending on the axes of the displacement imposed:

— horizontal inter-storey displacement in-plane resistance;

— horizontal inter-storey out-plane displacement resistance;

— vertical inter-storey in-plane displacement resistance;

— combined inter-storey displacement resistance.

The test method can be used to evaluate the inter-storey displacement either when it is a design requirement or to assess the relative displacement accommodated by the curtain walling assembly.

This test can be addressed manually or automatically depending on the size and/or the shape of the specimen.

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 3010, *Bases for design of structures — Seismic actions on structures*

3 Terms and definitions

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

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

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

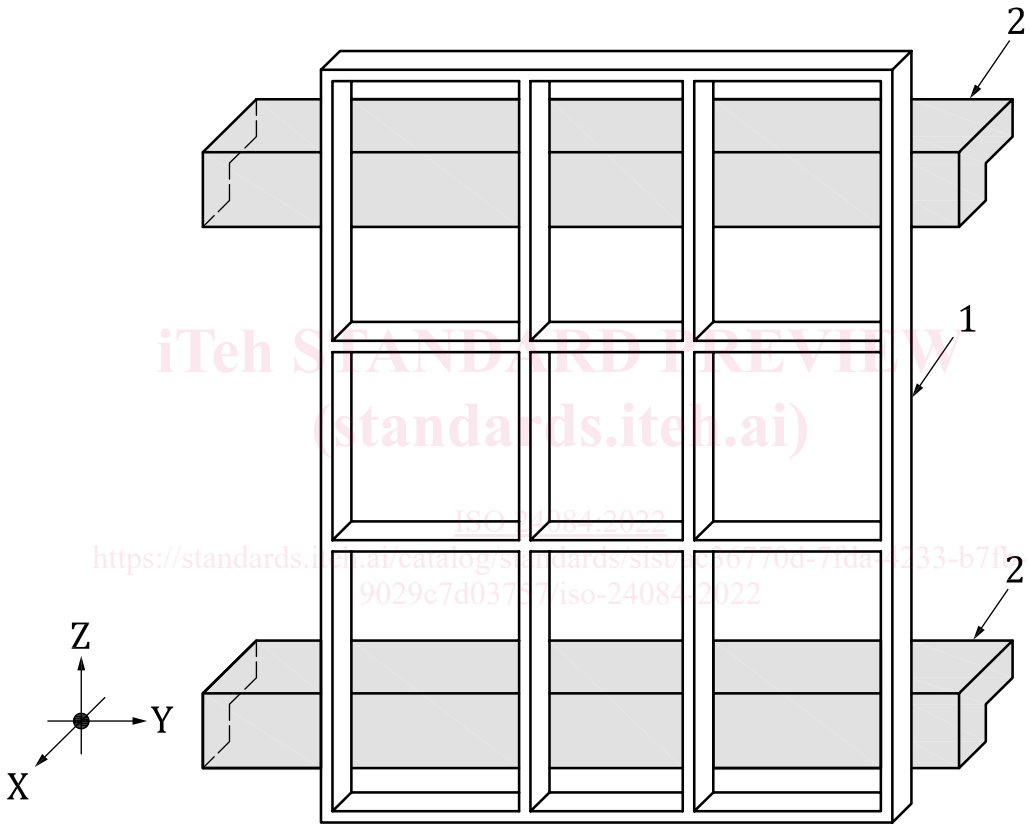
— IEC Electropedia: available at https://www.electropedia.org/

3.1
storey height
vertical dimension measured from the centre of a floor slab to the centre of the next consecutive floor slab, represented by the letter H in mm

3.2
inter-storey displacement
relative displacement caused for example by seismic actions or wind between two adjacent floor slabs in horizontal in-plane axis (Y-dir.), out-plane axis (X-dir.) and vertical in-plane axis (Z-dir.), as shown in Figure 1

Note 1 to entry: For the purpose of this standard the inter-storey displacement, which is the lateral displacement within a storey, is to be controlled. The inter-storey displacement should be limited to restrict damage to non-structural elements such as glass panels and curtain walling for moderate earthquake ground motions and to control failure.

Note 2 to entry: For control of life-threatening damage in occupied buildings at the ULS, the inter-storey displacement should be limited to certain values, depending on the materials of construction, the height of the building, and the use of the building (see ISO 3010).



Key
1 specimen
2 floor slab

Figure 1 — Schematic diagram of X-dir., Y-dir. and Z-dir.

