
**Destructive tests on welds in metallic
materials — Bend tests**

*Essais destructifs des soudures sur matériaux métalliques — Essais de
pliage*

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ISO 5173:2000

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 5173 was prepared by Technical Committee ISO/TC 44, *Welding and allied processes*, Subcommittee SC 5, *Testing and inspection of welds*.

This second edition cancels and replaces the first edition (ISO 5173:1981), which has been technically revised.

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Destructive tests on welds in metallic materials — Bend tests

1 Scope

This International Standard specifies a method for making transverse root, face and side bend tests on test specimens taken from butt welds, butt welds with cladding (subdivided into welds in clad plates and clad welds) and cladding without butt welds in order to assess ductility and/or absence of imperfections on or near to the surface of the joint. It also gives the dimensions of the test specimen.

In addition this International Standard specifies a method for making longitudinal root and face bend tests to be used instead of transverse bend tests for heterogeneous assemblies when base materials and/or filler metal have a significant difference in their physical and mechanical properties in relation to bending.

This International Standard applies to metallic materials in all forms of product with welded joints made by any fusion arc welding process. Side bend tests may be carried out when the wall thickness is greater than 12 mm.

2 Terms and definitions

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

2.1

face bend test specimen for a butt weld, FBB <http://standards.iteh.ai/catalog/standards/sist/67d7a564-ad74-4389-9006-5173-2000>
specimen for which the surface in tension is the side which contains the greater width of the weld or the side from which the welding arc was first applied, applicable to both transverse and longitudinal butt weld specimens

See Figures 1 and 3.

2.2

root bend test specimen for a butt weld, RBB
specimen for which the surface in tension is the side opposite to that of the face butt weld bend test specimen, applicable to both transverse and longitudinal butt weld specimens

See Figures 1 and 3.

2.3

transverse side bend test specimen for a butt weld, SBB
specimen for which the surface in tension is a cross-section of the weld

See Figure 2.

2.4

face bend test specimen for cladding without a butt weld, FBC
specimen for which the cladding is in tension, applicable to both transverse and longitudinal specimens

See Figure 4.

2.5

side bend test specimen for cladding without a butt weld, SBC

specimen for which the cross-section of the cladding overlay is in tension, applicable to both transverse and longitudinal specimens

See Figure 5.

2.6

face or side bend test specimen for cladding with a butt weld, FBCB or SBCB

specimen for which the cladding is in tension or for which the cross-section of the cladding overlay is in tension and which contains a butt weld

See Figures 6 and 7.

3 Principle

Submitting a test specimen, taken transversely or longitudinally from a welded joint, to plastic deformation by bending it, without reversing the bending direction, in such a way that one of the surfaces or cross-sections of the welded joint is in tension.

Unless otherwise specified, the test shall be carried out at ambient temperature (23 ± 5) °C.

The test shall be made in accordance with one of the methods described in clause 6.

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4 Symbols and abbreviations

4.1 Symbols

See Table 1 and Figures 1 to 17.

Table 1 — Symbols and designations

Symbol	Designation	Unit
b	Width of the test specimen	mm
b_1	Width of outside fusion line	mm
d	Diameter of the former	mm
D	Outside diameter of the pipe ^a	mm
l	Distance between the rollers	mm
L_t	Initial distance between contact of the roller and the centre line of the weld	mm
L_0	Original gauge length	mm
L_s	Maximum width of the weld after machining	mm
L_t	Total length of the test specimen	mm
r	Radius of the test specimen edges	mm
R	Radius of the rollers	mm
t	Thickness of the test piece	mm
t_c	Thickness of the cladding	mm
t_s	Thickness of the test specimen	mm
t_w	Thickness of the welded joint or base material under cladding	mm
α	Bending angle	°

^a The term "pipe", alone or in combination, is used to mean "pipe", "tube" or "hollow section (without rectangular cross section)".

