INTERNATIONAL STANDARD

ISO 5579

Second edition
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Non-destructive testing — Radiographic examination of metallic materials by X- and gamma-rays — Basic rules

Essais non destructifs — Examen radiographique des matériaux métalliques au moyen de rayons X et gamma — Règles de base

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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 voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 5579 was prepared by Technical Committee ISO/TC 135, *Non-destructive testing,* Subcommittee SC 5, *Radiation methods.*

This second edition cancels and replaces the first edition (ISO 5579:1985) which has been technically revised.

Annex A of this International Standard is for information only.

Introduction

For an item submitted for radiographic inspection by means of X- or gamma rays, the detectability of flaws depends on the details of the radiographic technique. Since the quality of the radiograph cannot be completely ensured by the use of an image quality indicator (I.Q.I.), this International Standard explains the basic rules and technical procedure for obtaining good radiographic quality.

Standards relating to specific applications should conform to these basic rules.

NOTE — Throughout this International Standard the term "flaw" has no implication of either unacceptability or acceptability.

Non-destructive testing — Radiographic examination of metallic materials by X- and gamma rays — Basic rules

1 Scope

This International Standard specifies the basic rules for industrial X- and gamma radiography for flaw detection purposes, using film techniques, applicable to metallic products and materials.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 1027:1983, *Radiographic image quality indicators for non-destructive testing — Principles and identification.*

ISO 2504:1973, *Radiography of welds and viewing conditions for film — Utilization of recommended patterns of image quality indicators (I.Q.I.).*

ISO 5580:1985, *Non-destructive testing — Industrial radiographic illuminators — Minimum requirements*.

ISO 11699-1:—[1], *Non-destructive testing — Industrial radiographic films — Part 1: Classification of film systems for industrial radiography.*

3 Definitions

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

3.1 nominal thickness, *t***:** The nominal thickness of the material in the region under examination.

NOTE — Manufacturing tolerances need not be taken into account.

3.2 penetrated thickness, *w***:** Thickness of material in the direction of the radiation beam calculated on the basis of the nominal thickness including for multiple wall techniques.

3.3 object-to-film distance, *b***:** Distance between the radiation side of the test object and the film surface measured along the central axis of the radiation beam.

3.4 source size, *d***:** Size of the source of radiation equal to the larger dimension of the radiation source.

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1) To be published.

3.5 source-to-film distance (SFD): Distance between the source of radiation and the film measured in the direction of the beam.

3.6 source-to-object distance, *f*: Distance between the source of radiation and the source side of the test object measured along the central axis of the radiation beam.

4 Classification of radiographic techniques

Radiographic techniques are divided into two classes:

— class A: basic techniques;

— class B: improved techniques.

Class B techniques shall be used when class A may be insufficiently sensitive.

Better techniques compared with class B are possible and may be agreed between the contracting parties by specification of all appropriate test parameters.

The choice of radiographic technique shall be agreed between the parties concerned.

If, for technical reasons, it is not possible to meet one of the conditions specified for class B, such as the type of radiation source or the source-to-object distance *f*, it may be agreed between the contracting parties that the condition selected may be that specified for class A. The loss of sensitivity shall be compensated by an increase of minimum density to 3,0 or by choice of a higher contrast film system. Because of the better sensitivity compared to class A, the test sections may be regarded as examined within class B.

5 General

5.1 Protection against ionizing radiation

WARNING — Exposure of any part of the human body to X-rays or gamma-rays can be highly injurious to health. Wherever X-ray equipment or radioactive sources are in use, appropriate legal requirements shall be applied. Local or national or international safety precautions when using ionizing radiation shall be strictly applied.

5.2 Test arrangement

The test arrangement consists of the radiation source, test object and the film or film-screen combination in casstte and depends on the size and shape of the object and the accessibility of the area to be tested. Generally, one of the arrangements illustrated in figures 1 to 7 should be used, figure 1 being the most usual case.

The beam of radiation shall be directed at the middle of the section under examination and shall be normal to the surface at that point, except when it is known that certain flaws are better revealed by a different alignment of the beam.

When radiographs are taken in a direction other than normal to the surface, this shall be indicated in the test report.

Double-wall techniques are acceptable only if single-wall techniques are not practical.

5.3 Surface preparation and stage of manufacture

In general, surface preparation is not necessary, but where surface imperfections or coatings might cause difficulty in detecting defects, the surface shall be ground smooth or the coatings shall be removed.

Unless otherwise specified radiography shall be carried out after the final stage of manufacture, e.g. after grinding or heat treatment.

