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Curtain Walling — Impact resistance — Performance requirements

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National foreword

This British Standard is the UK implementation of EN 14019:2016. It supersedes BS EN 14019:2004 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee B/538/6, Curtain walling.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Curtain Walling - Impact resistance - Performance requirements

Façades rideaux - Résistance au choc - Prescriptions de performance

Vorhangfassaden - Stoßfestigkeit - Leistungsanforderungen, Prüfverfahren und Klassifizierung

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European foreword

This document (EN 14019:2016) has been prepared by Technical Committee CEN/TC 33 “Doors, windows, shutters, building hardware and curtain walling”, the secretariat of which is held by AFNOR.

This document supersedes EN 14019:2004.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by December 2016, and conflicting national standards shall be withdrawn at the latest by December 2016.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

The revision of this European Standard clarifies requirements, impact positions and the test method, but it does not affect existing test evidence of EN 14019. Two informative annexes have been added.

This European Standard is part of a series of European Standards dedicated to curtain walling products.

This European Standard forms part of a series of curtain walling tests as defined in the product standard EN 13830.

According to the CEN/CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1 Scope

This European Standard defines performance requirements of curtain walling under impact load.

The mode of breakage of the glass has to be already assessed according to EN 12600.

Its criteria are targeted to safety in use and integrity of curtain walling in the event of sudden impact forces on the curtain wall surfaces. Compliance with the performance requirement is determined by the laboratory test.

It applies to those areas of curtain walling which face onto areas of human activity, either internally or externally and takes account of accidental impacts brought on by people going about their normal daily activities and impacts brought about by equipment and similar devices for maintenance, cleaning, repair and similar occasional activities.

It does not set out to define performance requirements of impact under exceptional circumstances such as acts of vandalism, vehicular collision, firearm projectiles, etc.

This standard will have no bearing whatsoever on any National Building / Health and Safety regulations which may exist and whose requirements have to apply separately and in parallel with these test performance requirements.

2 Normative References

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 1630, *Pedestrian doorsets, windows, curtain walling, grilles and shutters - Burglar resistance - Test method for the determination of resistance to manual burglary attempts*

EN 13119, *Curtain walling - Terminology*

EN 12600, *Glass in building - Pendulum test - Impact test method and classification for flat glass*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 13119 and the following apply.

3.1
component dislodgement
breaking away of any curtain wall component from the main construction, to the extent that the whole or part component falls off

4 Failure criteria

4.1 The curtain wall shall safely absorb the impact loads and shall retain its function in fulfilling the following criteria:

4.1.1 no part exceeding the mass of 50g shall fall down;

4.1.2 no holing shall occur permitting a test block E2 according with EN 1630 (ellipse) to be passed through it;

4.1.3 permanent deformation of curtain walling framing members, including their connections and fixings, shall be accepted as far as no fracturing or rupturing that separates any framing member, connection or fixing into two or more fragments shall occur;

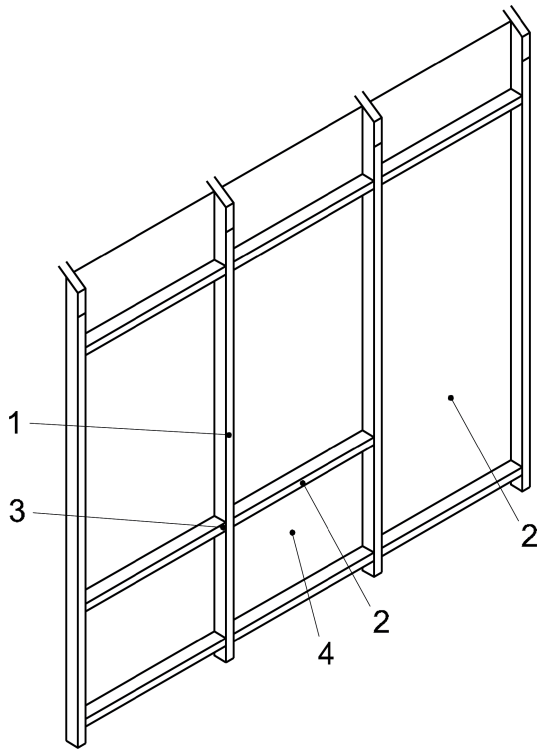
4.1.4 the test specimen shall not detach or dislodge;

4.1.5 any infill panels shall not detach or dislodge.

4.2 Glass products used as or incorporated in infill components shall be classified in accordance with EN 12600.

5 Impact load positions

For impact load positions see Figure 1.



