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Furniture — Tests for surfaces —

Part 4 : Assessment of resistance to impact

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Ameublement — Essais des finitions de surface —

Partie 4 : Évaluation de la résistance au choc

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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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 4211-4 was prepared by Technical Committee ISO/TC 136, *Furniture*.

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Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

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Furniture — Tests for surfaces —

Part 4 :

Assessment of resistance to impact

1 Scope and field of application

This part of ISO 4211 specifies a method of assessment of resistance to impact of the surfaces of finished furniture.

The tests are generally carried out on panels of a size sufficient to meet the requirements of the test and of the same material as, and finished identically to, the finished furniture.

The method is suitable for use either as a means of comparing different finishing systems or as a quality control test to ensure that a specified performance level is being achieved or maintained.

NOTE — The nature of the substrate will have a major effect on the results obtained in the test.

2 References

ISO 3290, *Rolling bearings — Bearing parts — Balls for rolling bearings.*

ISO 6508, *Metallic materials — Hardness test — Rockwell test (scales A, B, C, D, E, F, G, H, K).*

3 Principle

A cylindrical steel weight is dropped from specified heights through a vertically-mounted guide onto a steel ball of specified diameter and hardness positioned on the test panel. The degree of damage to the test area is assessed by reference to a descriptive numerical rating code.

4 Apparatus and materials

4.1 Horizontal base which provides rigid support for the test panel. When the test area forms part of a piece of furniture, the complete item should stand on a rigid floor.

4.2 Vertically-mounted guide tube with an inside diameter of 40 ± 5 mm (A in figure 1). A $10 \pm 0,5$ mm thick disc with a centre hole of diameter $14^{+0}_{+0,05}$ mm for the ball (4.4) shall be attached to the bottom end of the guide tube.

4.3 Cylindrical steel weight (B in figure 1) with a mass of 500 ± 5 g and a diameter that is approximately 1 mm less than the inside diameter of the guide tube. This weight shall be made of softer alloy than the ball, so that it will not make indentations on the ball. Provision shall be made for the weight to be raised and lowered.

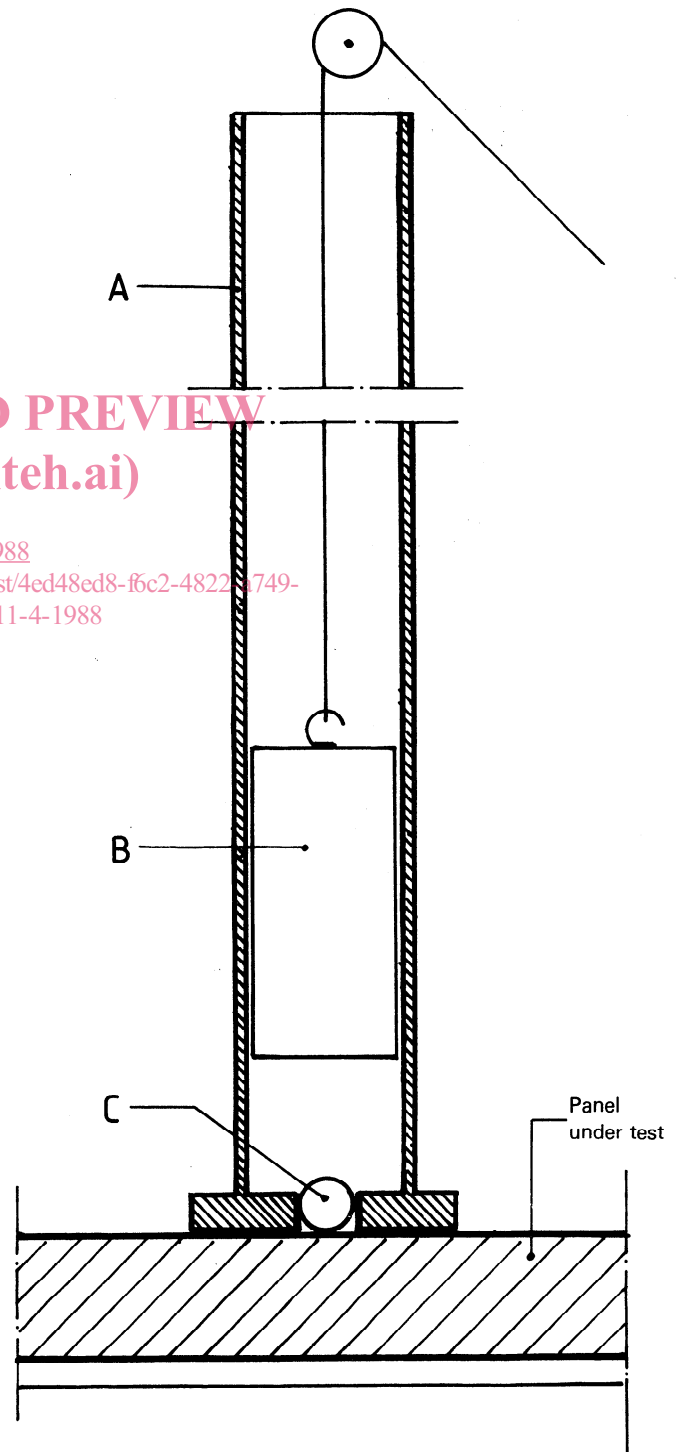


Figure 1 — Impact on surface

4.4 Steel ball (C in figure 1) with a diameter of 14 mm and Rockwell hardness of 60 to 66 HRC, a rolling bearing ball for example (see ISO 3290).