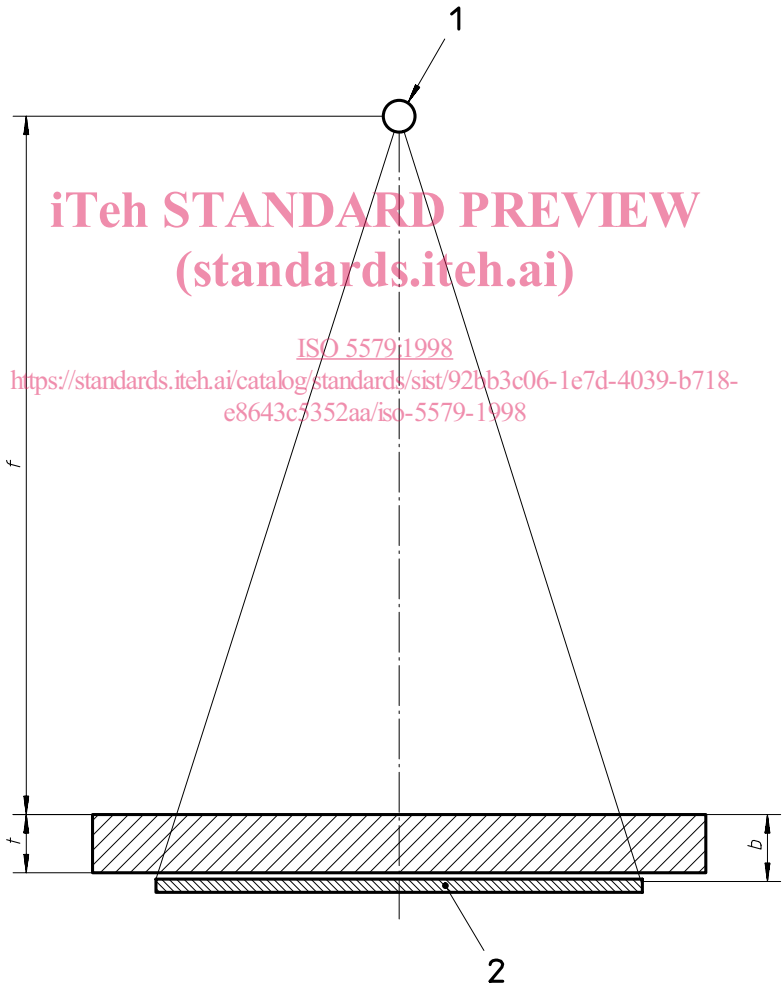
5.4 Identification of radiographs

Symbols shall be affixed to each section of the object being radiographed. The images of these symbols shall appear in the radiograph outside the region of interest where possible and shall ensure unequivocal identification of the section.

5.5 Marking

Permanent markings on the object to be examined shall be made in order to accurately locate the position of each radiograph.

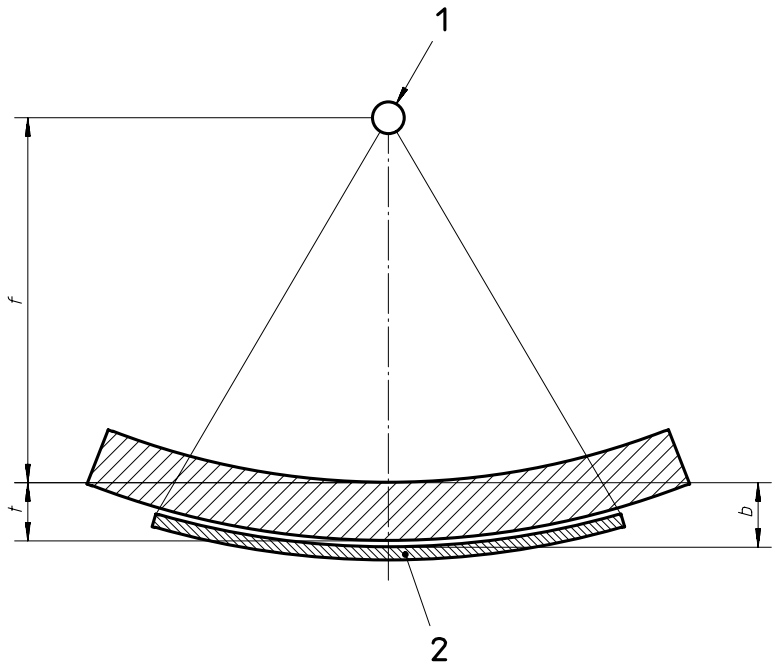
Where the nature of the material and/or its service conditions do not permit permanent marking, the location may be recorded by means of accurate sketches.



