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МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ

Cement-bonded particleboards — Boards of Portland or equivalent cement reinforced with fibrous wood particles

*Panneaux de particules à liant ciment — Panneaux en ciment Portland ou équivalent renforcé par
des particules fibreuses de bois*

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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.

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 8335 was prepared by Technical Committee ISO/TC 77, *Products in fibre reinforced cement*.

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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Cement-bonded particleboards — Boards of Portland or equivalent cement reinforced with fibrous wood particles

1 Scope and field of application

This International Standard specifies the characteristics of compressed cement-bonded particleboards and establishes the test methods for determination and control of the specified values.

These products are suitable for all internal applications, such as partitions, ceilings, etc.

For boards intended for applications exposed to the weather or moisture, special requirements apply (see 5.3).

2 References

ISO 390, *Asbestos-cement products — Sampling and inspection*.

ISO 1006, *Building construction — Modular coordination — Basic module*.

3 General composition

Cement-bonded particleboards consist essentially of a mixture of fibrous wood particles and Portland cement¹⁾, or other cements with equivalent properties, to which other fibres, fillers and pigments may be added.

Care should however be taken to exclude materials which have a deleterious effect on the product or its fastening (e.g. corrosion).

The fibrous wood particles are chips or shavings with typical sizes up to 15 mm in length, 3 mm in width and 0,3 mm in thickness, and used in amounts up to 30 % by dry weight.

This International Standard does not cover products made wholly or partly with magnesite binder.

4 General appearance and finish

The board shall have a dense structure with a smooth, flat surface on both sides.

5 Characteristics

5.1 Geometrical characteristics

5.1.1 Dimensions²⁾

The preferred standard range of sizes is as follows :

- a) length, l : 2 400 to 3 600 mm
- b) width, b : 900 to 1 250 mm
- c) thickness, e : $6 \text{ mm} \leq e \leq 40 \text{ mm}$

5.1.2 Tolerances on dimensions

Tolerances on dimensions are as follows :

- a) on length and width : $\pm 5 \text{ mm}$
(the measurement method is given in 6.2.2)
- b) on thickness :
 - $6 \text{ mm} \leq e \leq 12 \text{ mm}$: $\pm 1,0 \text{ mm}$
 - $12 \text{ mm} < e \leq 20 \text{ mm}$: $\pm 1,5 \text{ mm}$
 - $20 \text{ mm} < e$: $\pm 2,0 \text{ mm}$for sanded products : $\pm 0,3 \text{ mm}$
(the measurement method is given in 6.2.3)

5.1.3 Tolerances on shape

5.1.3.1 Straightness of edges

The tolerance on the straightness of edges is 1 mm/m for length and width. The measurement method is given in 6.2.4.

5.1.3.2 Squareness of edges

The tolerance on the squareness of edges is a maximum of 2 mm/m. The measurement method is given in 6.2.5.

1) As defined by national standards.

2) Other dimensions may be supplied by agreement between the purchaser and the manufacturer.

5.1.4 Dimensional stability

Dimensional variations due to changes of the moisture content of the boards shall be indicated in the manufacturer's literature. Measurements shall be made according to national standards.

5.2 Mechanical characteristics

5.2.1 Bending strength

The bending strength as determined by the measurement method in 6.4.2 shall be at least 9 N/mm². For boards intended for use under wet conditions, the bending strength determined after 24 h immersion in water shall be at least 5,5 N/mm² (type test).

5.2.2 Modulus of elasticity

The value as determined by the measurement method in 6.4.2 shall be at least 3 000 N/mm².

5.2.3 Static point loading

If appropriate to the intended use, the structure containing the product shall be subject to static point load testing and comply with test methods and values which may be specified in the country of use.

5.2.4 Screw-holding power

If required, the screw-holding power shall be determined by the method specified in annex C.

5.3 Physical characteristics

Where the unprotected board is intended for applications exposed to the weather or moisture (but not roofing), it shall comply with the requirements of the appropriate type tests included in this International Standard. For roofing applications, the products need to be suitably protected.

5.3.1 Density

When tested in accordance with 6.3.2, the boards shall have a density of at least 1 000 kg/m³ at a moisture content of 9 % by weight.

