

# WARNING SIGNS FOR RADIATION SOURCES

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This Guide is valid as of 1 March 2014 until further notice. It replaces Guide ST 1.3, Warning signs for radiation sources, issued on 16 May 2006.

Helsinki 2015

ISBN 978-952-309-294-3 (pdf)

ISSN 0789-4368

ISBN 978-952-309-295-2 (html)

# Authorization

The Radiation Act stipulates that the party running a radiation practice is responsible for the safety of the operations. The responsible party is obliged to ensure that the level of safety specified in the ST Guides is attained and maintained.

Under section 70, paragraph 2, of the Radiation Act (592/1991), STUK – Radiation and Nuclear Safety Authority (Finland) issues general instructions, known as Radiation Safety Guides (ST Guides), concerning the use of radiation and operations involving radiation.

Translation. In the event of any differences in interpretation of this guide, the Finnish and Swedish versions shall take precedence over this translation.

# 1 General

A party running a radiation practice must use appropriate signs to indicate radiation equipment and radioactive materials, and the places in which they are used and stored. This Guide provides general instructions for marking radiation equipment and radioactive materials, and the places in which they are used. The Guide governs both ionising and non-ionising radiation.

The definitions of the terms used in the Guide are presented in Appendix A.

*The Council of State Decision on safety signs for workplaces and on their use (976/1994) prescribes the general minimum requirements for safety signs in workplaces.*

## 2 All radiation sources must be marked

The purpose of a warning sign is to call attention to a radiation hazard. The marking must provide a warning that is intelligible even to a person who is unfamiliar with radiation protection. The severity of the radiation hazard, the working and environmental conditions and other safety-related aspects must be considered when choosing the marking method.

A radiation hazard is indicated by a triangular warning sign surrounding the graphical symbol for the type of radiation in question. The background colour of the warning sign is yellow. The graphical symbol and the edges are black. Yellow or white rims may be used to highlight the contrast between the warning sign and its surroundings. Some examples of warning signs are shown in Appendix B.

The meaning of a warning sign may be supplemented or clarified with text or a graphical symbol in a rectangular supplementary sign which must be placed above, underneath or to the left or right of the warning sign (Figure 2 in Appendix B). A radiation hazard may also be indicated by a square or rectangular combination sign which contains the warning sign and the supplementary sign providing the required additional information (Figures 3, 4, 8 and 11 in Appendix B). The size of a warning sign will

depend on the desired distance between the sign and the observer. The dimensions are given in detail in the relevant standards.

All signs must withstand normal wear and tear at the place where they are installed. Special attention must be paid to the durability of signs that are permanently placed outdoors or in damp premises. Signs must be made of acid-, base- and solvent-resistant materials if it is possible that they will be exposed to chemicals. All signs must be kept sufficiently clean so as to be clearly visible at all times.

Signs must be removed when the respective radiation hazard is no longer present. Dismantled radiation warning signs must be stored or destroyed in a manner that keeps them from being used inappropriately.

*The Government Decision (976/1994) sets a duty on employers to consider, when arranging safety signs, the relevant workplace risk assessment prepared under labour protection regulations and other relevant statutes. Standards EN ISO 7010 and ISO 3864-1 apply to safety colours and safety signs in workplaces and public places.*

## 3 Warning signs for ionising radiation

Warning signs are used when it is necessary to indicate or specify the hazard caused by ionizing radiation (Figures 1–4 in Appendix B). To improve intelligibility, it is generally preferable to use signs incorporating explanatory texts in the working language of the relevant workplace.

Devices producing radiation electrically, radioactive substances, appliances containing radioactive substances and also waste vessels containing radioactive substances must be marked with signs warning of a radioactive substance or ionising radiation (Figure 1 in Appendix B). Radioactive substances and equipment containing radioactive substances must, in principle, display combination signs or supplementary signs specifying the radionuclide and the activity of the nuclide, together with the date when the activity was determined (Figure 4 in Appendix B).