3.3
inter-storey displacement resistance
capability of a specimen to comply with its design criteria when and after subjected to either single-axis *inter-storey displacement* (3.2) or a combination thereof, i.e. air permeability, watertightness and resistance to wind

3.4
horizontal inter-storey displacement in-plane resistance
capability of a specimen to comply with its design criteria when and after subjected to Y-dir. movement repeatedly, i.e. air permeability, watertightness and resistance to wind

Note 1 to entry: Positive displacement shall be defined as a rightward displacement of a specimen as seen from the outdoor side of the specimen. Reversely, negative displacement shall be defined as a leftward displacement of a specimen as seen from the outdoor side of the specimen.

3.5
horizontal inter-storey out-plane displacement resistance
capability of a specimen to comply with its design criteria when and after subjected to the X-dir. movement repeatedly, i.e. air permeability, watertightness and resistance to wind

Note 1 to entry: Positive displacement shall be defined as an outward displacement of a specimen as seen from the outdoor side. Reversely, negative displacement shall be defined as an inward displacement of a specimen as seen from the outdoor side.

3.6
vertical inter-storey in-plane displacement resistance
capability of a specimen to comply with its design criteria when and after subjected to the Z-dir. movement repeatedly, i.e. air permeability, watertightness and resistance to wind

Note 1 to entry: Positive displacement shall be defined as an upward displacement of a specimen as seen from the outdoor side. Reversely, negative displacement shall be defined as a downward displacement of a specimen as seen from the outdoor side.

3.7
combined inter-storey displacement resistance
capability of a specimen to comply with its design criteria when and after the movements in two or three axes repeatedly, i.e. air permeability, watertightness and resistance to wind

3.8
horizontal in-plane displacement
relative displacement δy measured in mm in Y-dir. (Figure 5) when subjected to Y-dir. movement

3.9
horizontal out-plane displacement
relative displacement δx measured in mm in X-dir. (Figure 7) when subjected to X-dir. movement

3.10
vertical in-plane displacement
relative displacement δz measured in mm in Z- dir. (Figure 8) when subjected to Z-dir. movement

3.11
drift angle
a ratio of the relative displacement between the two adjacent floor slabs to the *storey height* (3.1) in either X-dir. or Y-dir.

3.12
reliability
ability of a curtain walling to fulfil the specified requirements, during the working life, for which it has been designed

3.13
serviceability
ability of the curtain walling to perform adequately for a normal use under all expected actions

3.14
safety in use
ability of the curtain walling to avoid exceedance of ultimate limit state

3.15
serviceability limit state
SLS
limit state beyond which the serviceability criteria of curtain walling are no longer satisfied

3.16
ultimate limit state
ULS
limit state beyond which curtain walling collapse, may fall down or with other forms of mechanical failure which might endanger the safety of people

4 Symbols and abbreviated terms

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

X-dir.	Inter-storey movement direction in horizontal out-plane axis
Y-dir.	Inter-storey movement direction in horizontal in-plane axis
Z-dir.	Inter-storey movement direction in vertical in-plane axis
ULS	Ultimate limit state
SLS	Serviceability limit state
H	Storey height
δx	Horizontal out-plane displacement
δy	Horizontal in-plane displacement
δz	Vertical in-plane displacement

5 General and testing principle

This document is used to evaluate the safety in use performance under inter-storey displacement of curtain walling when subjected to a repeated movement caused by a simulating apparatus, e.g. seismic or wind actions.

This test can be also put in a serviceability sequence of testing, including some additional tests, if specifically required, see clause B.2.

For one single storey or two-storey building curtain walls, the “parallelogram” method or “symmetry” method can be used as shown in Figure 2. For the building curtain wall with a height more than two-storey height, the “parallelogram” method should be used.