Key

1 radiation source with an effective optical focus size *d*
2 film
f source-to-object distance
t material thickness
b distance between the film and the surface of the object nearest the source

Figure 1 — Arrangement 1: Single-wall penetration — Objects with plane walls

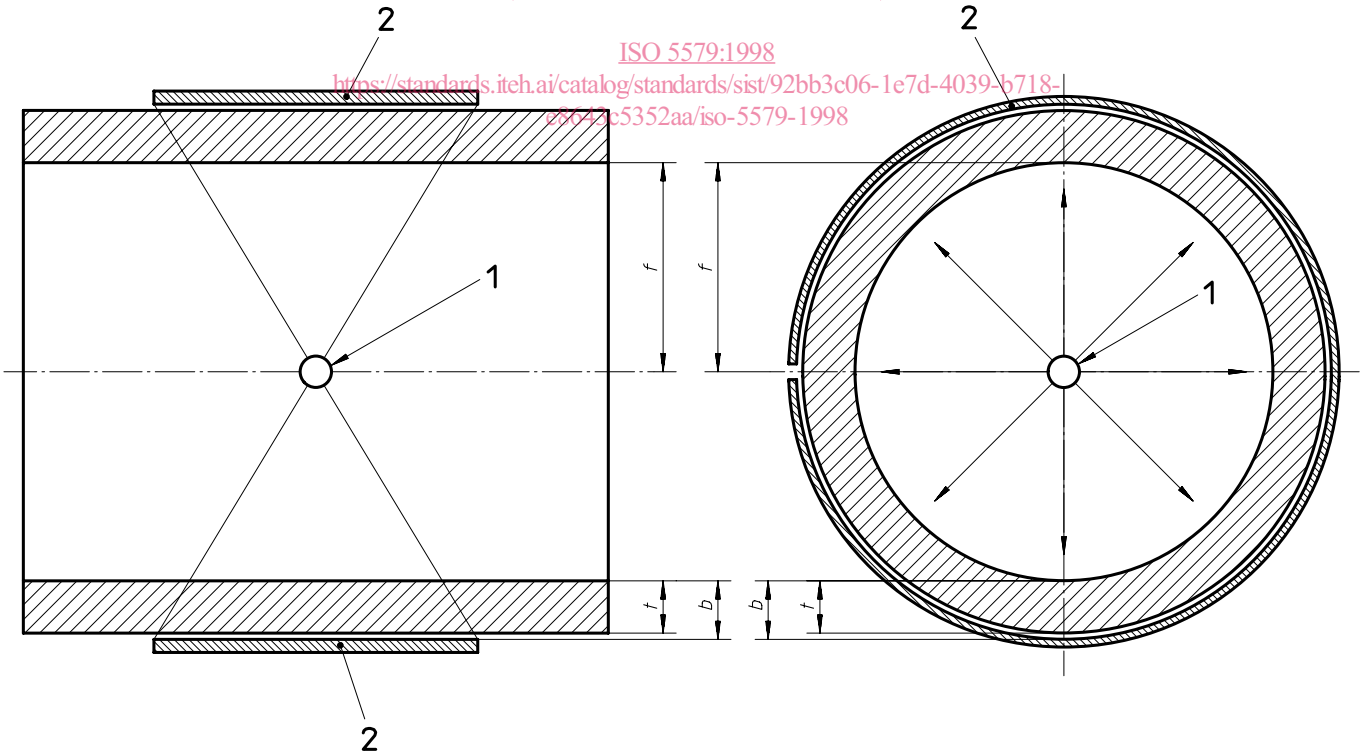


Key

See figure 1

NOTE — This arrangement is preferred to arrangement 4 (see figure 4).

Figure 2 — Arrangement 2: Single-wall penetration — Object with curved walls — Source off-centre on concave side — Film on convex side