Key

1 Centre of mullion or component height between fixings (external only).

2 Centre width of transom of component (external, internal) at sill height and/or at spandrel height.

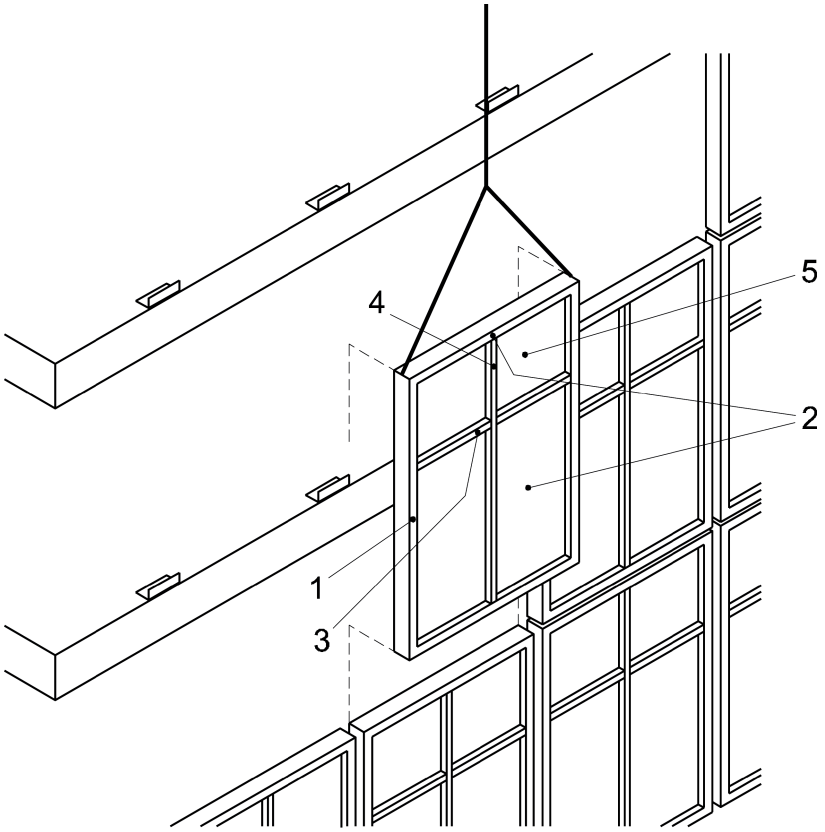
3 End of transom, 150 mm from junction with mullion (external, internal).

4 Centre of infill panel (external, internal).

If different mullion/transom/T-connector/infill panels are intended, all these variants have to be tested (in the most onerous combination)

NOTE The spandrel height has to be determined by the client.

Figure 1 — Illustration of impact load positions for stick construction



Key

1 Centre of modular frame, vertical between fixings (external only)

2 Centre of transom width (internal, external at sill height)

3 End of transom, 150 mm from junction with mullion (external, internal).

4 End of mullion or frame element, 150 mm distant from its end (external only).

5 Centre of infill panel (internal/external)

Figure 2 — Illustration of impact load positions of unitised construction

6 Test method

The test specimen should be a section of curtain wall a minimum of one storey height and of sufficient size to permit testing at all the specified test positions.

For each test position identified in Clause 5, where present, the classification impact is applied once followed by an impact of 100 mm drop height (see Figure A.1).

The test may start with a low potential energy and increase the drop height until the failure occurs or the maximum potential energy class is obtained.

Separate test positions could be used for internal and external tests.

The test specimen should be supported on a rigid structure using the same method of fixing as proposed for site installation. A sample used for wathertightness testing will normally be suitable.

Storage and testing shall be carried out in a non-destructive environment within the ranges of 5 °C to 30 °C and 25 % to 75 % relative humidity.

The impactor as specified in EN 12600 shall be mounted on a horizontal or vertical axis, as best befits the requirements of access to the impact point. In addition wires, pulleys, hooks and suitable height adjusting devices are needed, as specified in EN 12600.

With the impactor hanging in its free state, adjacent to the impact point, attach the release hook to it. Raise the impactor, by means of the height adjusting device until the drop height is correctly set, as judged from a reference point on the impactor. At the drop height the suspension cable shall be taut, and the axis of the impactor and cable shall be in line.

Disengage the release hook allowing the impactor to swing freely until it strikes the test specimen perpendicular to the infill. The metal part of the impactor shall not make contact with the test piece during the impact.

Testing may start at the lowest drop height (see Tables 1 and 2) and increase up to the drop height required.

The drop height shall be set to an accuracy of ± 10 mm.

Inspect the test piece after each impact and note whether it complies with the requirements given in Clause 4.

If failure of an infill panel occurs, the test may be repeated with a replacement infill panel once.

In case of sloped or complex geometry curtain walling, the test method described in EN 12600 may be varied using chains, cables, straps etc. for the suspension of the impactor. The suspension system, however, may not inhibit the pendulum movement of the impactor.

If impact points are difficult to access (e.g. internal) in exceptional circumstances the angle between suspension cable and bracket may be less than 14°. A sufficient pendulum movement, however, shall be possible.