5.3.2 Moisture content

On despatch from the manufacturer's premises, the moisture content shall be within 6 % to 12 % measured according to 6.3.3.

5.3.3 Thickness swelling

When tested in accordance with 6.3.4, the boards shall not swell by more than 2 %.

5.3.4 Dimensional variations

The dimensional variations due to changes in the moisture content of the boards shall be indicated in the manufacturer's literature. Measurements shall be made according to national standards.

5.3.5 Frost resistance (type test)

This requirement shall only apply in cases when the conditions of use or national standards justify it. Boards tested according to the method in 6.3.5 shall not show visible cracking or surface alteration. This specification does not apply to surface coatings.

5.3.6 Fire resistance (type test)

Due to the composition and dense structure, the boards possess fire resistance characteristics which shall be tested if required according to relevant standards or national regulations.

5.3.7 Impact resistance

If appropriate to the intended use, the product or the structure containing the product shall be subject to impact testing and comply with test methods and values which may be specified in the country of use.

6 Test method

6.1 General test conditions

Test specimens shall have the moisture content specified in 5.3.2. Should the moisture content be outside this range, the samples should be equilibrated to constant mass at a temperature of 23 ± 5 °C and a relative humidity of (60 ± 10) %. Constant mass is achieved when two successive weighings, carried out at an interval of 24 h, do not differ by more than 0,5 %.

6.2 Geometrical controls

6.2.1 Equipment

6.2.1.1 Smooth, flat and rigid inspection surface, large enough to take the sheet. Two metal rules may be fixed at right angles along the edges of the inspection surface. The straightness of each metal rule shall be at least 0,3 mm/m and the right angle shall be accurate to at least 0,1 % (less than 1 mm deviation from normal per metre of length) or 0,001 rad.

Alternatively, a portable square may be used. The same requirements for straightness and angularity apply.

6.2.1.2 Metal rulers of a suitable length, capable of being read to 0,5 mm.

6.2.1.3 Micrometer, reading at least to 0,05 mm with flat and circular metal jaws of at least 10 mm in diameter.

6.2.2 Measurement of width and length

Smooth any rough areas. Measure to the nearest 0,5 mm, using a metal rule, the length and width at three places avoiding taking the measurement over a local deformation which could be considered as a visual defect.

Compare the values obtained with the specifications in 5.1.2.

6.2.3 Measurement of thickness

Measure to the nearest 0,5 mm, using a micrometer (6.2.1.3), the thickness at three places over the width of the board (see figure 1).

Compare the maximum difference in thickness with the tolerances given in 5.1.3.2.

6.2.4 Measurement of straightness of edges

In succession, apply each side of the sheet to the relevant arm of the square.

Measure to the nearest 0,5 mm, by means of a steel rule, the maximum gap between the edge of the sheet and the arm of the square. Compare the values obtained with the specification given in 5.1.3.1.

6.2.5 Measurement of out-of-squareness of sheet

Place each of the four corners of the sheet in succession between the arms of the square, keeping the large side against the large arm and the small side in contact with the small arm.

In this position, measure the distance of the apex of the corner from the small arm of the square. Compare this value with the tolerance given in 5.1.3.2.

6.3 Physical tests

The physical characteristics of a board shall be determined as the average result of five test specimens of that board.

6.3.1 Test specimens

Five test specimens shall be cut to be representative of the board.

The specimens for the compulsory physical test shall be square, with sides measuring 100 mm, weighed to an accuracy of 0,1 g.

The thickness of each specimen shall be measured at four different points, shown by the circles in figure 2 to the nearest 0,05 mm. The arithmetic mean of the four readings shall be taken as the thickness of the test specimen.

The dimensions of the sides, parallel to the edges, shall be measured to the nearest 0,1 mm. The mean of each of the two pairs of parallel measurements shall be taken as the length and width of the test specimen.