Devices that produce radiation electrically

may be marked by combination signs or supplementary signs to indicate a radiation hazard when the device is operating.

In radiation work, workplaces must be classified into controlled areas and supervised areas, where appropriate. Signs must be placed to designate controlled areas and, where necessary, also supervised areas. The signs must show clearly which type of area is in question (Figure 3 in Appendix B).

If a radiation source is used or stored in a room specifically reserved for it, a sign indicating a radiation hazard must be placed on or in the immediate vicinity of any door leading to this room, should a need exist to warn people of a hazard caused by ionising radiation.

The positions of these signs should be selected so that they do not unnecessarily draw the attention of outsiders. However, the positioning of these signs must not compromise radiation safety.

*The graphical symbol of ionising radiation is presented in standard ISO 361. The use of open sources and the handling of radioactive waste are governed by Guides ST 6.1 and ST 6.2. The classification of places of work is discussed in Guide 1.6. Warning signs and lights in places of use of radiation are discussed in Guides ST 1.10 and ST 5.6. More detailed instructions on security arrangements are available in Guide 1.11.*

## 4 Warning signs for non-ionising radiation

Warning signs are used when it is necessary to indicate or specify the hazard caused by non-ionising radiation and, in particular, when the maximum values for non-ionising radiation might be exceeded. The general sign for non-ionising radiation is used as the warning sign (Figure 5 in Appendix B), if no specific warning sign exists for the particular type of non-ionising radiation in question.

*The warning signs for non-ionising radiation are presented in standard EN ISO 7010.*

### 4.1 Magnetic fields

The warning sign for static and low frequency magnetic fields is the sign shown in Figure 6. The sign may be further specified with a supplementary sign. The supplementary sign may carry a text such as "Voimakas magneettikenttä" ("Strong magnetic field"). The frequency may also be indicated on the supplementary sign if necessary, for example "Taajuus 50 Hz" ("Frequency 50 Hz"). Where strong magnetic fields exist (due to e.g. magnetic imaging devices), prohibition signs must also be used (Figure 7 in Appendix B) in order to prevent access by persons with e.g. pace makers or metal implants.

### 4.2 Electric fields

There is no standardised graphical symbol for static and low frequency electric fields, so the warning sign for non-ionising radiation (Figure 5 in Appendix B) may be used in such cases combined with a supplementary sign carrying an explanatory text such as "Voimakas sähkökenttä" ("Strong electric field").

### 4.3 Radio frequency radiation

The warning sign for radio frequency radiation is the warning sign of non-ionising radiation (Figure 5 in Appendix B). Radio frequency radiation also includes microwave radiation in the 300 MHz–300 GHz frequency band. The combination sign related to microwave radiation is presented in Figure 8.

### 4.4 Infrared radiation and incoherent light

The warning sign to indicate infrared radiation and incoherent light is the warning sign for optical radiation (Figure 9 in Appendix B). An explanatory supplementary sign is also recommended.

### 4.5 Laser radiation

All laser devices must carry signs warning of laser radiation (Figure 10 in Appendix B). Laser devices are also required to carry signs to indicate their safety classes. The supplementary signs of laser devices of higher safety classes than class 1

must present the safety class -specific warning text and radiation information as required under the standard; in other words, the sign must make clear the maximum radiant power, laser radiation wavelength(s), and pulse duration, if the laser is a pulse laser. In addition, the standard under which the laser device is classified and its publication date must be indicated on the device. The warning sign for laser radiation (Figure 10) and the respective supplementary signs may also be combined into a combination sign (Figure 11 in Appendix B). Devices in classes 3R, 3B and 4 must have the laser beam apertures marked; the signs must show the text "Lasersäde" ("Laser beam") or "Varo altistumista – tästä aukosta tulee lasersäteilyä" ("Avoid exposure - laser radiation emitted from this aperture").