The impact resistance tests according to EN 14019 shall be performed before any other impact testing (e.g. hard body impactor).

7 Classification

The drop heights to be applied shall be selected from the performance levels given in Tables 1 and 2.

Table 1 — Internal impact classification

Test Class	Drop height (mm)
I0	Not tested
I1	200
I2	300
I3	450
I4	700
I5	950

Table 2 — External impact classification

Test Class	Associated drop height (mm)
E0	Not tested
E1	200
E2	300
E3	450
E4	700
E5	950

For Class 0 there is no requirement for specific resistance to impact loads and the drop height/load aspect criterion is not applicable.

For the classification the impact load position with the lowest result is relevant, taking into account the results of all impact load positions tested.

8 Test report

In the test report the test specimen(s) has/have to be fully described and all impact load positions tested shall be stated.

The test report shall include at least the following information:

— reference to EN 14019;

— date of report and testing;

— name of manufacturer/provider of the test specimen(s);

— information on sampling;

— description and representation of test specimen (including product type, brand name or other means of identification);

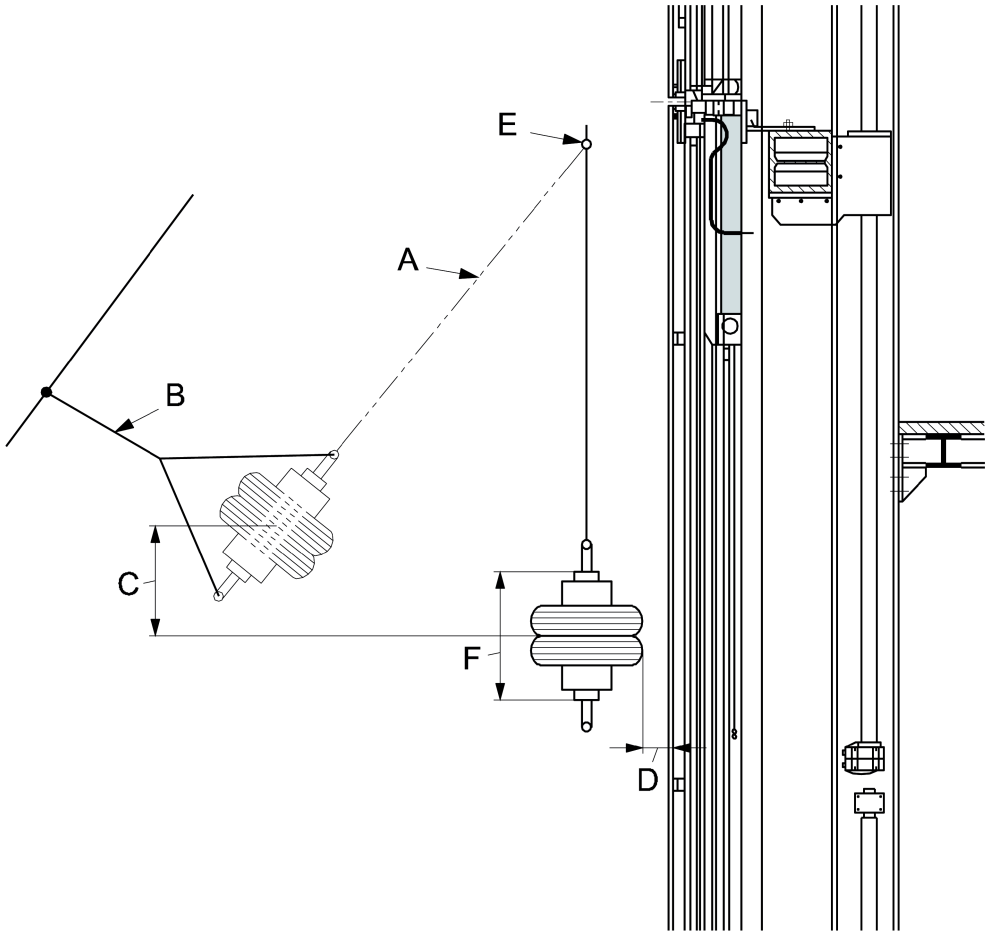
— dimensioned drawings of specimen(s)

— test result where applicable for both sides.

— name and address of testing laboratory, number of Notified Body, when relevant;

— signature of the head of the testing laboratory and stamp (when relevant).