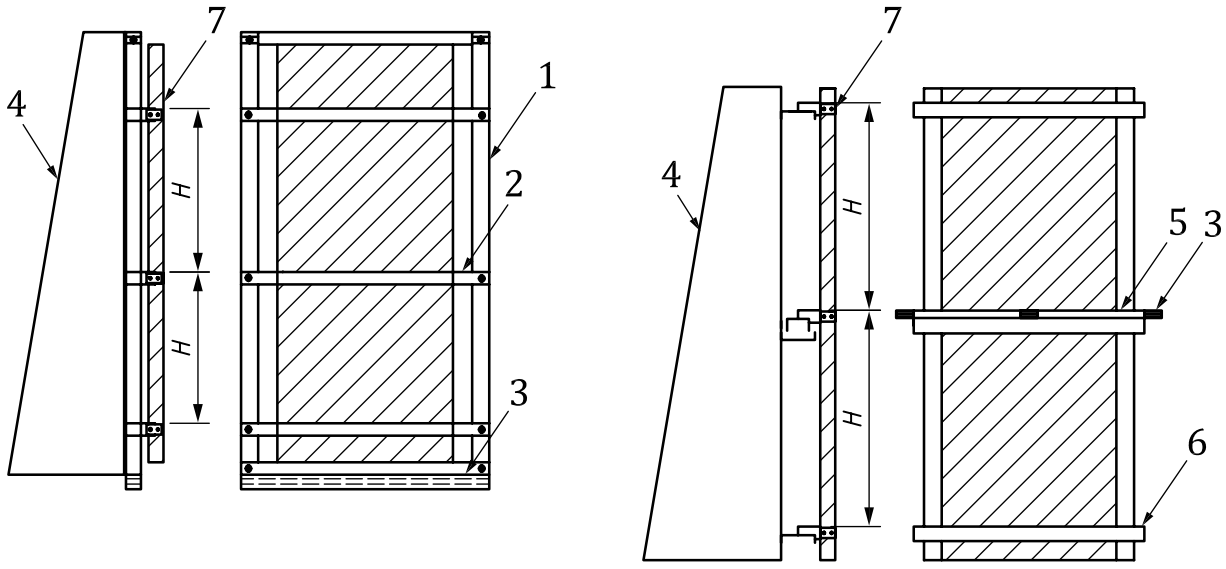
The most unfavourable condition shall be considered as the “symmetry” method is used.

The combined movement can be chosen according to Annex A.

6 Test apparatus and specimens

6.1 Configuration

The configuration of the test apparatus consisting of installation rig, static loading equipment and displacement measuring devices, is as shown in Figure 2.



a) Parallelogram method

b) Symmetry method

Key

1 vertical member
2 horizontal member
3 static loading apparatus
4 supporting structure
5 movable member
6 fixed member
7 fixings

Figure 2 — Schematic diagram of test apparatus and specimen

6.2 Installation rig

The installation rig consists of supporting structure, fixed member and movable member. The rig shall be capable of accommodating the test specimen with enough strength, rigidity and stability to avoid any additional deformations during the installation and testing. The vertical member and movable member shall meet the specified maximum drift angle or displacement for test.

6.3 Loading equipment

The loading equipment shall include a movable member of the rig to cause a movement of the specimen in three axes. The stroke of the movable member should be no less than 1,5 times the design requirement.

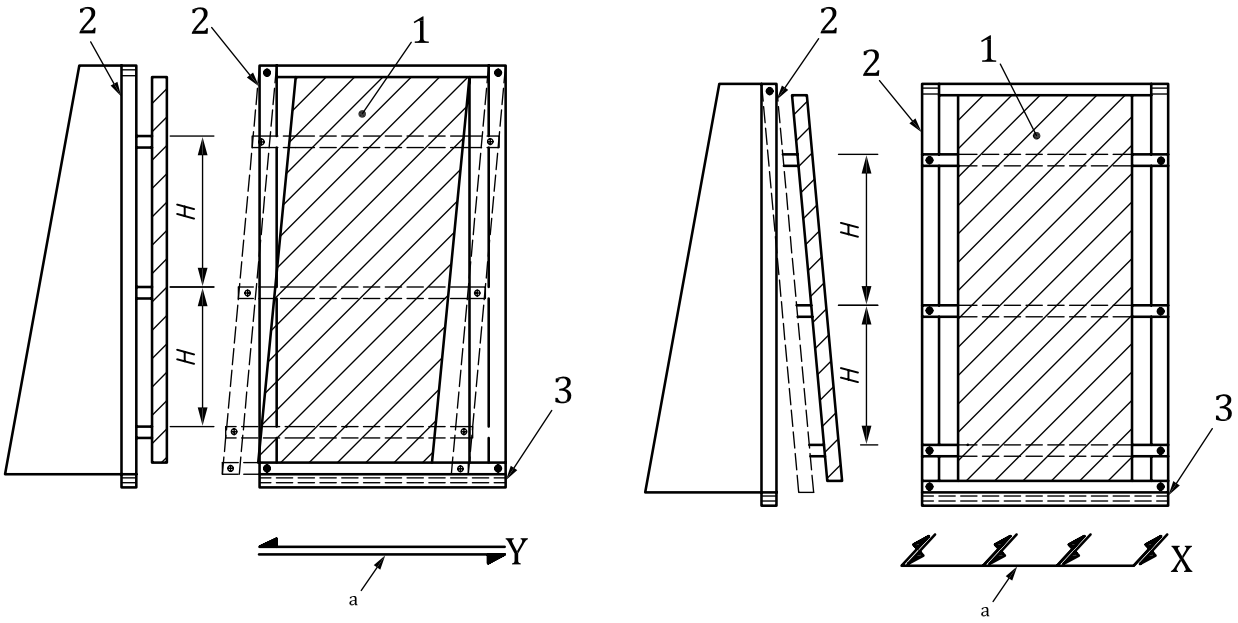
6.4 Displacement measuring device

The accuracy of displacement transducer shall not be more than ±1 % of its full range in the three axes.