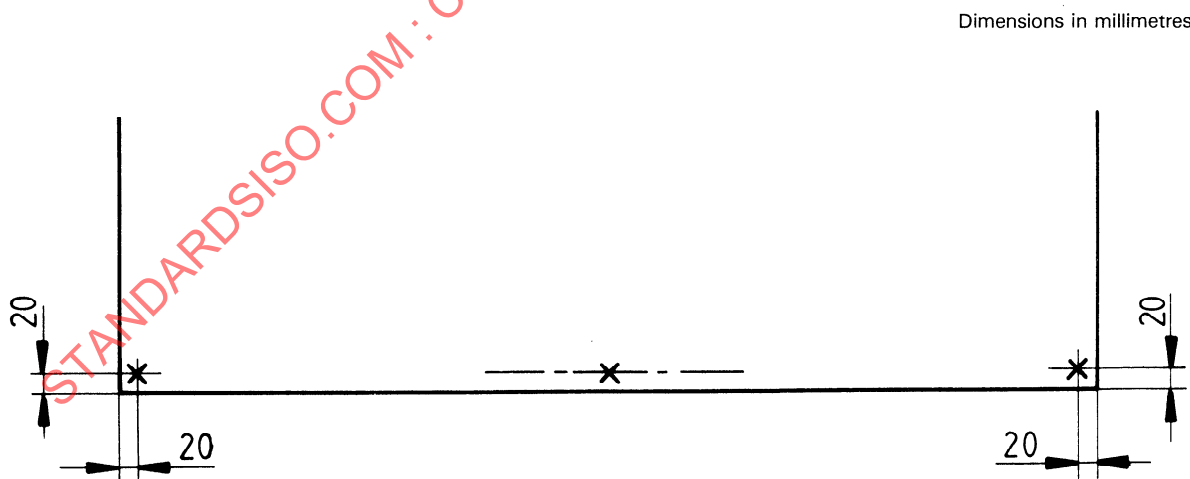


Figure 1 — Thickness measurement points

Dimensions in millimetres

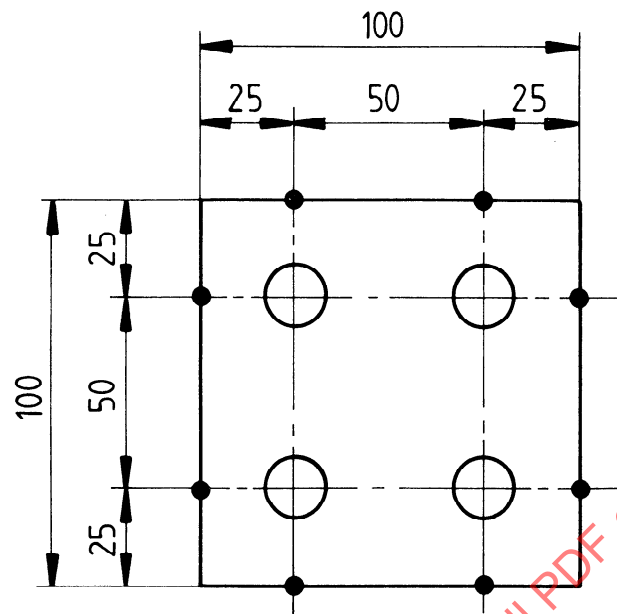


Figure 2 — Specimen dimensions for physical tests

6.3.2 Determination of apparent density

The apparent density, ρ , is calculated by the formula

$$\rho = \frac{m}{V}$$

where

m is the mass of the test piece, in grams;

V is the volume of the test piece, in cubic centimetres.

Determine the volume by calculation from the values of the measurements in 6.3.1, to the nearest 0,1 cm³.

Compare each value obtained with the requirements of 5.3.1.

6.3.3 Determination of moisture content

Determine the constant mass of each test piece cut in accordance with 6.3.1 by drying in an oven at 100 to 105 °C, until the difference between two consecutive weighings after an interval of 6 h is not more than 0,1 %.

After cooling in a dry atmosphere, weigh the sample with the same accuracy as before and rapidly enough to avoid an increase of moisture content of greater than 0,1 %.

Calculate the moisture content, H , as a percentage of each piece, to the nearest 0,1 % using the formula

$$H = \frac{m_0 - m_1}{m_1} \times 100$$

where

m_0 is the mass of the test piece at the time of sampling, in grams;

m_1 is the mass of the dried test piece, in grams.

The moisture content of a board shall be taken as the arithmetical mean of the moisture contents of all the relevant test pieces and shall be stated to the nearest 0,1 %.