4.5 Magnifier, with a magnification of at least X7 fitted with a graticule scale which permits measurements to be taken to an accuracy of at least 0,1 mm.

5 Test panel

The test panel shall be substantially flat, preferably not less than 120 mm × 140 mm. It shall be prepared by the same procedure as adopted in making the commercial product. It shall be allowed to age at a temperature of not less than 15 °C with free access to air for a minimum of 28 days. Conditioning

should begin at least 7 days before testing and should be carried out in air at a temperature of 23 ± 2 °C and a relative humidity of (50 ± 5) %.

6 Procedure

6.1 General

No impact point shall be less than 20 mm from any edge of the test panel. The centres of impact points shall not be less than 20 mm apart. If the grid pattern method detailed in 6.2 is to be used, then six lines spaced at least 20 mm apart shall be marked out on the surface that is to be tested. If the surface material is anisotropic, the lines shall be perpendicular to the grain (or equivalent). Five impact points spaced at least 20 mm apart shall be marked off along each line (see figure 2).

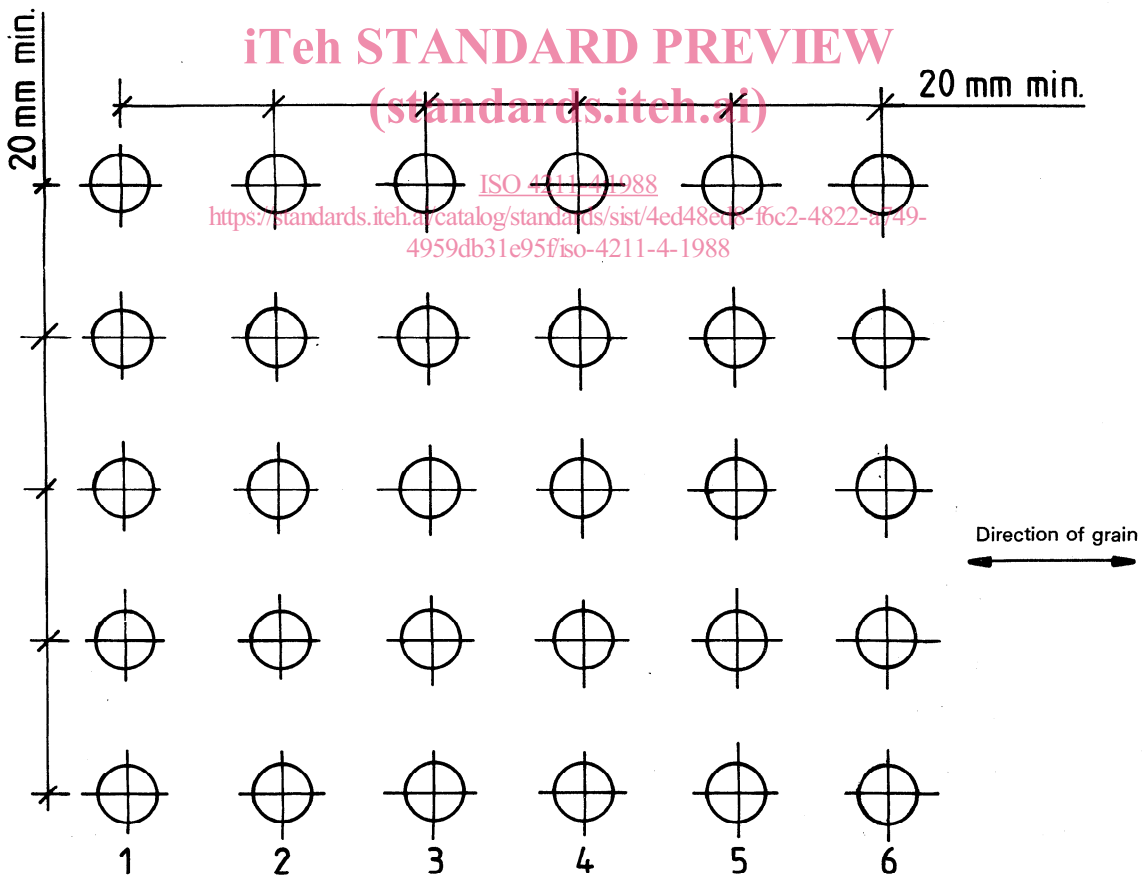


Figure 2 — Impact points on surface

The test panel shall be placed in a stable position on the horizontal base (4.1) in such a way that all impact points are inside the area covered by the base.