4.2 Abbreviations

FBB	Face bend test specimen for a butt weld
RBB	Root bend test specimen for a butt weld
SBB	Transverse side bend test specimen for a butt weld
FBC	Face bend test specimen for cladding without a butt weld
SBC	Side bend test specimen for cladding without a butt weld
FBCB	Face bend test specimen for cladding with a butt weld
SBCB	Side bend test specimen for cladding with a butt weld

4.3 Figures corresponding to the abbreviations

Figures 1 to 7 represent bend test specimens for butt welds and cladding.

The edges shall be rounded to a radius, r , on the side where the surface is in tension.

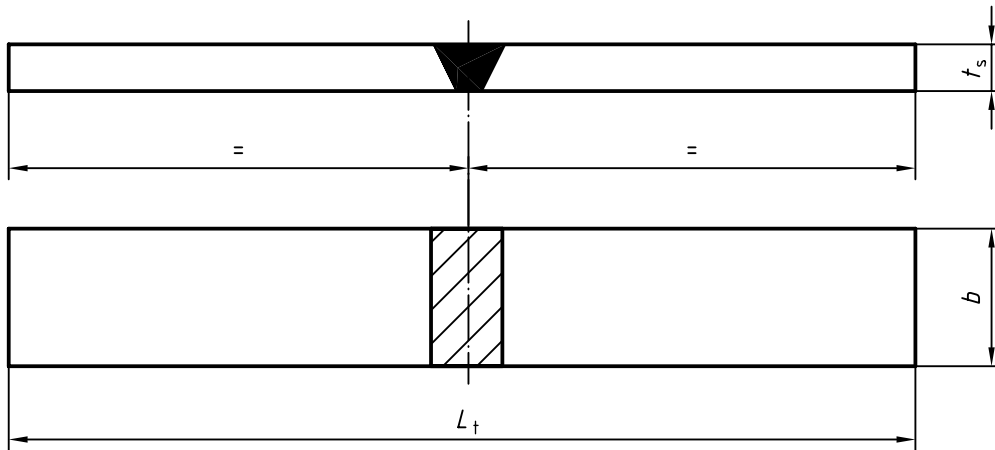


Figure 1 — Transverse root and face bend test specimen for a butt weld (RBB and FBB)

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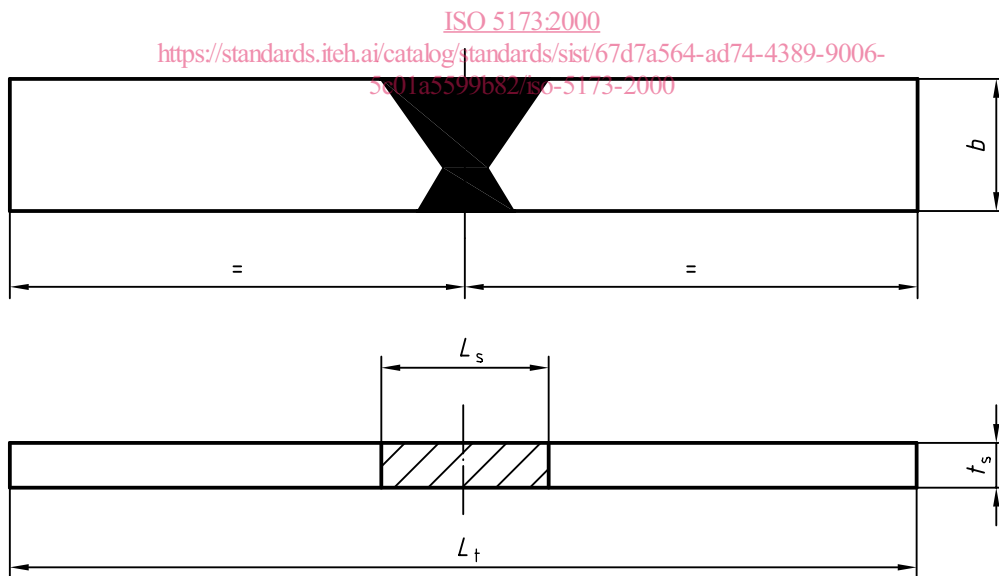
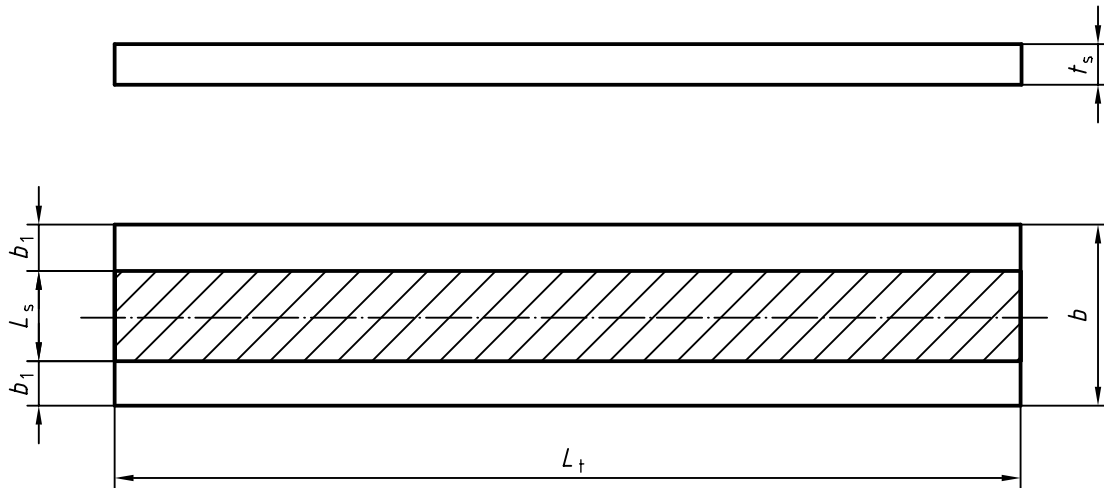