Compare each value obtained with the requirements of 5.3.2.

6.3.4 Determination of swelling in water

Measure the thickness of the test piece as described in 6.3.1.

Determine the thickness swelling by immersing each test specimen in clean water at ambient temperature. The specimens shall be placed vertically and be separated by at least 10 mm from each other and from the bottom and sides of the container. Cover them to an approximate depth of 25 mm of water.

After 24 h, withdraw each specimen from the water and allow them to stand under normal room conditions for 2 h with the bottom edges on a non-absorbent surface. Then remeasure the thickness of each specimen at the same points as indicated in 6.3.1 and calculate the swelling value of the board after 24 h immersion in water, S_{24} , in grams to the nearest 0,1 %, as follows :

$$S_{24} = \frac{e_2 - e_1}{e_1} \times 100$$

where

e_1 is the mean thickness before water immersion;

e_2 is the mean thickness after water immersion.

Compare the values obtained with the specification of 5.3.3.

6.3.5 Frost resistance (optional test)

Test pieces shall be immersed in water at ambient temperature for 48 h. They shall then be submitted to alternate cycles of freezing and thawing between temperatures of $-20\text{ }^{\circ}\text{C}$ and $+20\text{ }^{\circ}\text{C}$.

The number and duration of the cycles shall be specified by the national standards.

Check for visible cracking and surface alteration.

6.4 Mechanical tests

6.4.1 Test specimens

The test pieces shall be cut from the same part of the board, as shown in figure 3. Five test pieces shall be taken in each direction.

The width of each test specimen shall be 100 mm and the length $16e + 25$ mm (to the nearest 25 mm), where e is the nominal thickness of the board in millimetres (see figure 3).

The width of each test specimen shall be measured as specified in 6.3.1 to the nearest 1 mm. The thickness shall be measured as specified in 6.3.1 approximately 20 mm inside the midpoints of the two long edges, to an accuracy of $\pm 0,05$ mm. The mean of the two readings shall be calculated.

NOTES

- 1 Test specimens used to determine modulus of elasticity may also be used to determine bending strength.
- 2 If it is not possible to take five specimens out of one length of the sheet, the fifth specimen can be taken as shown by the dotted line.

6.4.2 Test procedure

6.4.2.1 Equipment

Each test specimen shall be supported on parallel metal rollers having a radius of 10 to 30 mm and free to rotate in ball or roller bearings. The centre-to-centre distance between the rollers shall be $16e$ to the nearest 25 mm. The span shall be measured to the nearest 1 mm. A load perpendicular to the face of the test piece shall then be applied at the centre of the span, by means of a metal bar of a radius of 10 to 30 mm, parallel to the supporting rollers and in contact with the test specimen over its whole width. (See figure 4.)