*The detailed requirements for warning signs in laser products are presented in the standard EN 60825-1. The Government Decree on laser equipment and its inspections sets forth requirements for such products and their use.*

#### 4.6 Ultraviolet radiation

There is no standardised graphical symbol for ultraviolet radiation. The warning sign for ultraviolet radiation, contrary to what is said in the introduction to Chapter 4, may be the warning sign for optical radiation (Figure 9 in Appendix B) together with a supplementary sign "UV- säteilyä" ("UV radiation").

*The warning signs used on solarium equipment designed for tanning purposes are presented in the standard EN 60335-2-27.*

## 5 Markings required in the transportation of radioactive materials

The requirements concerning the marking of transportation containers and the marking of vehicles used in the transportation of radioactive materials are based on the legislation governing the transportation of dangerous goods. More

detailed requirements concerning these markings are set forth in decrees and statutes per specific type of transportation (road, air, sea and rail). The marking requirements for the different types of transport are, in principle, uniform internationally and founded on the recommendations by the International Atomic Energy Agency (IAEA).

*Provisions concerning the transportation of dangerous goods are laid down in the Act on Transport of Dangerous Goods (719/1994). The marking requirements concerning road transports are set forth in the Decree of the Ministry of Transport and Communications on the Transport of Dangerous Goods by Road (369/2011), Appendix A, parts 5.2 and 5.3. The requirements concerning air transport are presented in the statute OPS M1-18 by the Finnish Transport Safety Agency. The requirements concerning transport by sea are set forth in Decree 666/1998. The requirements concerning railway transport are set forth in the Decree 370/2011 by the Ministry of Transport and Communications.*

## Bibliography

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6. SFS-EN 12198-1. Safety of machinery. Assessment and reduction of risks arising from radiation emitted by machinery. Part 1: General principles.

7. EN 60335-2-27. Household and similar electrical appliances. Safety. Part 2-27: Particular requirements for appliances for skin exposure to ultraviolet and infrared radiation.
8. EN 60601-2-33. Medical electrical equipment. Part 2-33. Particular requirements for the basic safety and essential performance of magnetic resonance equipment for medical diagnosis.
9. EN 60825-1. Safety of laser products. Part 1: Equipment classification and requirements.

## APPENDIX A

### DEFINITIONS

#### **Prohibition sign**

A safety sign that indicates that a specific behaviour is forbidden.

#### **Graphical symbol (symbol)**

A figure used in signs that depicts a certain situation or specifies a certain behaviour to be adopted.

#### **Supplementary sign**

A sign that is supportive of a safety sign and the main purpose of which is to provide additional clarification.

#### **Radiation appliance**

An appliance which produces radiation electrically or contains any radioactive substance.

#### **Radiation source**

A radiation appliance or radioactive substance.

#### **Safety sign**

A sign which gives a general safety message, obtained by a combination of a colour and geometric shape and which, by the addition of a graphical symbol, gives a particular safety message.

#### **Warning sign**

A safety sign that indicates a specific source of potential harm, intended to provide a warning concerning a risk or danger.

#### **Combination sign**

A sign that combines a safety sign and one or more associated supplementary signs on the same rectangular carrier.

**APPENDIX B**

**EXAMPLES OF WARNING AND PROHIBITION SIGNS**



**Figure 1.** Warning sign for a radioactive substance or ionising radiation.



**Figure 2.** Example of a supplementary sign to be used with a warning sign for a radioactive substance or ionising radiation. (Pääsy kielletty = No entrance)



**Figure 3.** Example of a combination sign with a warning sign for a radioactive substance or ionising radiation and an explanatory text. (Säteilyvaara = Radiation hazard, Valvonta-alue = Controlled are)



**Figure 4.** Example of a combination sign to be attached to the shield of a radiation source. (Radionuklidi = Radionuclide, Aktiivisuus = Activity, Pvm = Date, Valmistusno = Serial no)



Figure 5. Warning sign for non-ionising radiation.



Figure 6. Warning sign for a strong magnetic field.