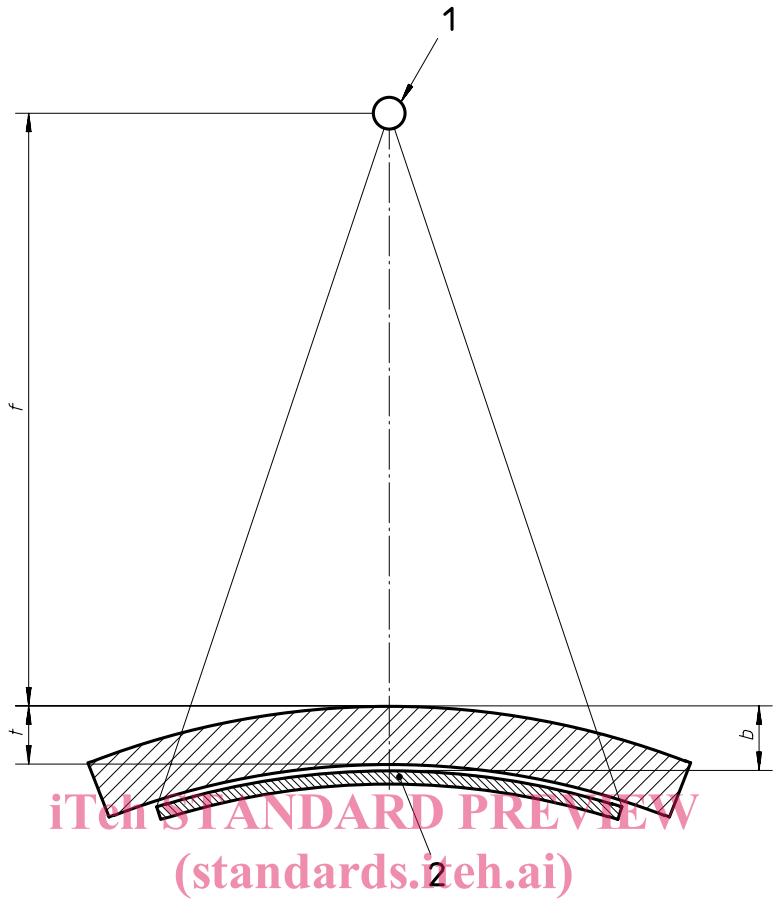


Key

See figure 1

NOTE — One advantage of this technique is that the whole circumference may be radiographed in one exposure. This arrangement is preferred to arrangements 2 (see figure 2), 4 (see figure 4) or 5 (see figure 5).

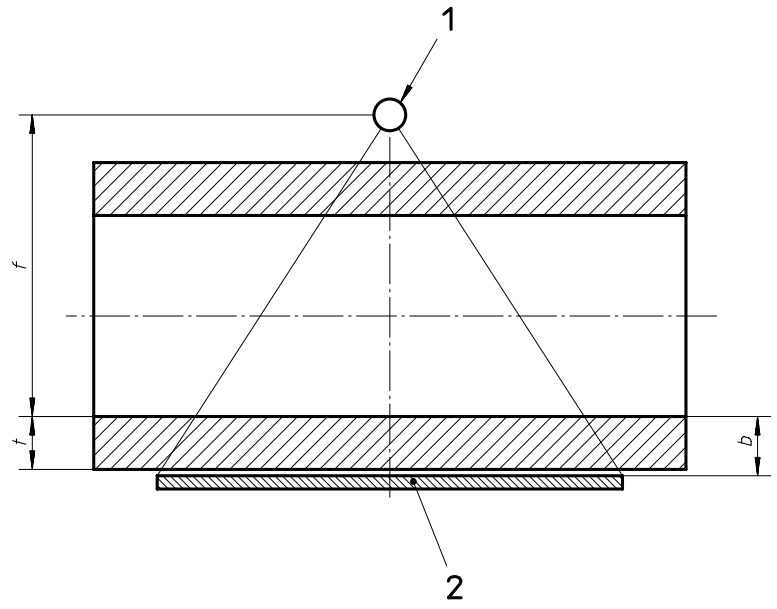
Figure 3 — Arrangement 3: Single-wall penetration — Object with curved walls — Source located centrally



Key

See figure 1

Figure 4 — Arrangement 4: Single-wall penetration — Object with curved walls — Source on convex side — Film on concave side