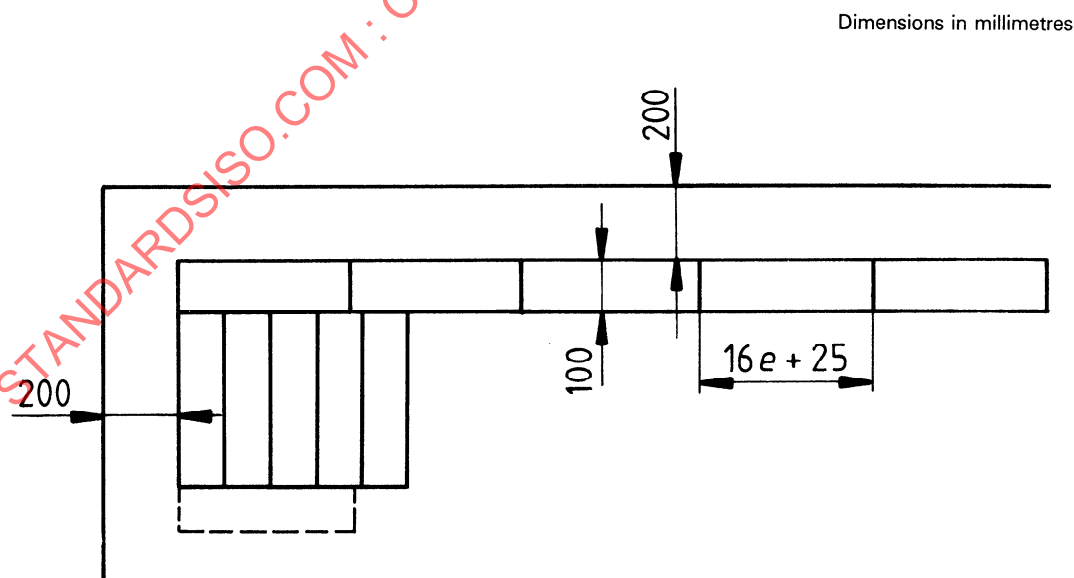


Figure 3 — Sampling and dimensions of test specimens for mechanical tests

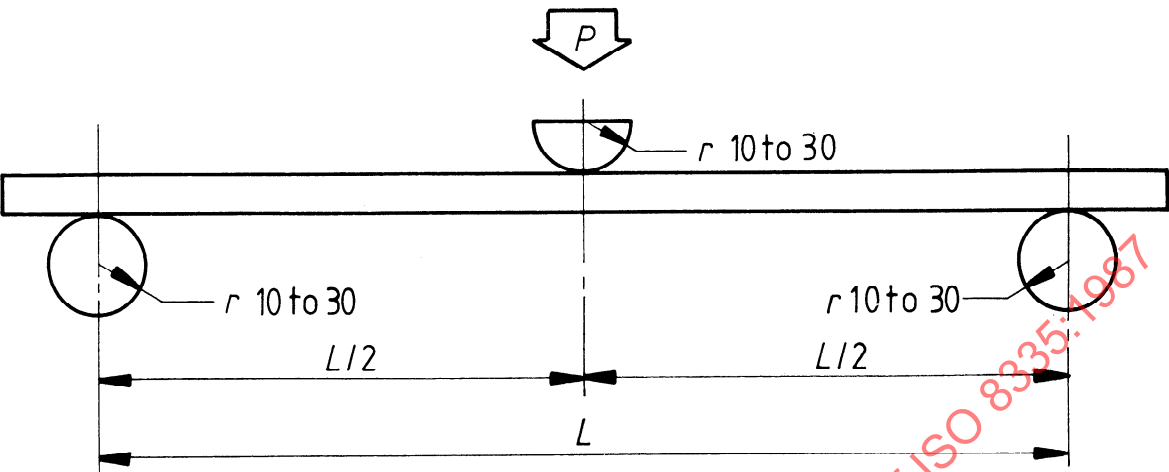


Figure 4 — Test apparatus to determine modulus of elasticity and bending strength

6.4.2.2 Determination of modulus of elasticity

The test shall be carried out so as to obtain a load/deflection curve with at least eight corresponding values of load and deflection within a range up to one third of the breaking load of the board under test. (See figure 5.)

The deflection at the midpoint of the test piece shall be measured with a suitable measuring instrument to the nearest 0,01 mm. Alternatively automatic load/deflection testing equipment may be used.

Load values shall be recorded to the nearest 1 %.

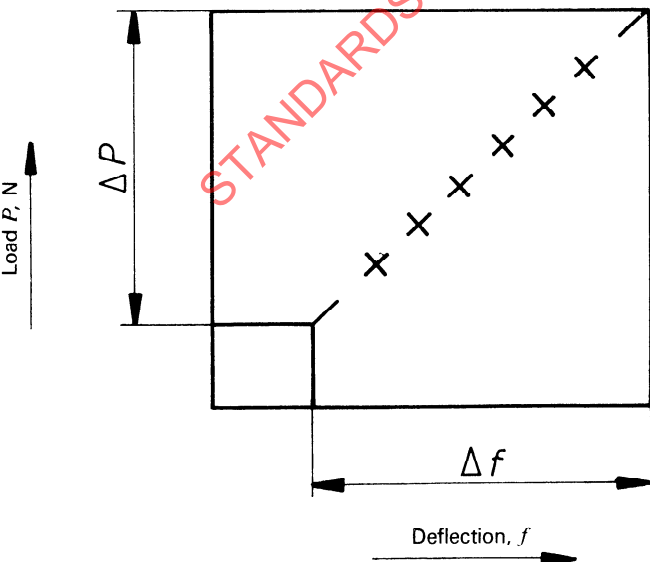


Figure 5 — Load/deflection curve for determination of modulus of elasticity

6.4.2.3 Determination of bending strength

The load shall be applied at a constant rate so that rupture occurs in a minimum of 30 s and a maximum of 120 s.