Figure 2 — Transverse side bend test specimen for a butt weld (SBB)



$$b_1 = \frac{b - L_s}{2}$$

Figure 3 — Longitudinal bend test specimen for a butt weld (RBB and FBB)

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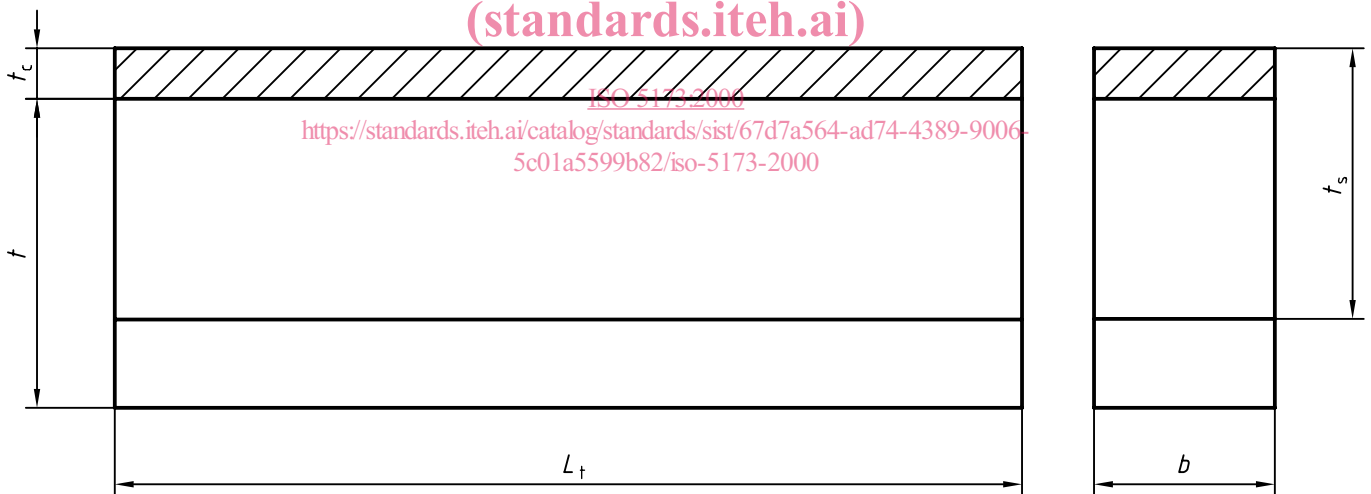