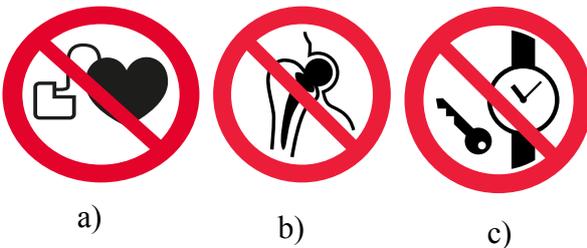


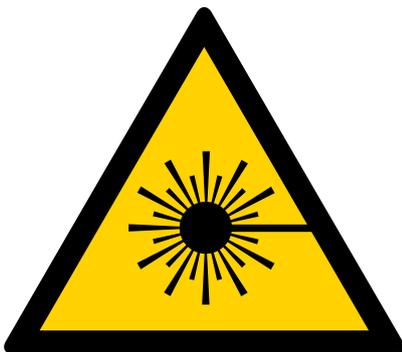
Figure 7. These prohibition signs, for example, may be used together with warning signs if there are grounds for preventing the access of certain persons to premises where there are strong magnetic fields: a) No access for persons with cardiac pacemakers, b) No access for persons with metal implants, and c) No metal objects and watches allowed.



Figure 8. Example of a combination sign containing a warning sign for non-ionising radiation and an explanatory text. (Mikroaaltosäteilyä = Microwave radiation, Turvaetäisyys antenniin = Safe distance to antenna)



**Figure 9.** Warning sign for optical radiation. If necessary, a supplementary sign must be added to provide information on the type of optical radiation (UV radiation, visible light or infrared radiation).



**Figure 10.** Warning sign for laser radiation.



**Figure 11.** Example of a combination sign containing a warning sign for laser radiation and a warning text in accordance with the safety class. (Näkyvää ja näkymätöntä LASERSÄTEILYÄ = Visible and invisible LASER RADIATION, Varo silmien tai ihon altistumista suoralle tai hajaheijastuneelle säteilylle = Avoid exposure of the eyes or the skin to direct or scattered radiation, Luokan 4 laserlaite = Class 4 laser device, jatkuvatoiminen = continuously working)

# ST GUIDES (16.11.2015)

## General guides

- ST 1.1 Safety in radiation practices, 23 May 2013
- ST 1.3 Warning signs for radiation sources, 9 December 2013
- ST 1.4 Radiation user's organization, 2 November 2011
- ST 1.5 Exemption of radiation use from safety licensing, 12 September 2013
- ST 1.6 Operational radiation safety, 10 December 2009
- ST 1.7 Radiation protection training in health care, 10 December 2012
- ST 1.8 Qualifications and radiation protection training of persons working in a radiation user's organization, 17 February 2012
- ST 1.9 Radiation practices and radiation measurements, 17 March 2008
- ST 1.10 Design of rooms for radiation sources, 14 July 2011
- ST 1.11 Security arrangements of radiation sources, 9 December 2013

## Radiation therapy

- ST 2.1 Safety in radiotherapy, 18 April 2011

## Diagnostic radiology

- ST 3.1 Dental X-ray examinations in health care, 13 June 2014
- ST 3.3 X-ray examinations in health care, 8 December 2014
- ST 3.8 Radiation safety in mammography examinations, 25 January 2013

## Industry, research, education and commerce

- ST 5.1 Radiation safety of sealed sources and devices containing them, 7 November 2007
- ST 5.2 Use of control and analytical X-ray apparatus, 26 September 2008
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- ST 9.1 Radiation safety requirements and regulatory control of tanning appliances, 1 July 2013 (in Finnish)
- ST 9.2 Radiation safety of pulsed radars, 2 September 2003 (in Finnish)
- ST 9.3 Radiation safety during work on masts at FM and TV stations, 2 September 2003 (in Finnish)
- ST 9.4 Radiation safety of laser displays and shows, 30 April 2015

## Natural radiation

- ST 12.1 Radiation safety in practices causing exposure to natural radiation, 2 February 2011
- ST 12.2 The radioactivity of building materials and ash, 17 December 2010
- ST 12.3 Radioactivity of household water, 9 August 1993
- ST 12.4 Radiation safety in aviation, 1 November 2013