Measure the thickness at two points near the break-line as indicated in figure 6.

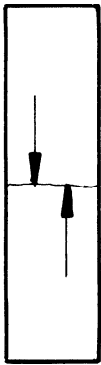


Figure 6 — Break-line

To determine the bending strength under wet conditions (see 5.2.1), the specimen shall be tested after 24 h immersion. The test is usually carried out on conditioned specimens as indicated in 6.1.

6.4.3 Expression of results

6.4.3.1 Modulus of elasticity

The apparent modulus of elasticity, E , expressed in newtons per square millimetre for each test specimen is calculated as follows :

$$E = \frac{L^3 \Delta P}{4 b e^3 \Delta f}$$

where

L is the span between centres of supports, in millimetres;

ΔP is the increment in load, in newtons, on the straight line portion of the load/deflection curve;

b is the width of test specimen, in millimetres;

e is the arithmetical average thickness of the test specimen according to 6.4.1, in millimetres;

Δf is the increment in deflection, in millimetres, corresponding to ΔP .

Express the results separately for each test and calculate the arithmetical mean of all results and compare with the values as specified in 5.2.2.

6.4.3.2 Bending strength

The bending strength R_f is given, in newtons per square millimetre, by the formula

$$R_f = \frac{3 PL}{2 b e^2}$$

where

P is the breaking load, in newtons;

L is the distance between supports, in millimetres;

b is the width of the test piece, in millimetres;

e is the average thickness of the test piece according to 6.4.1, in millimetres.

Express the results separately for each test and calculate the arithmetical mean of all results and compare with the values as specified in 5.2.1.

7 Marking

Marking shall comply with national standards of the producing country and shall ensure that a precise identification of the product can be made.

The method of marking shall be stated in the manufacturer's catalogue.

8 Conformity with standards

There are two main methods for establishing conformity with standards; they are described in annexes A and B.

Annex A

Receiving inspection¹⁾ for products which are not subject to third-party certification

(This annex forms an integral part of the Standard.)

A.1 When tenders and/or orders do not specify receiving inspection, the lot(s) delivered is (are) presumed to be in conformity with the relevant standard (valid in the manufacturer's country).

A.2 When tenders and/or orders specify it, the receiving inspection is carried out on a lot(s) of the consignment according to the test programme of the product standard, unless there is a special agreement. Therefore the testing programme necessarily covers the compulsory tests and, if specified by one of these documents, all or some of the optional tests.

Details related to the application of the sampling clauses shall be established in agreement between the manufacturer and purchaser. Failing such an agreement the maximum and minimum inspection lots should be 3 000 and 400 pieces respectively for all dimensions.

A.3 After agreement on the sampling procedure, sampling should be carried out in the presence of both parties from the

lot(s) which are to be delivered to the purchaser. If the inspection lot(s) are not yet formed, the manufacturer should present to the purchaser the stock(s) from which the inspection lot(s) can be selected and marked.

A.4 The tests shall normally be carried out by an independent laboratory and the samples addressed to the laboratory selected by mutual agreement between the manufacturer and purchaser. The laboratory of the manufacturer can be used. In case of dispute, the tests shall be carried out in the presence of both parties.

A.5 When non-destructive tests are carried out and the results of the sampling inspection do not comply with the acceptance requirements of the product standard, the tests can be required on each item of the consignment. The units of the consignment when tested one by one which do not meet the requirements can be refused and disposed of, unless otherwise agreed between manufacturer and purchaser.

Annex B

Third-party certification

(This annex forms an integral part of the Standard.)

B.1 When a third-party certification system is operated on a continuous basis, no further evidence of conformity to the standards is in principle necessary.

B.2 Together with the general rules of a third-party certification system, there may exist specific rules.

¹⁾ See ISO 390.