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Steel and steel products — Location and preparation of samples and test pieces for mechanical testing

Acier et produits en acier — Position et préparation des échantillons et éprouvettes pour essais mécaniques

[Revision of second edition (ISO 377:1997) and ISO 377:1997/Cor.1:1997]

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ISO/CEN PARALLEL PROCESSING

This draft has been developed within the International Organization for Standardization (ISO), and processed under the **ISO-lead** mode of collaboration as defined in the Vienna Agreement.

This draft is hereby submitted to the ISO member bodies and to the CEN member bodies for a parallel five-month enquiry.

Should this draft be accepted, a final draft, established on the basis of comments received, will be submitted to a parallel two-month approval vote in ISO and formal vote in CEN.

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Foreword

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ISO 377 was prepared by Technical Committee ISO/TC 17, Steel, Subcommittee SC 20, *General technical delivery conditions, sampling and mechanical testing methods*.

This third edition cancels and replaces the second edition (ISO 377:1997), which has been technically revised.

D R A F T

STANDARD PREVIEW
(standard.iteh.ai)
Full standard/catalog/standards/siv/2015-02-25-9213-4226-9399-abfed1516e9/iso-377-2015

Steel and steel products — Location and preparation of samples and test pieces for mechanical testing

1 Scope

This International Standard specifies requirements for the identification, location and preparation of samples and test pieces intended for mechanical tests on steel sections, bars, rod, flat products and tubular products as defined in ISO 6929. If agreed in the order this standard may also apply to other metallic products. These samples and test pieces are for use in tests which are carried out in conformity with the methods specified in the product or material standard or, in the absence of this, in the test standard.

Where the requirements of the order or product standard differ from those given in this International Standard, then the requirements of the order or product standard apply.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the editions cited applies. For undated references, the latest edition of the referenced document, (including any amendments) apply.

ISO 3785, *Metallic materials — Designation of test specimen axes in relation to product texture*

ISO 6929, *Steel products — Definitions and classification*

3 Definitions

For the purposes of this International Standard, the definitions given in ISO 6929 and the following apply.

3.1 test unit

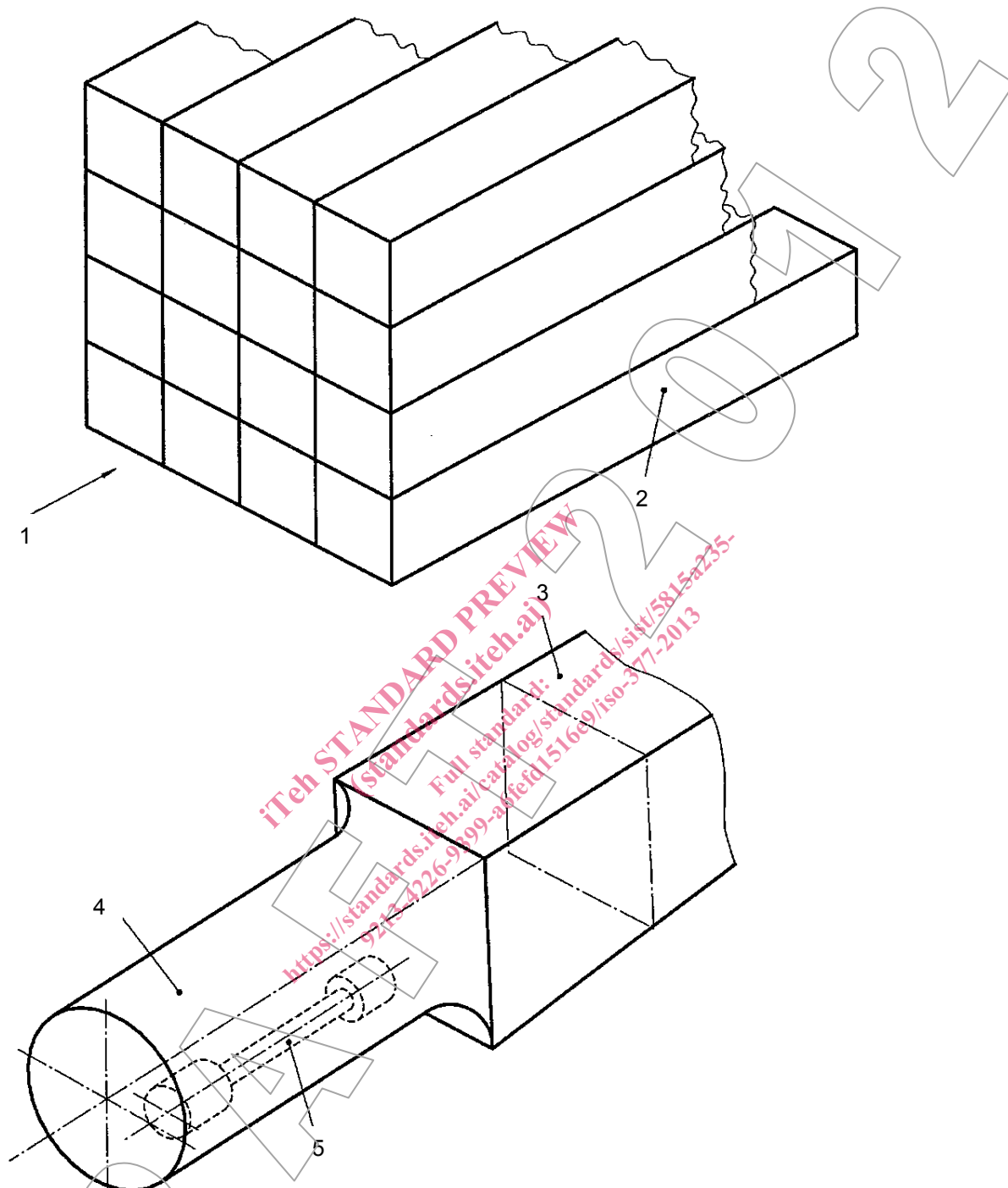
number of pieces or the tonnage of products to be accepted or rejected together, on the basis of the tests to be carried out on sample products in accordance with the requirements of the product standard or order