Figure 4 — Face bend test specimen for cladding without a butt weld (FBC)

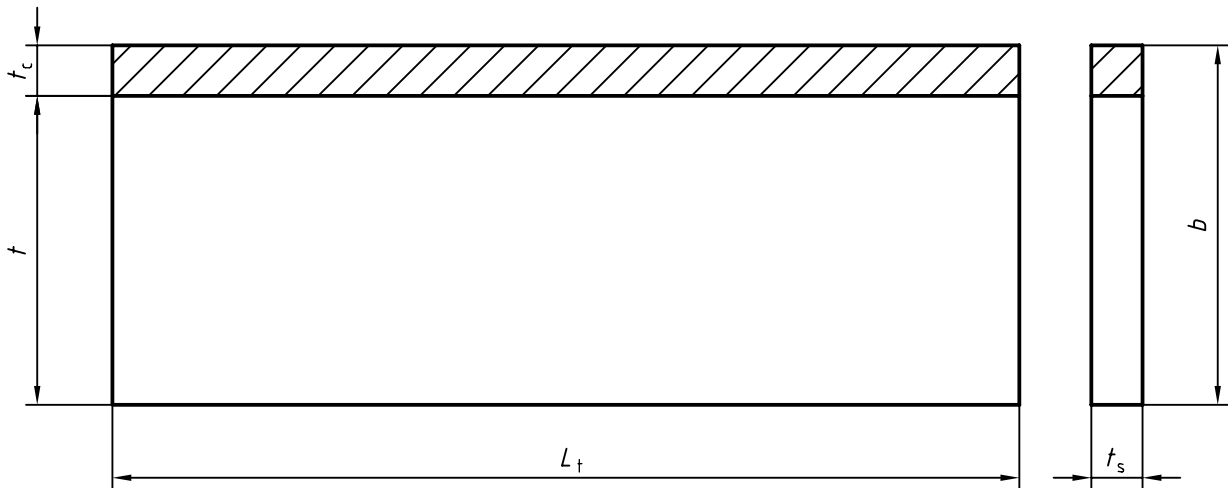


Figure 5 — Side bend test specimen for cladding without a butt weld (SBC)