Annex A
(informative)
Examples of test assembly and drop height



Key

A. Suspension cable

B. Traction cable

C. Drop height

D. Impactor distance from sample (EN 12600:2002, 5.1.1.5)

E. Suspension bracket

F. Impactor consisting of double tyres, metal core and fixings

Figure A.1 — Sketch showing the test assembly and drop height (“C”)

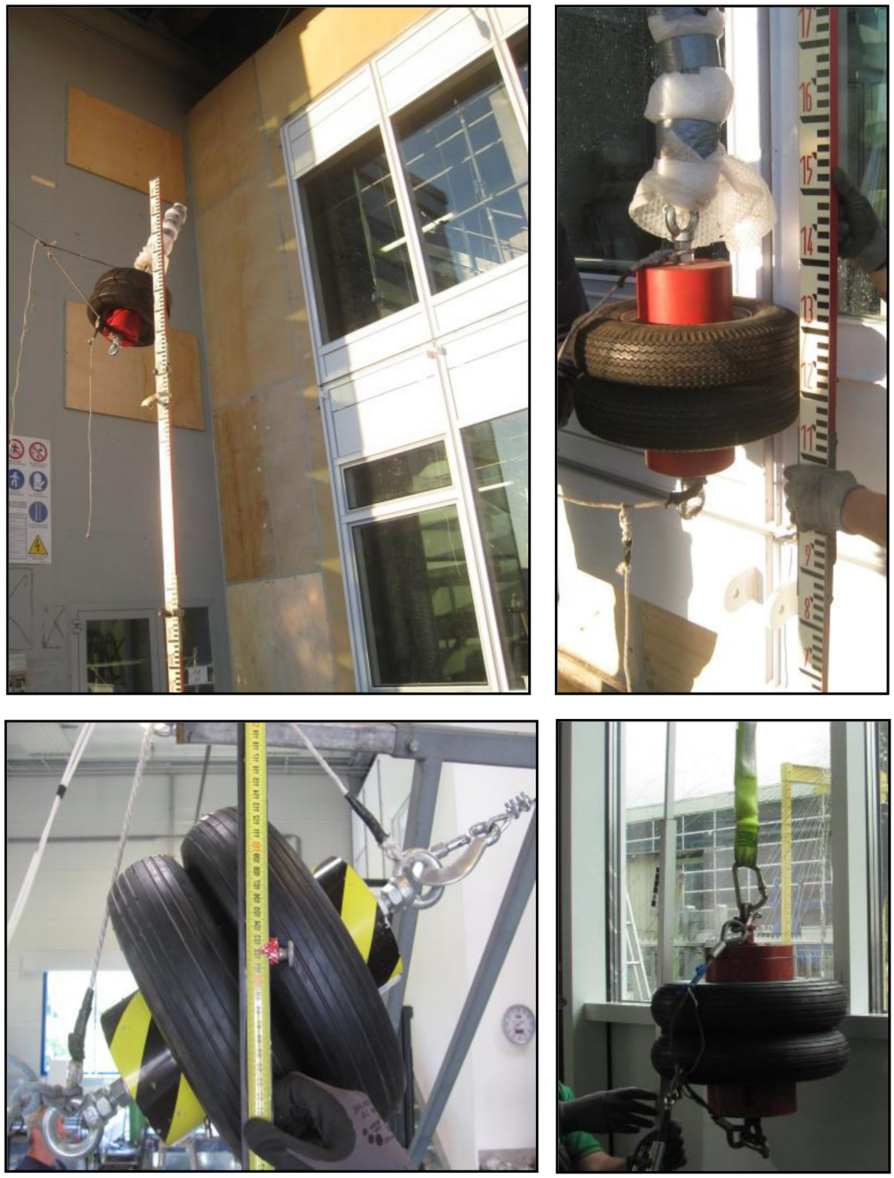


Figure A.2 — Example of test on a sample of curtain walling and relevant check of drop heights

Annex B
(informative)
Correlation between impact classes (drop height and energy) and exposure categories – Application guidelines

Table B.1 — Correlation between impact classes (drop height and energy) and exposure categories

Exposure categories	Descriptions	Class	Drop height [mm]	Energy [J]
A	Readily accessible to the public and others with little incentive to exercise care. Chance of accident occurring and of misuse.	5	950	466
B	Accessible primarily to the private with some incentive to exercise care. Some chance of accident occurring and of misuse.	4	700	343
C	Only accessible but not near a common route, to those with a high incentive to exercise care. Small chance of accident occurring and of misuse.	0	n/a	n/a
Areas more than 1,5 m above ground				
D	Above zone of normal impacts from people but liable to impacts from thrown or kicked objects. May also be subjected to impact during maintenance. *1,5 to 6 m above pedestrian level in location category A.*	4	700	343
E	Above zone of normal impacts from people and not liable to impacts from thrown or kicked objects. May also be subjected to impact during maintenance. *Wall surfaces at higher positions than those defined in category D.*	4	700	343

NOTE: For the conversion from drop height to energy the following formula is used:

$h = E / (9{,}81 \times m)$

Where

h is the height expressed in metres (m)

E is the energy expressed in Joule (J)

m is the mass expressed in kilogrammes (kg)

Bibliography

[1] EN 13830, *Curtain walling - Product standard*

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