See Figure 1.

3.2 sample product

item (e.g. bar, sheet, coil) selected for inspection and/or testing

See Figure 1.



Key

- 1 test unit (3.1)
- 2 sample product (3.2)
- 3 sample (3.3)
- 4 rough specimen (3.4)
- 5 test piece (3.5)

Figure 1 — Examples of terms defined in Clause 3

3.3**sample**

sufficient quantity of material taken from the sample product for the purpose of producing one or more test pieces

See Figure 1.

NOTE In certain cases, the sample may be the sample product.

3.4**rough specimen**

part of a sample having undergone mechanical treatment, for the purpose of producing a test piece

See Figure 1.

3.5**test piece**

part of a sample or rough specimen, with specified dimensions, machined or unmachined, brought to a required condition for submission to a given test

See Figure 1.

NOTE In certain cases, the test piece may be the sample or the rough specimen.

3.6**reference condition**

condition of a sample, rough specimen or test piece having undergone a heat treatment to represent the intended final condition of the product

NOTE In such cases the sample, rough specimen or test piece is called the reference sample, reference rough specimen or reference test piece.

4 General requirements**4.1 Representative testing**

Sample, rough specimens and test pieces selected in accordance with Annex A, shall be considered to be representative of the product.

NOTE As a result of their production sequence i.e. melting, casting hot and/or cold forming, heat treatment etc., steel products are not homogeneous. The mechanical properties of samples taken from other locations can be different.

4.2 Identification of sample products, samples, rough specimens and test pieces

Sample products, samples, rough specimens and test pieces shall be marked to ensure traceability to the original product and their location and orientation in that product. For this purpose, if, during the preparation of the sample, rough specimen and/or test pieces, removal of the marks cannot be avoided, transfer of these marks shall be carried out before the existing marks are removed or in the case of automatic preparation equipment before the test piece is removed from the equipment. In the case of specific inspection and where requested by the purchaser, the transfer of the marks shall be carried out in the presence of the purchaser's representative.

In the case of fully automatic in line preparation and testing systems, marking of samples, rough specimens and test pieces is not necessary if an adequate control system exists, which defines the procedures to be followed in the event of system failure.

5 Preparation of samples and selection of test pieces

5.1 Selection and dimensions of samples and location of test pieces

The sample shall be selected so that the test piece can be located as indicated in Annex A. The sample shall have sufficient dimensions to allow sufficient test pieces required for carrying out specified tests, and for any retests which are necessary.