7 Loading mode

7.1 Parallelogram method

As shown in Figure 3.



a) In Y-dir. b) In X-dir.

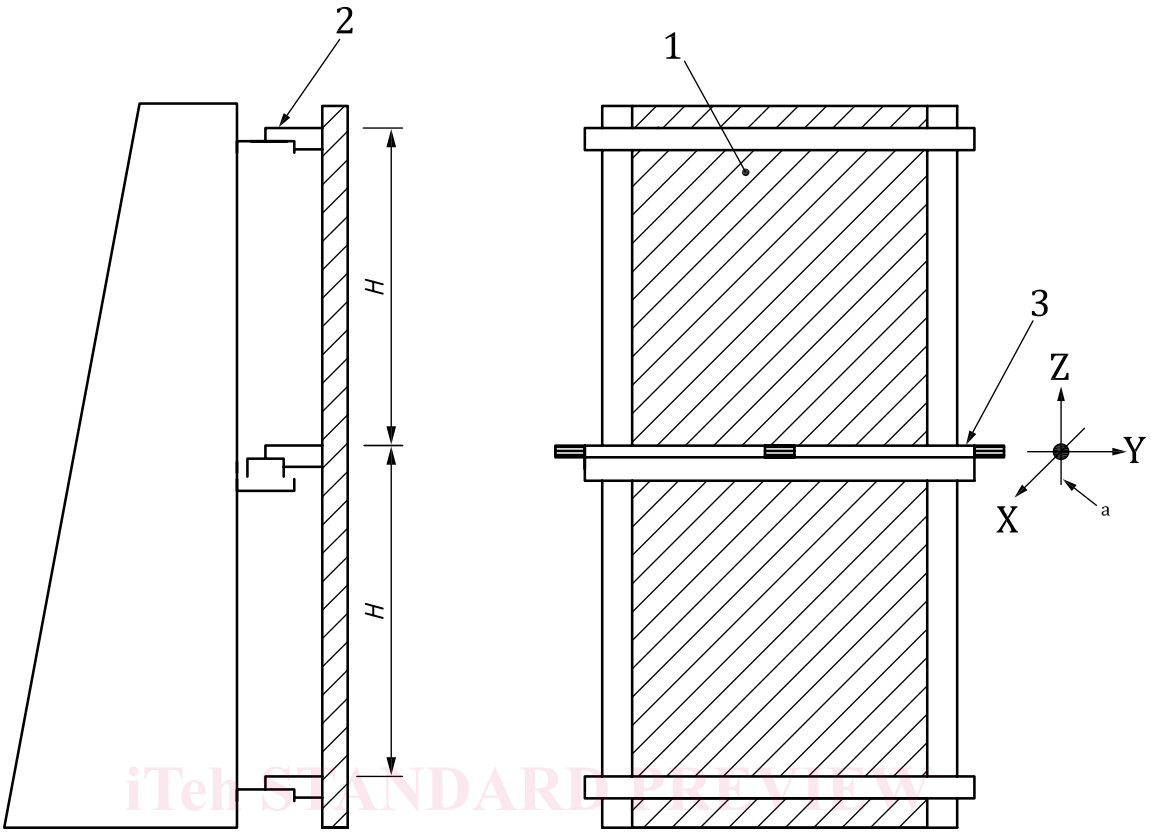
Key

1 specimen
2 vertical member
3 loading equipment
a Acting force in Y-dir. or X-dir..

Figure 3 — Schematic diagram of parallelogram method

7.2 Symmetry method

As shown in Figure 4.



Key

1 specimen
2 fixing
3 loading equipment
a Acting force in Y-dir., X-dir. or Z-dir..

Figure 4 — Schematic diagram of symmetry method

8 Specimen

Test specimen shall be erected as in practice and no additional fixing shall be used onto the specimen to affect the testing result.

9 Test procedure

9.1 Preparation

Inspect the specimen and open, close and lock the openable part for five times prior to test.

Make sure there is no restraints in the moving axis of the vertical or movable member. Any movement of the test specimen outside of the test axes shall be restrained.