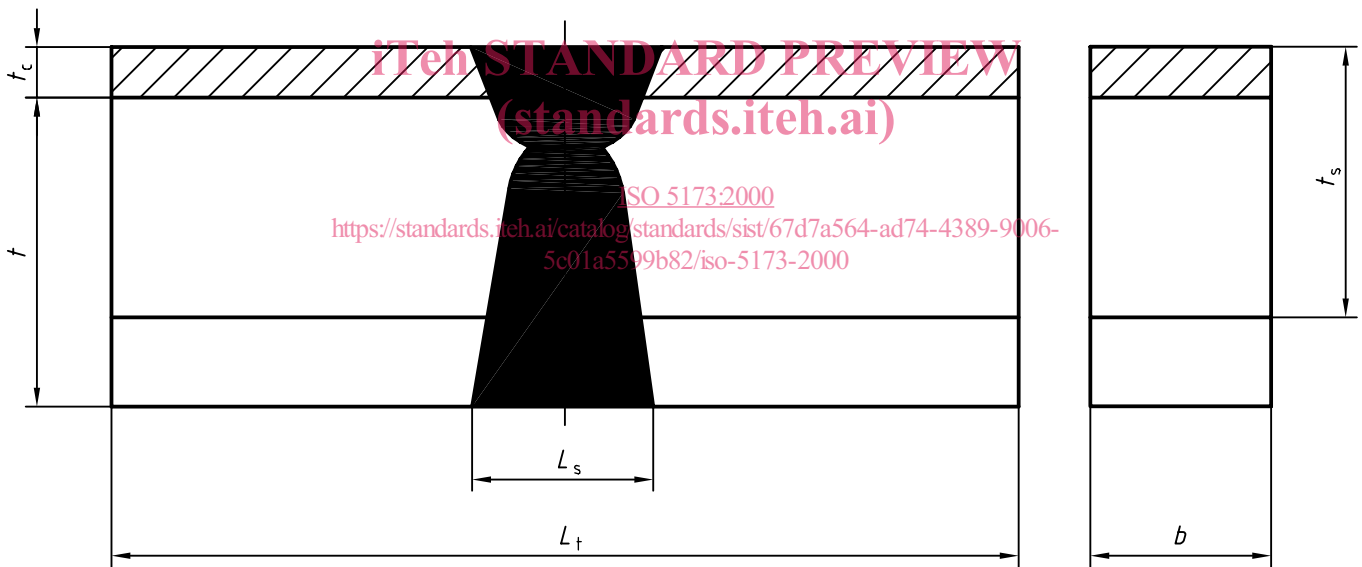
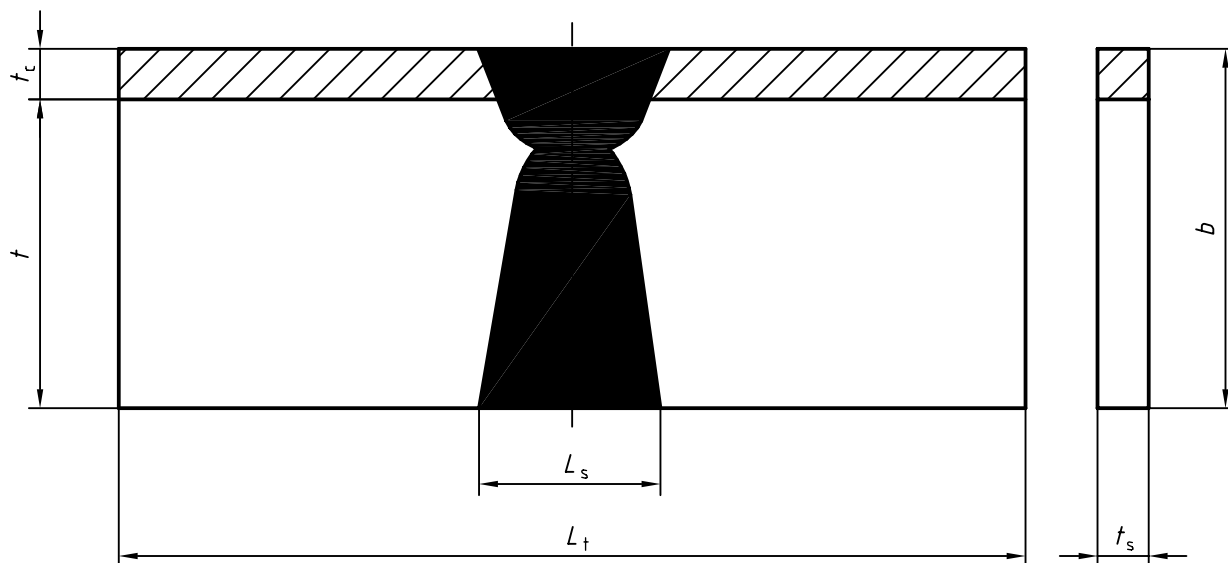


Figure 6 — Face bend test specimen for cladding with a butt weld (FBCB)



$$b = t + t_c$$

Figure 7 — Side bend test specimen for cladding with a butt weld (SBCB)

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5 Preparation of test specimens

5.1 General

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Specimens shall be prepared in such a manner that the preparation does not affect either the base material or the weld metal.

5.2 Location

For transverse bend testing of butt welds the test specimen shall be taken transversely from the welded joint of the manufactured product or from the welded test piece in such a way that after machining the weld axis will remain in the centre of the test specimen or at a suitable position for testing.

For longitudinal bend testing of butt welds the test specimen shall be taken longitudinally from the welded joint of the manufactured product or from the welded test piece.

The location and orientation of bend test specimens of cladding shall be specified by the application standard or by agreement between the contracting parties.

5.3 Marking

Each test piece shall be marked to identify its exact location in the manufactured product or in the joint from which it has been removed.

If required by the relevant application standard, the direction of working (e.g. rolling or extrusion) shall be marked.

Each test specimen shall be marked to identify its exact location in the test piece from which it has been removed.

When removed from the test piece, each test specimen shall be marked.