5.2 Direction of axis of test pieces

The direction of the test piece axis relative to the principle direction of working shall be as specified in the appropriate product standard or order. The designation of the test piece axis shall be in accordance with ISO 3785.

5.3 Condition and separation of samples

5.3.1 General

The material or product standard shall specify whether the test is intended to determine the properties:

- a) in the as-delivered condition (see 5.3.2) or
- b) in the reference condition (see 5.3.3).

5.3.2 Testing in the as-delivered condition

A sample intended for testing in the as-delivered condition shall be separated from the product either

- a) after the forming and/or heat treatment processes have been completed or
- b) before the heat treatment process, in which case the heat treatment of the separated sample shall be carried out under the same conditions as that of the product.

Separation of the sample shall be carried out in such a manner so as not to change the characteristics of that part of the sample used to provide the test pieces.

If flattening or straightening of the sample is unavoidable in the preparation of the test piece, it shall be carried out cold unless otherwise specified in the product standard.

5.3.3 Testing in the reference condition

5.3.3.1 Sample

A sample intended for testing in the reference condition shall be separated from the product at the stage of manufacture specified in the product standard or order.

Separation of the sample shall be carried out in such a manner so as not to change the characteristics of that part of the sample used to provide the test pieces after heat treatment.

If flattening or straightening is necessary it may be carried out either hot or cold before any heat treatment. When carried out hot it shall be at a temperature below the final heat treatment temperature.

5.3.3.2 Rough specimen

A rough specimen intended for testing in the reference condition shall be prepared as follows:

- a) Mechanical treatment prior to heat treatment: when the sample is to be made smaller for the process of heat treatment, the product standard shall specify the dimensions to which the rough specimen shall be reduced and the reduction process e.g. forging, rolling, machining;
- b) Heat treatment: the heat treatment of the rough specimen shall take place in an environment where the uniformity of the temperature is adequately assured and the temperature is measured by means of a calibrated instrument. The heat treatment shall be in accordance with the requirements of the product standard or of the order.

6 Preparation of test pieces

6.1 Cutting and machining

Cutting and machining of samples and rough specimens for the preparation of test pieces shall be carried out taking such precautions as necessary to avoid superficial work hardening and heating of the material likely to change the mechanical characteristics. After machining, any marks left by the tool which might interfere with the results of the test shall be removed, either by grinding (with ample coolant supply) or by polishing, provided that the chosen method of finishing maintains the dimensions and shape of the test piece within the tolerances specified in the standard for the appropriate test.

The tolerances on the dimensions of the test pieces shall be those specified in the appropriate test methods.

6.2 Reference heat treatment

When the required reference heat treatment is to be carried out on the test piece the provisions for heat treatment shall be the same as for the rough specimen [see 5.3.3.2 b)].

Annex A (normative)

Location of samples and test pieces

A.1 General

This annex applies to the location of test pieces for the following product forms:

- sections;
- bars and rod;
- flat products;
- tubular products.

The location of test pieces for tensile and impact tests are indicated in Figures A.1 to A.15. For bend tests the width position is as for the tensile test pieces.

When more than one test piece is required they may be placed adjacent to each other in the location specified.

A.2 Sections

A.2.1 Location of test pieces across the width of section

The location of test pieces shall be in accordance with Figure A.1.

NOTE 1 For sections with tapered flanges; if agreed at the time of enquiry and ordering the sample may be taken from the web [see Figure A.1 b) and d)] or the sample from the tapered flange may be machined.

NOTE 2 For products with non tapered flanges greater than 150 mm, tensile samples are to be taken from the flange. For other products, if specified in national standards, the sample may be taken from the web.

NOTE 3 For unequal leg angles, samples may be taken from either leg.

A.2.2 Location of test pieces in thickness of section

A.2.2.1 Tensile test pieces

The location of tensile test pieces shall be in accordance with Figure A.2. The location of the test piece shall be under the outside surface of the flange unless otherwise specified in national standards. Full thickness test pieces [see Figure A.2 a)] shall be used whenever machining and test equipment allows.

A.2.2.2 Impact test pieces

The location of impact test pieces shall be in accordance with Figure A.3. The location of the test piece shall be under the outside surface of the flange unless otherwise specified in national standards.