INTERNATIONAL STANDARD 1677

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Sealed radioactive sources — General

Sources radioactives scellées — Généralités

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FOREWORD

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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.

International Standard ISO 1677 was developed by Technical Committee ISO/TC 85, *Nuclear energy*, and was circulated to the member bodies in October 1975.

It has been approved by the member bodies of the following countries :

Austria	Italy	Switzerland
Belgium	Mexico	Thailand
Brazil	Netherlands	Turkey
Canada	Poland	United Kingdom
Finland	Romania	U.S.A.
France	South Africa, Rep. of	Yugoslavia
Germany	Spain	
Hungary	Sweden	

No member body expressed disapproval of the document.

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Sealed radioactive sources — General

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies the general requirements, production tests, marking and certification for sealed radioactive sources. Fuel elements are specifically not covered in this International Standard.

2 REFERENCES

ISO 2919, *Sealed radioactive sources — Classification.*[1)]

ISO/TR 4826, *Sealed radioactive sources — Leak test methods.*[1)]

ICRU Report 10 c, *Radioactivity* (National Bureau of Standards Handbook 86).

3 DEFINITIONS

3.1 sealed source : Radioactive source sealed in a capsule or having a bonded cover, the capsule or cover being strong enough to prevent contact with and dispersion of the radioactive material under the conditions of use and wear for which it was designed.[2)]

3.2 capsule : Protective envelope to prevent leakage of radioactive material.

3.3 radiation output : Number of particles and/or photons of ionizing radiation emitted per time unit from the sealed source in defined geometry. This is best expressed in terms of radiation fluence rate.

4 GENERAL REQUIREMENTS

The sealed source capsule

a) shall be free from surface radioactive contamination;

b) shall be leak-free;

c) shall be physically and chemically compatible with its contents;

d) shall not contribute significantly to the activity of the radioactive material in the case of a sealed source produced by direct irradiation.

5 PRODUCTION TEST

These tests shall cover freedom from surface contamination, and leak-tightness. The requisite tests shall be carried out on each sealed source by the manufacturer.

5.1 Freedom from surface contamination

5.1.1 Except as in 5.1.2, one of the following two methods shall be used :

Method 1

Wipe all exposed external surfaces of the sealed source thoroughly with a piece of filter paper or other suitable material of high absorbent capacity, moistened with a liquid which will not attack the material of which the external surfaces of the capsule are made and which, under the conditions of this test, has been demonstrated to be effective in removing any radioactive material involved. Measure the activity on all the paper or other material used. If the detected activity is less than 5 nCi, the sealed source is considered to be free from surface contamination.

Method 2

Immerse the sealed source in a liquid which will not attack the material of which the external surfaces of the capsule are made and which, under the conditions of this test, has been demonstrated to be effective in removing any radioactive material involved. Examples of such liquids include distilled water and weak solutions of detergents or chelating agents. Heat the liquid to $50 \pm 5\ ^{\circ}C$ and hold it at this temperature for 4 h. Remove the sealed source and measure the activity in the liquid. If the detected activity is less than 5 nCi, the sealed source is considered to be free from surface contamination.

NOTE — Method 1 is generally applicable, but is difficult to use if the sealed source is small. Method 2 cannot be applied in all cases since a suitable solvent cannot always be found.

5.1.2 In the case of sealed sources the characteristics of which (dimensions, chemical composition, etc.) do not allow for such a test, another equivalent method shall be established by agreement between manufacturer and purchaser.

1) At present at the stage of draft.

2) This definition conforms to ISO 921 term No. 548, except that the word "container", which is a general term, is termed for the purpose of this International Standard a "capsule" (see 3.2).

5.2 Freedom from leakage

5.2.1 Except as in 5.2.2, one of the leak test methods described in ISO/TR 4826 shall be used.

5.2.2 In the case of sealed sources the characteristics of which (dimensions, chemical composition, etc.) do not allow for one of these tests, another method shall be established by agreement between manufacturer and purchaser.

6 SOURCE MARKING

Whenever physically possible, the capsule shall be durably and legibly marked with the following information, which is given in order of priority :

a) mass number and chemical symbol of the radionuclide;

b) serial number;

c) for neutron sources, the target element;

d) manufacturer's name or symbol.

The marking of the capsule shall be done before the sealed source is tested.

7 SOURCE CERTIFICATE

The manufacturer shall provide a certificate with every sealed source or sealed source batch. The certificate shall in every case state

a) name of manufacturer;

b) classification designated by the code established in ISO 2919;

c) serial number and brief description, including chemical symbol and mass number of the radionuclide;

d) equivalent activity and/or radiation output in terms of fluence rate, as appropriate, on a specified date;

e) method used and result of test for freedom from surface contamination;

f) leak test method used and test result.

An example of a certificate for a sealed radioactive source is given in the annex.

NOTE – In addition, the certificate may include, as appropriate, a detailed description of the source, in particular :

– for the capsule : dimensions, material, thickness and method of sealing;

– for the active contents : chemical and physical form, dimensions, mass or volume; percentage of undesirable radionuclides from the point of view of the use to which the sealed source is to be put.

ANNEX

EXAMPLE OF CERTIFICATE FOR A SEALED SOURCE

[1] Manufacturer's name and address . . . . . Certificate No.

CERTIFICATE
for
SEALED RADIOACTIVE SOURCE

[1] Serial No. . . .
[1] ISO classification designated by code No. . . . .

[1] Radionuclide . . . . . Mass number and chemical symbol . . . . . .
Target element (applicable for neutron sources) . . .

Equivalent activity[2] (Ci ± %) . . . . . measured on . . . . . (date)
and/or
[1] Radiation output (fluence rate ± %) . . . . . measured on . . . . . (date)
of specified kind of radiation
Actual/Maximum percentage of other radionuclides . . . . . % activity on . . . . . (date)
. . . . . % activity on . . . . . (date)
. . . . . % activity on . . . . . (date)

Active contents : chemical and physical form[3] . . . . . .
mass/volume . . . . . dimensions . . . . . .
Capsule : dimensions . . . . . minimum thickness[4] . . . . . .
material of construction . . . . . method of sealing . . . . . .
number of encapsulations . . . . . .

[1] Freedom from surface contamination : method of test . . . . . date of test . . . . . .
result of test . . . . . .

[1] Freedom from leakage : method of test . . . . . date of test . . . . . .
result of test . . . . . .

We certify that this sealed source complies with the requirements of [ISO 1677 or relevant national standard] and that the above information is correct.

[5] We declare that we hold capsule approval certificate No. . . . . .
in respect of this sealed source, issued on . . . . . by . . . . . .

Date . . . . . Signature . . . . . .

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1) Mandatory information.

2) See ICRU Report 10 c, *Radioactivity* (NBS Handbook 86).

3) For example solid (metal, glass, ceramics powder), liquid, gas, etc.

4) Normally this will be the thickness of the emitting surface (window).

5) This applies only to radioactive material in special form in accordance with the IAEA publication Safety Series No. 6, *Regulations for the safe transport of radioactive materials*, current edition.