When the horizontal surfaces of finished furniture or parts of furniture are being tested, they shall be aged and conditioned as in clause 5, and the unit being tested shall be supported on a rigid floor. On finished furniture, the impact shall be on the most rigid part of the furniture.

The tests should be carried out at an ambient temperature of $23 \pm 2 \text{ }^\circ\text{C}$, and at a relative humidity of $(50 \pm 5) \%$.

6.2 Test

Make five tests from each of the following dropping heights : 10 mm; 25 mm; 50 mm; 100 mm; 200 mm and 400 mm. The dropping height, which shall be measured within $\pm 0,5 \text{ mm}$, is the distance from the top of the ball to the bottom surface of the weight.

Either make a random selection of test sites, making provision to identify the dropping height for each site adequately, or preferably use the grid pattern described in 6.1 making five tests on each numbered line with dropping heights as follows :

- on line 1 from a dropping height of 10 mm;
- on line 2 from a dropping height of 25 mm;
- on line 3 from a dropping height of 50 mm;
- on line 4 from a dropping height of 100 mm;
- on line 5 from a dropping height of 200 mm;
- on line 6 from a dropping height of 400 mm.

For each test, position the guide tube (4.2) on the test area with the ball (4.4) in direct contact with the surface. Drop the cylindrical weight (4.3) once from the specified height onto the ball.

NOTES

- 1 After each test, the ball should be examined for possible deformation and if necessary replaced by an undamaged ball.
- 2 After completion of the tests, the application of penetrating stain or other suitable material to the test area may assist with the identification of surface cracks.

6.3 Examination of test panel

Carefully examine the test area under magnification and good direct light using the following procedure.

Keeping the test area directly under the light, rock the panel or the light, so that the angle between the direction of the light and the plane of the panel varies between 0° and 30° . During the rocking movement, examine the test area using the magnifier (4.5).

Turn the test face of the panel through 90° and repeat the procedure.

7 Assessment of results

7.1 Rating

Rate the test areas according to the descriptive numerical rating code in the table (see also figure 3).

Table – Descriptive numerical rating code

Rating	Description
5	No visible changes (no damage).
4	No cracks in the surface but the impact mark is visible when light from the source is reflected from the surface at or very near the test point, and the reflected light strikes the observer's eye.
3	Slight cracking at the surface, usually one or two circular cracks within the impact mark. ¹⁾
2	Moderate to heavy cracking limited to the impact mark. ²⁾
1	Cracks which extend outside the impact mark and/or flaking of the surface finish.

1) The cracks need not form full circles; they can form circle arcs. These arcs usually form across the grain. In such cases, damage is estimated on the basis of the number of cracks or circle arcs inside the impact mark.

2) A certain amount of care should be taken when deciding whether cracks lie inside or outside the impact mark, since its boundaries are often obscure. See note 2 in 6.2.

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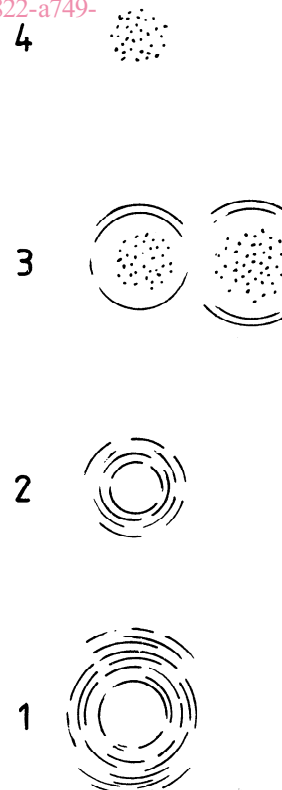


Figure 3 – Visible changes

Calculate the rating to be reported as the nearest whole number to the mean of 5 individual ratings, for example :

a) Individual ratings : 2, 2, 3, 3, 3

Reported rating : 3

b) Individual ratings : 2, 2, 2, 3, 3

Reported rating : 2

The average rating shall be calculated and reported for each dropping height used.

NOTE — It is recommended that each test area be rated by more than one observer experienced in this type of assessment.

7.2 Diameter of impact mark

Measure the largest diameter of the impact mark at each of the test areas using the magnifier (4.5). (See figure 4.)

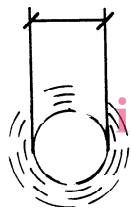


Figure 4 — Impact mark diameter

The average impact mark diameter for all five test areas shall be calculated and reported for each dropping height used.

NOTE — If the impact mark cannot be observed directly using the magnifier, the boundaries of the mark are ascertained when illuminated as set forth for rating 4 in the table, using the magnifier.

8 Test report

The test report shall include at least the following information :

- a) a reference to this part of ISO 4211;
- b) relevant data of the unit or panel tested (Wherever possible, the substrate and the finishing system should be identified.);
- c) the dropping height for each test area;
- d) the reported rating of each test according to 7.1;
- e) the reported rating of each test according to 7.2;
- f) the result of the test in terms of the stated requirements, if any;
- g) any deviations from this part of ISO 4211;
- h) the date of test.

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