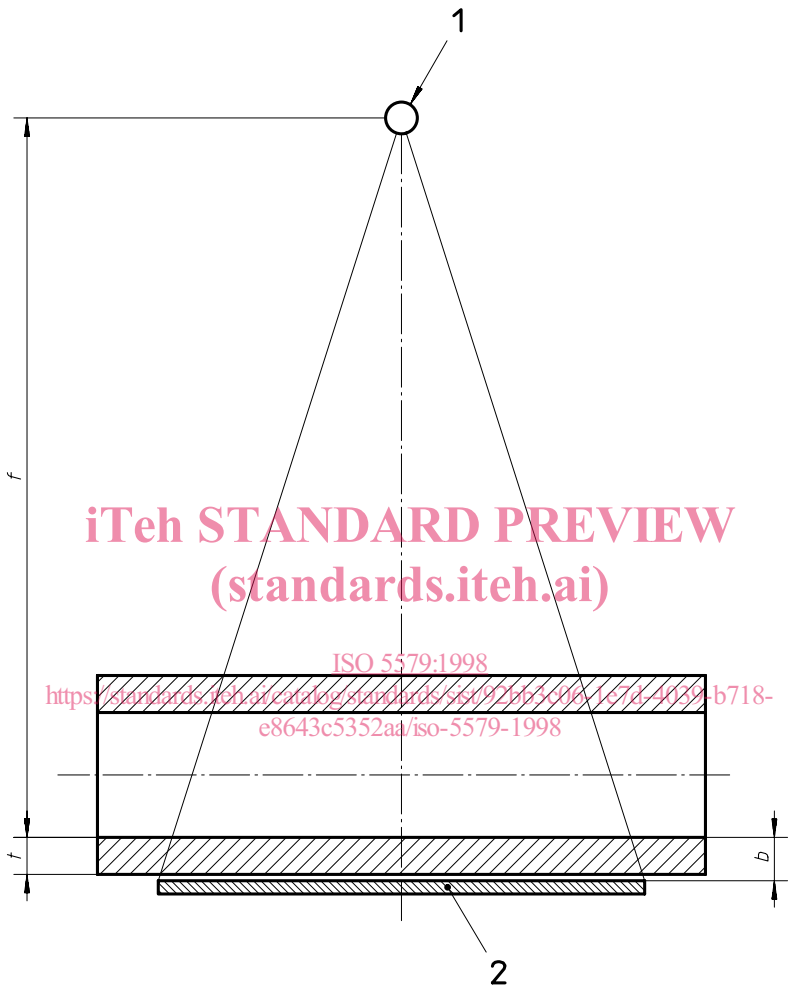


Key

See figure 1

NOTE — Because the source is close to the upper wall, flaws should not be evaluated in this wall.

Figure 5 — Arrangement 5: Double-wall penetration — Single-wall evaluation — Source and film outside

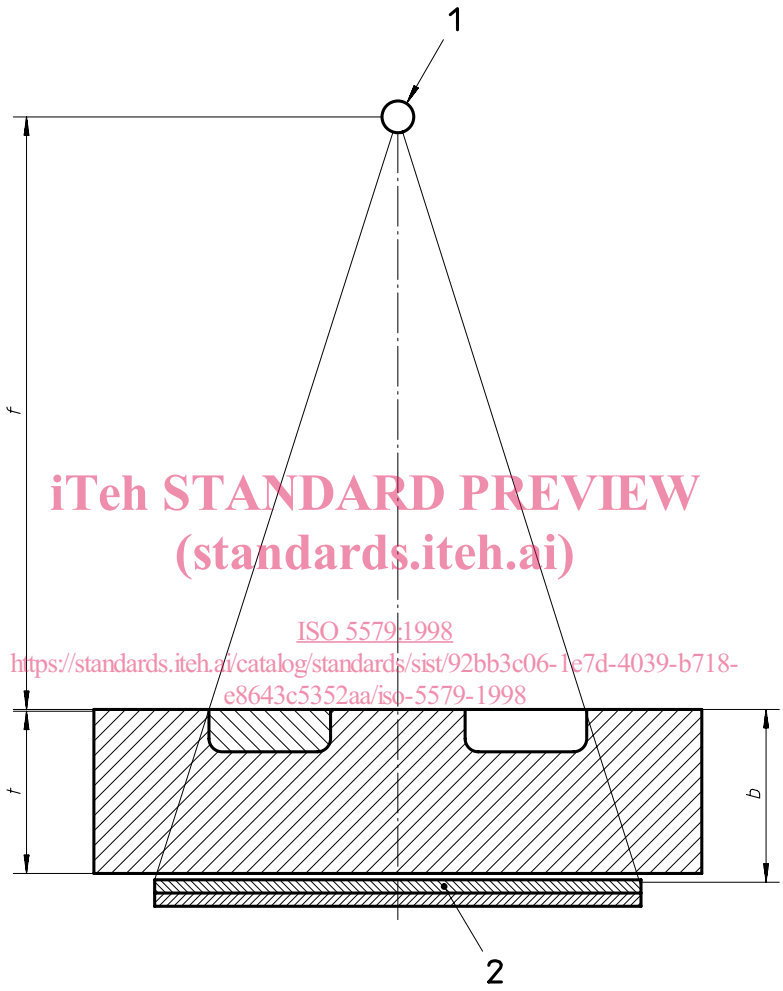


Key

See figure 1

NOTE — Flaws in the upper wall may be evaluated. For some applications the radiation beam might be used at a different angle (i. e. not perpendicular to the centre of the film).

Figure 6 — Arrangement 6: Double-wall penetration — Double-wall evaluation — Source and film outside



Key

See figure 1

Figure 7 — Arrangement 7: Single-wall penetration — Objects with plane or curved walls of different thicknesses or materials — Two films with the same or different speeds